

From the geophysical-meteorological Observatory of Modena to the Italian network of observatories

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Abstract

The paper reconstructs the history of the Observatory of the University of Modena. The second part describes a network of Italian astronomical observatories, starting from creating a database of the collections by cataloguing the historical instruments through the standard cataloguing pattern for scientific and technological heritage released by the Central Institute for Cataloguing and Documentation within the General Informative System for Cataloguing SIGEC Web. The main goal is to spread knowledge about the collections of scientific instruments through an effective cultural and educational action, using in particular the updating of the website, digital technologies and social networks.

The history of the geophysical-meteorological Observatory of Modena

The creation of the observatory and the direction of Giuseppe Bianchi

A renewed interest for astronomical studies in Modena is due to Maximilian of Austria Este, brother of the archduke of Modena and Reggio Emilia Francesco IV. After the restoration Modena became the capital city of the Este Dukedom again. In 1814 the archduke Maximilian contacted the young Modenese Giuseppe Bianchi who had graduated in mathematics the previous year (LUGLI 2007). After a brief interview with Maximilian, he was awarded with a ducal bursary in order to let him move to Milan and improve his astronomical studies in Brera under the guidance of the astronomers Barnaba Oriani, Giovanni Angelo Cesaris and Francesco Carlini. His stay in Milan allowed him to continue his studies and to keep in contact with the archduke Maximilian – who was particularly interested in the studies of astronomy and often was in Milan – as well as with important scholars, such as the mathematician Gabrio Piola with whom he had a constant though irregular correspondence from 1817 to 1850.

In 1818, at the end of his studies, Bianchi was called back to Modena and awarded with the teaching of theoretical astronomy, created on purpose for him. At first he did not have any instrument or observatory to practice his science. Yet, in the month of January of the same year, when he still was in Milan, Bianchi had sent to Marquis Luigi Rangoni, Studies Magistrate and Minister of Public Education, a list of instruments to be bought. In the following month of March Rangoni announced him that his request had been approved by the archduke Francesco IV. Therefore Bianchi commissioned in Munich a Meridian Circle by Reichenbach: this arrived in Modena in the middle of July 1823.

At the end of January 1818 Rangoni, as suggested by Bianchi, wrote to the rector of the university, the mathematician Paolo Ruffini (BIANCHI 1894), asking him not only to ask Amici (DONATI 1865; PALERMO 1870; ABETTI 1960; DI PIETRO 1988; DI PIETRO 1994; MESCHIARI 2001) to give the Newtonian reflecting telescope that he had already built in 1811, but also to sign a contract for the construction, in the following six years, of the other two instruments: a transit instrument for right ascension and an equatorial telescope for extra-meridian observations.

Amici accepted the proposal: he gave to Bianchi the Newtonian telescope on 9th June 1820 and wrote to the rector saying he would construct the two instruments over the six-year contract with the help of the technician Giuseppe Sgarbi. He added that he did not want any interference or supervising conditions: Bianchi should only provide information about the technical requirements. Amici started construction in September 1821.



Fig. 1 - The Ducal Palace of Modena

instruments to be placed in the eastern tower (on the right side of the façade) of his own ducal palace. This had been built in the first half of XVIIth century, as in 1598 Modena became the capital of the Estense Dukedom (CORRADINI 1999) (fig. 1).

The tower, chosen for the new observatory, had already served Bianchi as place for astronomical observations from 1819 to 1826, and in particular to observe the longitude signals lit up on the Cimone mountain and on the Baldo mountain in May 1822 and August 1823. During the creation of the observatory, Bianchi dedicated himself to observations and to various researches.

