



049 - ITALY'S ARCHIVE ON THE HISTORY OF SOLAR ENERGY

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Abstract

This paper reviews research and organizational activities for the creation of the Italy's Archive on the History of Solar Energy, a project started in 2003. The project's main purpose is to preserve the Italian heritage of solar energy use, creating a digital archive accessible via the Internet. The first branch of what will be a geographically distributed archive has been taking shape over the past years at the Luigi Micheletti Foundation and the Eugenio Battisti Museum of Industry and Work (www.musil.bs.it) in Brescia, in northern Italy. An important step forward came in 2006, when the "Italian National Committee 'The History of Solar Energy'" (CONASES), a multidisciplinary non-profit entity, was established by the Italian Ministry for Cultural Heritage and Activities, following a proposal by the Group for the History of Solar Energy (GSES, www.gses.it). In 2008, a cooperation agreement on a nationwide survey of sources on solar energy, signed between the State Archives Department and GSES, opened up new prospects for further development of the Archive. Examples of archives and documents already collected and under study are provided. The paper also shows that the Solar Archive project is already rewriting Italian solar energy history.

Keywords: solar archive, solar history, solar pioneers, solar architecture, solar cities,

1. Introduction

It often happens that we think of solar energy (its direct and indirect forms, wind, hydro, forests and other biomass) as an aspect of our modern world, although it had powered everything on earth until 150-200 years ago, when its fossilized forms -- coal, oil and gas -- began to gain sway.

For thousands and thousands of years the use of solar energy shaped human settlements and cities, farming and forestry, architecture and buildings, landscapes and territories, religious beliefs and cultures, social relations and lifestyles on Earth – in a word, whole civilizations. The use of solar energy is thus an age-old experience marked by milestones on the path that led human beings to artificially convert it into other useful forms of energy and goods: food, construction materials, heat, fuel, daylight and, more recently, electricity, which has been, is and will continue to be a fundamental part of modern life.

Discoveries in the field of solar energy use, made during what I would propose to call the *primitive or ancient solar age* - when solar was the sole source of energy - still have a major role in our daily lives. This is well exemplified by the Romans' discovery of windowpane glass in the first century A.D., to bring daylight inside buildings and at the same time prevent cold and winds from entering. Today millions upon millions of windows provide daylight to homes and workplaces all over the world, thereby saving on artificial light produced with electricity generated by fossil and nuclear fuels.

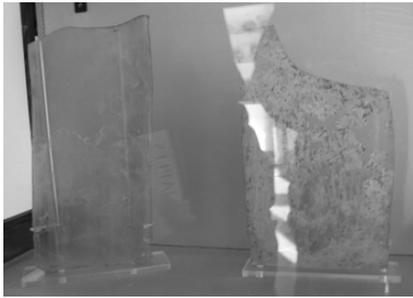


Fig. 1 . Flat transparent glass from Pompeii, 1st cent. a.d. to capture sun's light and heat for houses and baths (Photo National Archaeological Museum, Naples). Naples).



Fig. 2 . Roman Solar Architecture – A reconstruction by Edmund Paulin of the Baths of Diocletian (From a Golden Thread by K. Butti and J. Perlin, 1981).

An additional example is provided by farming and agriculture. From the earliest civilizations they were powered, and continue to be powered today, by solar energy as the primary and principal energy source.

These technologies and discoveries, which have evolved throughout the centuries, are still of greatest importance in our daily lives. It is as if an ancient renewable-solar-energy soul were an essential part of our modern world, taken for granted and not accounted for in official energy-use and economic statistics. Therefore, the history of solar energy can hold important lessons for our own times, when humanity is beset by a growing number of problems, closely related to the use and availability of energy.

Since 2000 GSES, a volunteer not-profit organization formed by experts and scholars from various technical fields, has been promoting and organizing initiatives aimed at producing a systematic history of the use of solar energy. In this paper, the focus is on *modern or future solar age*, currently sprouting from the pioneering work on solar energy done over the last centuries, in particular during the last 150-200 years.

2. Building Italy's Solar Archive: the starting point in 2003

The idea of Italy's Archive on the History of Solar Energy began to develop within GSES in 2003, with the main purpose to preserve and make widely available the Italian heritage of solar energy use. Two main actions were initiated: the preparation of a "Directory of Italian Activities and Bibliography of Significant Literature" regarding the period prior to the first oil shock of 1973 and the identification of overlooked archives at universities and research centres or privately owned [1].

Key information to begin a narrowly focused investigation was found in the World Directory on Applied Solar Energy Research, published and distributed in 1955 by Stanford Research Institute for the Association for Applied Solar Energy (AFASE), the precursor of today's International Solar Energy Society (ISES) [2]. This publication, which lists approximately 4000 references relevant to 27 countries and covers 17 different topics, from architecture to bibliographies, from furnaces to heat storage and systems, includes a dozen references regarding Italian activities and publications prior to 1955.



