Antoine Darquier, his discovery of Lyra Ring nebula and astronomy in the city of Toulouse

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If the expression "planetary nebula" is of William Herschel, it is not foreign to the discovery of Lyra Ring nebula at Toulouse in February, 1779 by Antoine Darquier de Pellepoix. Indeed, this one compared it by the shape and the thickness with the planet Jupiter. Come back on the conditions of his discovery and biographic approach of a French observer of the Age of the Enlightenment whose tercentenary of the birth we celebrate, in this year of the IPS-2018 in Toulouse.

Life and work of Antoine Darquier (1718-1802)
The awakening of a vocation

Antoine Darquier de Pellepoix was born on November 23rd, 1718 in Toulouse and died January 18th, 1802 to Beaumont-de-Lézat, at the age of 83. After his studies to the College of the Jesuits in Paris, he returns in Toulouse because of the fragile health of his father. In the foreword of the first volume of his astronomical Observations, he indicates dedicating itself to the astronomy having attended sessions of the Société des Sciences de Toulouse. Raise of the class of geometry in 1739, his first communication goes back up on March 26th, 1744 and door on the movement of planets. According to these diverse elements, we can consider that it is near 1745, thus towards the age of 27 years, that takes form its interest in celestial bodies, passion which it exercises till the end of his life.

Darquier and Garipuy: a work which ends in the emergence of Toulouse Observatory

How to present Darquier without evoking François Garipuy (1711-1782), of seven years his older ? It is this main astronomer of the Society of the Sciences that arouses its interest. On its initiative, the Company establishes an observatory on the Tower of the Rampart St-Etienne in 1734. The astronomers observe there together the big phenomena. This threatening Tower ruins, both observers, bothered by its estrangement, decide by 1750 to establish in their properties their own observatories. It is shortly after the call of Delisle to lead observations corresponding to those of Lacaille in the Cape of Good Hope in 1751 and 1752. They are realized in Toulouse by Garipuy and Darquier with a quarter circle of two and a half feet of Langlois acquired by the Academy (today kept to the Museum of the Paris Observatory), and a glasses of Darquier of seven feet stocked with a micrometer, placed on a wooden sector of five feet of beam. They end in a parallaxe of the Sun of 8,5 "giving evidence of the quality of their observations ».

Next years, Darquier, provincial Conductor of the Clergy and the impositions of the Auch’s district, fits out his observatory. Garipuy, Civil engineer in Languedoc, ceases its activity about twenty years. By 1770, he replaces his observatory, by a new one at the top of his house, magnificent, more spacious, in a room of 20 feet of internal diameter (with four terraces to move forward instruments to four cardinal points) and a closed dome representing the boreal constellations. We can see a representation on an engraving accompanying a study of Bigourdan in 1886, with the mention of the Lyra nebula ; joke of the biographer, because it is indicated that this engraving is inspired by a watercolor drawing of 1774, time preceding the discovery of the nebula. In fact, the original drawing, preserved to the Archives of Toulouse, dates 1826. It contains a signature of Carney, president of the Academy but is most probably Julien Rivet's work, an architect alumnus of Darquier, who oversaw then the restoration of the observatory.

When Garipuy built its observatory at the top of its house, Riquet de Bonrepos, grandson of the builder of the Canal du Midi, establishes his, developing with Vidal that he recruits as astronomer of the meridian observations of Mercury.
This type of observations is also gone deeper into by Darquier and arouses the general interest of the astronomers. Lalande write in his Astronomy (t. IV, p. 587) published in 1792: "Toulouse. Mr Darquier published a big collection of observations in 1777. Mr Garipuy built a beautiful observatory in his house in 1773. M. de Bonrepos did one in his earth near Toulouse. It is all the provincial towns that where the astronomy is the most cultivated".

The astronomical brilliance of the pink city is sealed by the deliberation of the States of Languedoc to acquire of Garipuy’s observatory shortly after its death in 1782 to became the Observatory of the Province.