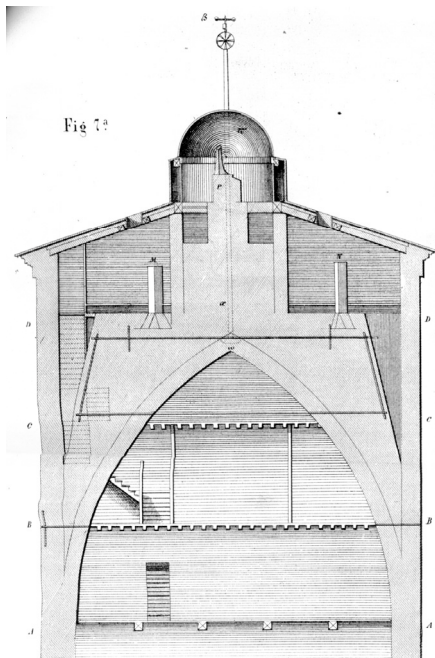


Fig. 2 - A section drawing of upper part of east-wing tower of the Ducal Palace in Modena, place of the observatory (RAGONA 1869).

The issue of finding an adequate seat for the observatory still remained: as the palace of the university, built by Francesco III from 1774 to 1776, did not have any appropriate room, and as the termination of the six-year contract of Amici approached, it became more and more urgent to find an appropriate place to house the new instruments (MOR & DI PIETRO 1975). The problem was solved by his successor, the archduke Francesco IV, when on 15th January 1826 he allowed the

The works for the observatory began during the spring of the same year 1826 under the direction of Gusmano Soli, inspector of the royal buildings, and lasted until the end of August of 1827.

It was necessary to transform completely the internal structure of the upper part of the tower, thirty meters high from the ground, making the rooms suitable for the new usage, without changing anything in the external shape, architecturally symmetrical with the other parts of the ducal palace. It was necessary to rebuild the whole roof of the tower, since it had to be divided obliquely by the meridian clefts (since the front of the palace is facing south-west), in correspondence with the Meridian Circle and the transit instrument that were placed on the second floor of the tower (where they still are). On the first floor there was a big office or study and two smaller rooms (BIANCHI 1828). In order to ensure the necessary steadiness to the framework of the observatory, it was necessary to set a huge pointed arch vault on the two external walls of the eastern and western side, linked with chains, to create within the tower a support for the three fundamental instruments (fig. 2): on the buttress walls, over the vault, Reichenbach's Meridian Circle was placed on one side; on the other, the transit instrument (fig.

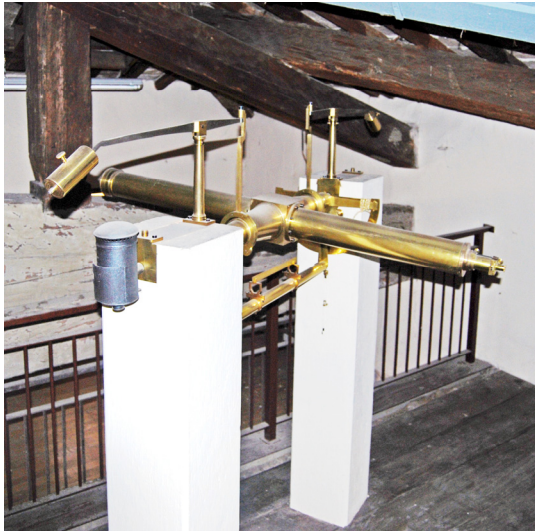


Fig. 3 - The transit instrument of Giovanni Battista Amici in the Observatory of Modena

craftsman who had been working until that moment in the laboratory of Amici, was appointed technician.

The first official observation began on 17th October 1827 as stated by Bianchi in his *Acts of the R. Astronomical Observatory of Modena* which were published from 1834 on (BIANCHI 1834).

There was no recorded opening ceremony celebrating the birth of the new observatory although the newspaper *Il Messaggiere Modenese* on 7th November 1827, n. 89, reported the realization of the observatory promoted by Francesco IV in the right-wing tower of his ducal palace, mentioning its instruments and the fact that Bianchi had already started his recordings. The following year Bianchi stated himself this information in the *Astronomical Ephemeris of Milan* (BIANCHI 1828).

It is very important to notice that Bianchi started the daily recordings on dedicated registers, which are still preserved in the observatory, of the observations on meteors (rain, snow), the temperature (originally measured with old temperature scales, but after a few years in degrees Celsius), the atmospheric pressure, wind and then solar radiation.

The approval of archduke Francesco IV for the observatory was proven by the fact that he not only supplied the observatory with the instruments and the books, but also he considered it as a status symbol like the Gallery of Pictures and the Library, and the observatory was included with them in the visiting tours of his Palace for Princes or Sovereigns that he hosted in Modena (BIANCHI 1846; TABARRONI 1988; VENTURI BARBOLINI 1997).

The Observatory of Modena was built in the same year of the one founded in Rome, at the Campidoglio, by Feliciano Scarpellini. The observatory was preceded by the older ones of Bologna (1725), Parma (1759), Milan (1763), Padua (1767), Rome Collegio Romano (1776), Palermo (1790), Turin (1791) and Naples Capodimonte (1820); it was then welcomed with the approval and good wishes of all astronomy scholars, both Italian and foreigners, as shown in the letters of Bianchi of that time which are preserved at the Estense Library in Modena.

The Cabinet of Metrology and the Metric Workshop 1851

In the middle of XIXth century, there was the Metric Workshop or Cabinet of Metrology in the rooms next to those of the observatory.

3), and on the top of the arch the pillar of the equatorial telescope was placed (BIANCHI 1846; MESCHIARI 2003a; LOMBROSO & QUATTROCCHI 2008).

In the summer of 1827 other instruments were placed in the observatory (MESCHIARI 2003b): a Newtonian telescope of Amici, a repeating reflecting circle by Gambey, and a Dollond telescope, left to the heirs of abbot Venturi (on which Amici stuck an excellent double image micrometer), a Grindel pendulum-clock, and the Fraunhofer telescope (BUFFA & FILIPPINI-LERA BUFFA 1988; DI PIETRO, LUPPI & MANZINI 2011).

Next to the observatory a laboratory was created containing necessary tools – machines for glass and lens working. Giuseppe Sgarbi, an excellent

The law of 27th October 1803 introduced the metric system in Italy. But after the fall of Napoleon I, once the ancient government had been replaced, old measures were readmitted. In 1846 in Piedmont the idea to adopt the French metrical system was suggested and some standards were ordered in Paris. In Modena, under the reign of archduke Francesco V, son and successor of Francesco IV, a ducal decree issued on 17th October 1849 stated that starting from 1852 the Este Dukedom would introduce the decimal metric system to make the measures uniform instead of differing from place to place; there was also to be a new regulation for the checking measures (CHISTONI 1893; LODOVISI 1997; LODOVISI 2003).

A chirograph issued on 27th October 1849 by Francesco V appointed a special commission on weights and measures headed by Stefano Marianini, president of the Italian Society of Sciences in Modena (BIANCHI 1855). Since the month of August it had been suggested to the Minister of Finances Ferdinando Castellani Tarabini to ask Giuseppe Bianchi to go to Paris to investigate and measure the new archetypes that had been commissioned there. In Paris Marianini and Bianchi got in contact with Jean Baptiste Biot, a member of the Italian Society of Sciences, who asked for the assistance of Henri-Victor Regnault, physician and teacher at the College of France and a great connoisseur of the instruments and techniques in the metrological field. They commissioned a standard kilogram and a precision balance, which was made by Joseph Deleuil; a standard meter, a linear measures comparator and a dividing machine which were made by Guillaume Perreaux.

Between the beginning of August and the middle of September 1850, after Deleuil and Perreaux had accomplished their task, Bianchi stayed in Paris to perform a series of tests with the new instruments, comparing the archetypes created for the Dukedom of Modena with those preserved at the Internal Ministry of France and at the Astronomical Observatory of Paris. Once the instruments arrived in Modena at the beginning of December 1850 (LUGLI 2007), Bianchi announced in a letter to Biot sent on 31st January 1851 the starting of activities in the Cabinet of Metrology (BIANCHI 1851; GROSSI 1997; APPARUTI 2003).