One thing leading to another, the provincial observatory, entrusted to the Academy, becomes in the Revolution the National Observatory of Toulouse endowed with a paid staff. After a municipal status in 1808, it takes a new impetus from 1840, with the rise of domes on the hill of Jolimont. Garipuy is thus twice at the origin of the observatories of the Toulousian Academy, in the Tower of ramparts, then at the top of its house. But the latter would not probably have been saved in 1782 without the share and the scientific aura of Darquier, author of his academic praise.

The written work of Darquier: works of observations, popularization and translations

The main contribution printed of Darquier is the complete edition of its observations on five decades (1748-1798), extremely rare fact. His astronomical Observations appear in two volumes: the first one printed in Avignon in 1777, for the period (1748-1777) and the second printed in Paris in 1782 for the period (1777-1780). Then, three consequences are inserted at the end by volumes II, III, and IV of the Reports of the Academy of Toulouse covering the period (1781-1791). Finally, after the dissolution of Academies in the Revolution, Lalande inserts the period (1791-1798) into its French celestial History. In the register of the popularization, Darquier joins as a precursor through its two works, Uranography and Letters on the practical astronomy, which would find both domains of the popular astronomy and amateur's astronomy today, but in the sense of its period.

Uranography or pondering over the sky within the reach of everybody, was edited in Paris in 1771, republished in 1780, then in 1786 at the end of its Letters on the practical astronomy, edited in Paris by Didot. Darquier practice four languages : English, Italian, Spanish and German, language acquired to maintain a long correspondence with Jean Bernoulli. He translates in particular the Cosmological Letters of the mulhousien Lambert.

Darquier, an astronomer to rediscover…

Darquier give us a very singular contrast regarding investment between what we believe to be useful for the science and what the situation is for the test of time. Because finally, here is an amateur who observes accurately the sky during more than half a century, who does not arrange his efforts to publish (on his personal fortune, rare fact to be underlined) its thousand meridian observations of the Moon, the planets and the stars, reduced, commented and classified chronologically, as well as all the announced or impromptu phenomena, moon and Sun eclipses, aurora borealis ... A working sum of observation, calculation and considerable edition, today reduced to the state of archives in some libraries. Thousands of pages compared to which seem very derisory some lines granted to this nebula of the Lyre, considered by his discoverer as a simple curiosity, while it turns out the vector immortalizing its work...

It is the Canon Louyat who really brings out Darquier of the shade in 1960. He suggests a commemorative tablet on his hotel. It is however necessary to wait for 1984 so that it succeeds, during a ceremony in the presence of the Mayor of Toulouse, Dominique Baudis. Organized by Louyat, the remembrance is accompanied in particular with communications by Jean-Paul Zahn, Director of the Pic-du-Midi Observatory and Jean-Pierre Brunet, President of the Society of popular astronomy of Toulouse and author of a first project Toulouse Planetarium in the 1980’s years, who realized with Robert Nadal the inventory of its works (published in the magazine Pulsar of May-June, 1984). Meanwhile, Roger Jaquel, specialist of the works of the mulhousien Lambert, presents a communication on his translation of Lambert's cosmological Letters to the Congress of the Learned societies held in Toulouse in 1971. About twenty years later, during the same Congress held in Avignon in 1990, Simone Dumont redraws his admission to the Institute in 1796 together with three other Southern astronomers in the honor : Flaugergues from Viviers (Ardèche), de Ratte in Montpellier and Duc-Lachapelle in Montauban, completed in 1802 by that of the astronomer Vidal of
The discovery of Lyra Ring nebula
The Ring nebula of Lyra (M57 in the catalog Messier and NGC 6720 in New General Catalogue) is one of the objects of the deep sky the most appreciated by the amateur astronomers. Situated not far from Vega, one of the three stars of the beautiful summer triangle, it is easily locatable by the amateur astronomers in a third of the line of the quadrangle of the Lyre joining both stars of the third magnitude, Sheliak and Sulafat of this constellation. Its discovery by Darquier is the second of the kind. With Dumbbell (M 27) in the Small Fox, discovered by Messier in 1764, Small Barbell (M 76) in Perseus and the Owl (M 97) in the Great Bear, it is one of the four planetary nebula of the catalog Messier and it is often considered as the prototype of this type of nebula. Nowadays, about 2.000 are listed in the Milky Way, where we esteem their number around 50.000.