Thanks to Bianchi, Cesare Zoboli, who worked in the mechanical laboratory of the Astronomical Observatory, was asked by the duke to supervise the handling of archetypes and instruments from Paris. The difficulties in introducing the decimal metric system in the Estense Dukedom were expressed in a decree of the Ministry of Finance issued on 29th December 1855 which delayed the enforcement of the decimal metric system for private administrations. The ministry then assumed the task to produce a series of standard instruments in order to let local communities adopt them as soon as possible. In the meantime, Zoboli went to Genova, Turin, Milan, Lecco and other places of Northern Italy to get the necessary instruments and raw materials to start production. From 1st January 1856 the task of supervising the production activities for the creation of the seventy-two standard instruments for new measures for each of the 72 local administrations of the Estense Dukedom was assigned to Zoboli. The Metric Workshop started its activity at the beginning of June 1856 in some rooms in Largo Hannover.

Pietro Tacchini's direction

The archduke Francesco V in 1859 was removed from Modena after the Italian unification, Bianchi lost his position as director of the observatory and was replaced by the Modenese Pietro Tacchini (LUGLI 2005). He had been Bianchi's assistant and thanks to his interest he obtained in 1857 a bursary to attend the University of Padua for the academic year 1858–59 where he studied astronomy under Giovanni Santini and Virgilio Trettenero. It was a good start for his career as astronomer.

Thanks to the advice of Giovanni Virginio Schiaparelli, Tacchini moved to Palermo, where there were better instruments for his studies. He was interestingly succeeded by Domenico Ragona, the previous

director of the Observatory of Palermo. Tacchini, during his stay in Sicily, promoted the construction of the observatories in Catania and on Etna mountain. Years later, as Tacchini became director of the Central Office for Meteorology in Rome and promoted the meteorological movement in Italy (TACCHINI 1902), he was strongly supported by the Observatory of Modena which was ready to take part in the wide network he designed and implemented: therefore Tacchini always had close relationships with Modena (RAGONA 1875; TACCHINI 1882). Furthermore Tacchini started to create the Italian magnetic map and entrusted Ciro Chistoni, professor of physics, with the first measurements.

The meteorological observatory under the direction of Domenico Ragona

In October 1863, when Tacchini moved to Palermo together with Gaetano Cacciatore, the direction of the Observatory of Modena was assigned to Domenico Ragona who had been director of the Observatory of Palermo from 1853 to 1860. Before getting the direction of the Observatory of Modena, Ragona had been sent by the general lieutenant of Sicily to study Astronomy abroad and he stayed for long time in Berlin with Johann Franz Encke, then in Bonn with Friedrich Wilhelm August Argelander, and on the way back he went to the most important European cities to visit their observatories and the workshops of astronomical machines.

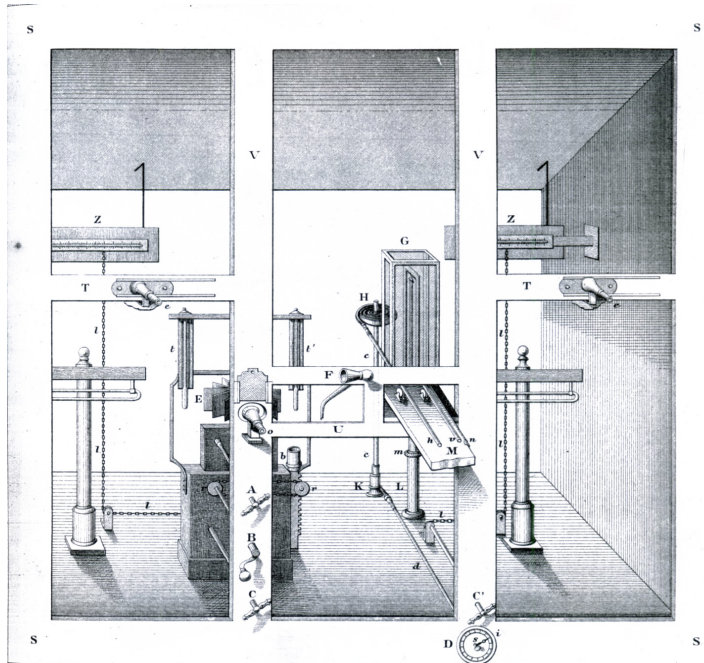


Fig. 4 - The meteorological window designed by Domenico Ragona (RAGONA, D. 1871a)

In 1866, because of the growing importance of meteorological studies abroad, the Italian government decided to entrust Giovanni Cantoni, Professor of physics at the University of Pavia, with the task to build meteorological observatories. Therefore Ragona understood the opportunity to transform the Observatory of Modena as one of these new institutions.

Meteorology was not a new science to Ragona: he already studied it when he was director of the Observatory of Palermo.

Once he was convinced that the best interests of the observatory would be to change its research emphasis, the first task of Ragona was to find the

best meteorological instruments available. He could count on the experience he had in Palermo: he had the advice of Cantoni, who was the official scientific consultant of the first official meteorological service founded in Italy in 1865 thanks to the initiative of the Ministry of Agriculture (direction of statistics). As the instruments provided by the government were scarce, he obtained some new ones from the province, which clearly understood the utility of meteorological studies and supported the Ragona's initiatives (RAGONA 1865; RAGONA 1891).

He introduced right away the regular and methodic use of psychrometer (1864) and obtained a standard Salleron barometer for the study of wind. In 1865 he invented and constructed an hourly pluviometer and built the first meteorological window (fig. 4). These improvements allowed thermometric measures that, until that moment, were performed on the terrace without any shield and in a rough manner by placing the thermometers in the clefts of the passages (RAGONA 1871a).

Angelo Secchi clearly showed in Rome through his meteorograph the advantages of a constant registration of meteors. Ragona supplied the observatory with recording machines, some of them, including an anemometer, were built by him or by his technician. The observatory was also supplied with the first recorders: the two most important instruments were the hourly pluviometer (1876) and the evaporimeter (1870 ca), unique tools because of their precision and cleverness (RAGONA 1871b).

In 1876 the observatory was officially termed meteorological, according to the decree n. 3037 of the Italian King Vittorio Emanuele II (published in the Official Journal of the Italian Kingdom on 11th April 1876 n. 85), stating that the observatories could belong to three different categories (art. 1–2): “The first one concerns those aimed in particular at the study of practical Astronomy and at the progress of science”, namely the observatories of Naples, Milan, Florence and Palermo; “The second category concerns those linked to the faculties of mathematical, physical and natural sciences within the Universities, where there is also the mathematics section of the educational faculties”, namely the observatories of Padua, Bologna, Rome (Campidoglio) and Turin; “To the third category belong the observatories of Modena and Parma”. Concerning the observatories of Modena and Parma, the decree stated (art. 3) that “these ones are named Meteorological Observatories, and belong to that group of institutes of observation used by the Ministry of Public Education, Agriculture, Industry and Trade, Public Works and Navy to verify and to coordinate meteorological phenomena”.

In 1876 Ragona suggested the creation of an Italian Meteorological Society, which would publish the *Bulletin of meteorological research and records* transmitted by the associate members, and to report on the progress of these specific studies abroad.

Once the society had been created, with Ragona as president, he founded the *Yearbook of the Italian Meteorological Society*, published twice a month in 1878 and 1879 by Loescher in Turin in 16-pages. Then this Yearbook ceased publication because in 1880 the *Yearbooks of Meteorology* were founded by the Central Office in Rome, and also because of the creation of the “Italian Meteorological Association” whose members left the society created by Ragona to join the new one (RAGONA 1887).

The meteorological and geophysical observatory under the direction of Ciro Chistoni and Carlo Bonacini

In 1892 Ragona died and Ciro Chistoni, professor of physics since 1887, became director of the observatory.

Chistoni started his career in 1877 in Pavia as the assistant of Giovanni Cantoni, who gave a strong impulse to meteorological studies in Italy; the first studies accomplished by Chistoni in that period concerned hygrometry, a topic that he continued to research later. In 1879 Chistoni, chosen by Tacchini as assistant of physics for the new Central Office of Meteorology in Rome, was sent abroad to visit the most important geophysical observatories and to learn the practice of magnetic measures. At the end on 1881 he came back and started right away a campaign to design the general magnetic map of Italy, according to Tacchini’s program; while doing that job, he found ways to deal with many meteorological issues, as stated in his writings prior to his arrival in Modena. During his first years in Modena, he proved his competence with new studies in the field of magnetology and made new contributions to the magnetic map of Italy, in which he was well succeeded by Luigi Palazzo (PALAZZO, PLATANIA, AMERIO, PACINI, BONACINI, SIGNORE & MALLANDRA 1927).