In spite of its naming, M 57 has nothing « planetary ». But in the eighteenth century, the astrophysics, the red giants and the white dwarfs were not still on the agenda, and the shape of these nebula gave them a family resemblance with planets resolved with visible diameters in the astronomical instruments. Thus it is quite naturally that Herschel established this naming in 1784. In fact, this discovery was made in a fortuitous way by Antoine Darquier in his exploration of the constellations crossed by the comet of 1779. He pointed immediately his researcher of comets and his glasses of Dollond in the concerned region and followed the evolution of this comet until March 24th. To establish the walking of the comet, he establishes in the second about fifteen February a catalog of 270 stars of the constellations of Berenice, the Crown, Hercule and the Lyre. In this context he tells the discovery of the nebula, some lines in the second volume of his astronomical Observations :

"I met some nebula in my path, most of which are unknown; but the one in which I stopped with most complacency is a nebula situated between two beautiful stars of the third size of the Lyra ; it looks like no other one : it is as big as Jupiter, perfectly round and well determined, mat as the dark part of the Moon in szigies : it seems that its center is a little less mat than the reflection of its surface... There is good reason to wonder that no astronomer spoke about it : it is true that is needed a rather strong glasses to perceive it. Would it be a new production of nature ? Or would it have the same date as the stars which surround it ? That is why we keep silent, not to deliver us to still imaginary guesses ".

Darquier used a glasses of Dollond of 3 inches and stand-off half (92 mm) and 42 inches of focal (1,10 m), rather powerful to suspect the center of the nebula of different aspect. It liked to say that his instrument " had the same strength as that of Messier ".

It should be noted that in a publication printed in 1782, the Mémoires de l'Académie des Sciences, 1779, we can read that Messier observed this nebula on January 31st, 1779, that is about ten days before Darquier does learn the existence of this comet, on February 9th, following her from the same evening till the end of April, what motivates him to study the crossed constellations. Thus it would be attractive to assert that Messier is the first discoverer of this nebula …

Yet, not only the columns of the astronomy mention the name of Darquier for 238 years, but there was no contesting at that time because Messier himself, in the edition of its catalog of 1781, associates the name of Darquier with the discovery of this nebula. And we know nevertheless the propensity which had Messier to claim its discoveries, whether it is comets or nebulae …

Besides, it is advisable to take into account all the elements of the context of a discovery by respecting the criteria of allocation of the astronomical discoveries. That they are amateur or professional astronomers, that they work in the XVIIIth or in the XXIth century, these criteria are the same for all the observers. And they are well known : it is the first one who communicates who is recognized as
discoverer. We understand the race in which are engaged all the observers to be the first ones to warn the astronomical community to be recognized as discoverers. Everything is affair of chronology, not in the observation itself, but in the distribution of this observation.

The discovery of this nebula of the Lyre is not the fruit of the fate. It is due to the meticulous examination of the zone browsed by this comet of 1779 which Messier observed on January 19th, independently of Bode who had discovered it from January 6th. He immediately sent a note on the comet, published in the Gazette de France on January 26th. Darquier lay in Toulouse and the mail coach putting in the period about ten days to bring the information to this provincial town, he observed this comet from the night from 9 till 10 February. Yet, if Messier observed this nebula on January 31st as he asserts it in his text printed on one year later, I took care of verifying that we have no handwritten document giving evidence that he informed the scientific community immediately after his discovery: no dated letter, no article in newspapers, no register of observation with dates kept, even no manuscript in the Archives of the pouches of sessions of the Académie des Sciences. Nothing surprising in it, Messier was at first a hunter of comets, and he had undertaken his catalog of low objects only to avoid confusing these nebula with the new comets. These low objects (our current stellar or spherical galaxies, heap, diffuse and planetary nebulas, were then indicated under the general word of "nebulas" and were not on the agenda yet. It is moreover one of the main paradoxes of the observational science in the XVIIIth century: the name of Messier went down in history through its catalog of objects rather than by his about forty observed comets, of which near half bare or co-bare independently of other observers …