Thanks to the extraordinary contributions of the ministry, Chistoni could repair and refurbish some rooms, improving the equipment. He started observations with the eliofanograph, and renewed the meteorological balcony according to the suggestion of Pietro Tacchini, director of the Central Institute of Meteorology in Rome. He also built a meteorological roof in the public garden which had a snow gauge to measure the amount of snow. He accurately corrected the altimetrical quotes of the

observatory; started in 1895 a systematic and rigorous series of *Publications of the Observatory*, established exchanges with other national and international institutes, enriched the library with new acquisitions, suggested changes of personnel to widen research interests and changed the name to Geophysical Observatory (1897) to show that the institute had enlarged its field of action.

In 1896 an astronomical dome in copper was built on the top of the Observatory tower. This has been recently rebuilt thanks to the financial contribution of the Province of Modena with provision for museum premises with the co-financing of the University of Modena and Reggio Emilia.

Between 1891 and 1898 Chistoni, thanks to the collaboration of Giacomo De Vecchi, started and concluded a long experimental study on permanent magnets; his research can be found in the publications of the observatory (CADOPPI 1988; LUGLI 2002; BRENNI 2010).

In 1906, when Chistoni was awarded with the direction of the Institute of Terrestrial Physics at the University of Naples, the directorship of the Geophysical Observatory was entrusted temporarily to Dante Pantanelli, and starting from November of the same year the Faculty of Sciences named Carlo Bonacini as director (LUGLI 2006). Although in 1909, because of the activity of the observatory was reduced under restrictive instructions, Bonacini maintained a good level of scientific activities (LUGLI 2006). In 1927, Bonacini promoted the celebrations for the first centenary of the foundation of the observatory (BONACINI 1928).

Starting from last century the observatory is part of the udometric national network. Meteorological observations are daily performed with precision, with the use of automatic equipment. Meteorological observations are also performed on other sites, mainly located in the Apennines of Modena as Sestola, Pavullo and Cimone Mountain.

The daily meteorological time series, carefully observed at the observatory, which continue to be recorded in the registers, are a good basis to highlight any changes in climate. Time series of temperature, pressure, rainfall and snow have been analyzed with particular attention: they allow the drawing of statistical models over long periods of continuous observations. The time series of daily minimum temperatures have clearly shown a steady increase over time, due to the urbanization of the city and global climate change (TAROZZI 1983; TABARRONI 1985; FRONTERO, LOMBROSO & PUGNAGHI 1988; MORELLI 1988; TAROZZI 1988; TAROZZI 1989).

A project for a network of Italian historical observatories

The creation of the first national network of Italian historical observatories will develop incisive popularization, and promote a stronger general coordination of the activities and cultural exchanges among different structures that operate within the diffusion of scientific culture. This will allow the cultural activities to reach a wider audience, such as multi-regional or national and address different issues in a multidisciplinary way with respect of specific competences of each single structure and/or operational area.

The mission of the network is to activate tools to make the interaction of users with science possible, amusing, exciting and versatile to stimulate their curiosity, and interest. To respond to this need, scientific museology is in constant evolution, and aware that if audiences lost interest in science and not understand its importance, it would be difficult for scientists and researchers to obtain adequate financial support.

Monitoring the historical instruments

An introductory objective for the network is a systematic survey – through a bibliographic, archival and iconographic research – of the historical specimens and objects that constitute the different scientific

collections of the observatories which are open and accessible to a wide public, or planned to be displayed. This survey is the best way to start to describe and interpret the research activities of the observatories, but also to activate procedures to safeguard them in collaboration with regional and local offices of the Italian Ministry of Cultural Heritage and Activities.