In the passage, if we examine the supplied descriptions, Messier is very light in its description of this Lyra Ring nebula that he claims to have observed January 31st, 1779. What includes because the Full moon, what arose the next day in February 1st, returned then the night-sky particularly little convenient to the observation - and even more, in the discovery - of an object as M57...

Darquier, without indicating the date of its observation, is more precise, comparing this nebula with Jupiter by the shape and the size, opening the way to the expression "planetary nebula" widely diffused by Herschel following his journey in England at the famous manufacturer of telescopes, discoverer of Uranus.

The manuscript of the "Memory on the comet of 1779" of Messier not being preserved in the Archives of the Academy of Science, the only source concerning him whom we have is thus its text printed in the Mémoires de l’Académie des Sciences 1779, including its observations of this nebula in January and in September, 1779, followed by the observations of Darquier of the constellations browsed by the comet, made of February at the end of April, then taken back in July, 1779. In view of the former and current criteria of the astronomical discoveries, the difference is clear.

Even if we can suppose honest Messier in its assertions and admit that he observed this nebula M57 on January 31st, this source was printed in 1782, took out press with three years of gap. Whereas Darquier communicated well the first one its observations to the astronomical community from the summer, 1779 through the mention of this nebula sent to Messier. The conclusion is without appeal: by virtue of the fact that the discoverer of a new celestial body is the first one who communicates, the discoverer of the nebula of the Lyre is good Darquier.

It is doubtless unfair for Messier, but he would go away so nowadays for any talented astronomer who would discover a new object. If he does not immediately make known his observation and that another observer, although observing later, communicates more quickly, he cannot make validate his discovery …

The astronomy in Toulouse

Drawings on the walls of the Basilica Saint Sernin give evidence of an education of the astronomy in the thirteenth century with a geocentric representation, before the heliocentric revolution of Copernic. In the XVIIth century, father Minime Emmanuel Maignan (1601-1676) develop astronomical observations and gnomonical realisations. In 1648, he publishes his Perspectiva Horaria, voluminous treaty of gnomonics and optics. The Jesuit Michel Mourgues (1642-1713) observes the big comet of 1680. Guillaume Bonjour (1669-1714) imagine a project of calendar approved by Cassini and produce observations in China. Besides his observations, father Emmanuel de Viviers (1666-1738) designs an astronomical, geographical and lunar Dial for Toulouse.
If Darquier and Garipuy dominates the middle of the XVIIIth century, Riquet de Bonrepos and especially Jacques Vidal (1742-1819) have developed their meridian observations of Mercury. In the XIXth century, Frédéric Petit (1810-1865) insures the transfer of the Observatory from the Garipuy’s house Jolimont, developing this observatory that he makes equip big instruments of which the Foucault’s telescope of 83 cm he orders, installed by his successor Félix Tisserand (1845-1896) in 1875. Besides the foundation of the Annales de l’Observatoire de Toulouse en 1863, like popular astronomy class of Arago, he give a weekly public lessons, edited under the title "Traité d’astronomie pour les gens du monde ". Director in 1878, Benjamin Baillaud (1848-1934) completes the equipment (33 cm glasses in 1889, meridian circle), develops the photographic project of the Carte du Ciel and makes build the big dome of the Pic-du-Midi Observatory, which gradually takes over in the XXth century by the quality of its sky in 2877 m from height …
François Garipuy

Watercolor of Garipuy’s observatory built in 1774 (1826)

Toulouse observatory (Jolimont)