The network promotes collaboration among institutions and increases knowledge, both in quantitative and identifiable terms, of historical instruments. In order to achieve this, it will be necessary to survey the existing databases of historical instruments of observatories, finally end to update and complete them and start computer cataloguing campaigns for those historical instruments that have never been catalogued.

The need for systematic cataloguing, to preserve, safeguard and valorise cultural heritage, is an established idea not only in the cultural world but also among public opinion. Cataloguing cultural heritage basically consists in recognizing and defining the instruments in time, space and during history. A catalogue promotes the recognition of the context within which the different evidences of civilization have been created over time.

The registration, description and classification of the scientific heritage according to standards released in Italy at national level by the Central Institute for Cataloguing and Documentation of the Italian Ministry of Cultural Heritage and Activities¹ is fundamental. Moreover, databases will be useful not only to spread information on cultural heritage but also to correctly preserve cultural heritage as defined by the Code for Cultural Heritage and Landscape.² This goal can be achieved through the following: first of all their “study and knowledge”, consequently an “attentive and constant maintenance” and, if necessary “a well performed restoration”.

In order to catalogue the scientific technical heritage the Central Institute for Cataloguing and Documentation has created a specific pattern, the Scientific and Technological Heritage – PST pattern,³ conceived – like the patterns realized for the different kinds of cultural goods – as a hierarchical structure that allows each instrument to be described and related to its typological or phenomenological specific relationships, as well as to the historical dimension of the context. This pattern for the scientific technical heritage has to be used within the General Informative System for Cataloguing on the web, SIGEC Web, managed by the same Central Institute for Cataloguing and Documentation.⁴

The PST catalogue pattern is the result of a collaboration between the Conference of Italian University Rectors (CRUI), the Italian Ministry for Cultural Heritage and Activities and the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA). Its development is due to a working group constituted by the representatives of the University of Siena (CUTVAP, University Services Center for the Safeguard and Valorisation of Ancient Siena Scientific Cultural Heritage), the Scienza e Tecnica Foundation of Florence and the Central Institute for Cataloguing and Documentation. The origin of the catalogue pattern refers to the pattern for objects of art named OA, and takes its name from the SIC Scientific Instruments Commission: thanks to the collaboration of specialists and researchers of scientific heritage, a specific catalogue pattern for scientific instruments *STS* has been implemented. This one has further been developed to become the present pattern *PST – Scientific and Technological Heritage*.

¹ www.iccd.beniculturali.it (accessed July 13, 2013).

² D. l. 42/2004, art. 29.

³ <http://www.iccd.beniculturali.it/index.php?it/389/beni-scientifici-e-tecnologici> (accessed July 13, 2013).

⁴ <http://www.iccd.beniculturali.it/index.php?it/118/sistema-informativo-generale-del-catalogo-sigec> (accessed July 13, 2013).

The cataloguing of the collections of ancient instruments of the observatories taking part to the network will be in collaboration with the postgraduate master course in *Cataloguing and accessibility of cultural heritage: new technologies for the valorisation*.⁵

The network's activities

This network will boost the flow of information and data among the different research structures, in order to promote the cultural exchange in a multidisciplinary approach and for the internationalization of scientific knowledge. Data collected and digitized will be a dynamic reality, constantly growing and updatable thanks to the contribution of the whole scientific community and to the collaboration of CRUI – Conference of Italian University Rectors – Museum Commission, which will be a reference point for the whole network and to which the network could work as operating partner.

Through the network it will be possible to promote initiatives for the diffusion of scientific information and culture, and to produce multimedia open source material and cultural initiatives thus strengthening the network and enriching it with content to boost its effective communication. Moreover, meetings, seminars, temporary exhibitions, informative flyers and other multimedia products will be the means to give visibility to the network activities (DUFF, CARTER, DALLAS, HOWARTH, ROSS, SHEFFIELD & TILSON 2010).

Advanced multimedia tools and technologies will allow to create cultural communication programs that involve the emotional and sensorial spheres, by adopting edutainment strategies specifically designed for students of different kinds and levels of schools – including university students –, for scholars and professionals, as well as general audiences, stimulating the visitor through sight, hearing, touch and smell, and 3D reconstructions will create virtual visiting paths using various narrative registers (ALEXANDER & LEVINE 2008; GOSPER, MALFROY, MCKENZIE & RANKINE 2011). In particular for the representation of scientific cultural heritage, the network will take advantage of the evolution of multimedia and wireless communication systems, spatial georeference systems and the use of interactive tools, virtual guides, augmented reality presentations, 3D reconstructions, intelligent environment, multimedia paths. These tools will be used on-site also thanks to mobile devices, as well as inserted – according to their specific features – in the web sites of the observatories taking part in the network (BRAND, KINASH, MATHEW & KORDYBAN 2011; DALGARNO, LEE, CARLSON, GREGORY & TYNNAN 2011; GARRETT & MCMAHON 2011).

One of the aims of the network is the creation of simple to use, efficient and low-cost technological solutions (with specific reference to the Code of Cultural Heritage and Landscape and to regulations and guidelines concerning public administrations, in particular the recommendation of the Web Content Accessibility Guidelines WCAG 2.0).

The availability of multimedia interactive information concerning cultural historic scientific heritage represented by several specimens, objects and tools of the historical observatories will allow the organization of initiatives to promote communication with the world of research in schools of different kinds and levels.

A particular effort will be dedicated to design and build real and virtual educational activities to be enjoyed either within the school or in the observatory – in close connection to its scientific research domains – in a complementary way, to stimulate interest in participating in technical and scientific cultural heritage. These activities will be in collaboration with and addressed to students and teachers, with the support of regional and provincial school offices, headmasters, and associations of teachers.

⁵ www.cibec.unimore.it (accessed July 13, 2013).

There is a more general goal of a growth of a clear awareness about the importance of science for everyday life and for a sustainable development of society.

The historical observatories involved in the project can also create and test some informal learning activities for adult audiences composed by those who actively take part in educational activities, oriented to scientific cultural heritage with their personal experience and knowledge (McLOUGHLIN 2011). This will strengthen the activities aimed to social inclusion that have already been started by single museums, with specific attention to migrants and 'new citizens' that bear cultural values and knowledge of various origin, by activating inclusion-aimed projects together with their associations and communities (JOHN & JENKINS 2011). Assistance will be provided by the LEM project – The Learning Museum Network Project.⁶ This network will allow the historical observatories to provide cultural tourism operators with a useful working tool and a support to guided tours, and to create paths of touristic and cultural interest.

In order to promote the dialogue between historical observatories and present society, and to permit to anybody who is interested in a topic to discuss and share experiences with other people, the use of Internet and of social tools typical of Web 2.0 allows the creation of virtual places without space and time limits (AHRENS 2011; FLAGG & AYLING 2011). The emerging multichannel model will be adopted, and the web will work as conductor: through distributed networks, and in particular social networks (CORRADINI 2012), this model connects not only cultural institutes to their users, but also to other persons. This will be an innovation for the Italian historical observatories which, like the majority of Italian university museums, use an information distribution model typical of Web 1.0, that is to say the broadcast model in which contents are created by the cultural institutions and then distributed to users through the web in a unidirectional way.

The network creation has been envisaged within a research project, thanks to a framework agreement among the university museums of twelve of the most important Italian universities (Bari, Cagliari, Chieti, Ferrara, Florence, Parma, Perugia, Rome "La Sapienza", Salento – Lecce, Siena, Tuscia – Viterbo coordinated by the University of Modena and Reggio Emilia). The proposal is under evaluation by the Italian Ministry for Education, University and Research for a grant under the directorial decree n. 369 on 26th June 2012 on the basis of the Law n. 6 of 10th January 2000 for the diffusion of scientific culture.

Acknowledgements

I thank Lorenzi Costi, Viviana Ebner, Alessandra Mantovani, Martina Aldrovandi and Silvia Rossi for their useful and attentive collaboration and the colleagues of the Estense University Library of Modena.

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⁶ <http://www.lemproject.eu> (accessed July 13, 2013).

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