Other citations and bibliographies that were useful in guiding our historical research during this early phase were found in books, such as “*L’energia solare e le sue applicazioni* (Solar energy and its applications)” by Righini and Nebbia [3] and in articles, magazines and scientific journals published in the late 1800s and early 1900s, such as *Il Monitore Tecnico* (The Technical Monitor), *Scienza e Tecnica* (Science and Technology), *L’Ingegnere* (The Engineer), *Il Sole* (The Sun).

We also looked at books by international authors, which had been translated into Italian. For example, according to Rau, although Italy is “*Il paese del Sole*” (The country of the Sun), there were few Italian representatives among the most innovative solar energy pioneers. Those who were interested in solar energy, according to Rau, ‘made only marginal contributions by adding to or improving technologies developed elsewhere’ [4]. This statement, as we will see later is not correct.

The initial branch of the solar archive started to take shape in Brescia, in northern Italy, at the Luigi Micheletti Foundation and the Eugenio Battisti Museum of Industry and Work (www.musil.bs.it) [5]. In 2002 the Giorgio and Gabriella Nebbia collection on a range of environmental topics was donated. Nebbia’s collection contains one of the largest Italian archives on solar energy of the 1900s. In 2005 the heirs of Giovanni Francia (1911 - 1980), who was the first person ever to apply the Fresnel reflector technology principle in real systems, both linear and point focus, donated his personal archive.

The creation of Italy’s Solar Archive made an important step forward in 2006, when the “Italian National Committee ‘The History of Solar Energy’” (CONASES), a multidisciplinary non profit entity was established by the Italian Ministry for Cultural Heritage and Activities, following a proposal by GSES. Funding support by CONASES contributed to intensify research of other private archives and documentation that belonged to Italian solar pioneers cited in literature, such as Gaetano Vinaccia (1889 - 1971), Vittorio Storelli (1911 - 2003), Ferruccio Grassi (1897 - 1980), Daniele Gasperini (1895 – 1960). These archives were donated to the Museum by their heirs and have already been partially inventoried and can be consulted at www.musil.bs.it.

CONASES also supported specific research on patents done by Martelli and Merola in 2006-2007 at the Central State Archive, where documentation produced by the Italian central institutions has been preserved since 1861, the year of Italy’s unification [6]. The research was carried out on the Patent collections, which are among the better-structured collections preserved at the Central State Archive. These collections are made up of 891,000 folders that document more than one century of activity of the Italian Patents and Trademarks Office of the Italian Ministry of Trade and Industry, today’s Ministry of Productive Activities. The research was focused on collection of patents dealing with Inventions, which is made up of 620,000 folders dating from 1855 to 1962, and whose content is available only in print format. Each patent application includes the description of the patent, as well as machine and flow chart drawings. As of March 2008, 157,113 folders related to the period from 1855 to 1916 had been examined and 392 patents associated with solar energy were identified, corresponding to 2.5% of all patents.

Non-Italians, mainly from European countries, such as Austria, France, Germany, Portugal and Spain, also authored several of these patents. Among the European patent authors were well-known pioneers such as the French scientist Augustine Mouchot (1823 – 1912) and the Portuguese Manuel Antonio Gomès Himalaya (1868 – 1933).

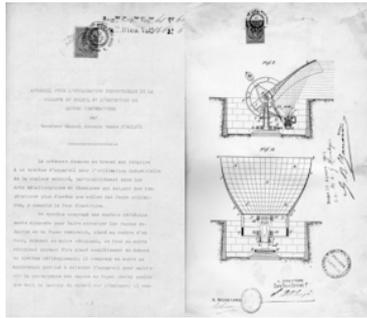


Fig. 3 . Himalaya patent's application to collect solar energy at high temperature, submitted in Boulogne (France), Aug. 12, 1901, (courtesy Italian Central State Archive).



Fig. 4 . Alessandro Battaglia patent's application on a "Collettore multiplo solare, Multi Solar Collector" registered in Genoa (Italy), Oct. 13, 1886, (courtesy Italian Central State Archive).

Among Italian patent authors only a few can be easily identified in literature. Most of the applicants, who anticipated important technical concepts and solutions, are unknown. The case of Alessandro Battaglia (1842 - ?) from Acqui Terme, author of a Multi Solar Collector, made up of an array of 252 mirrors individually aimed at a receiver, provides a good example. He applied for a patent on September 30, 1886. Several research efforts to learn more about him, have thus far resulted in determining only his time and place of birth. This shows that it can be difficult to find additional information regarding patent authors identified at the Central State Archive. This type of research has also shown to be highly time consuming.

Martelli and Merola presented the research results at a seminar promoted and organized by GSES and CONASES in cooperation with the Central State Archive on April 4, 2008. Detailed information about the seminar can be found at www.gses.it.

3. The work ahead for the creation of Italy's Archive on the History of Solar Energy

The results of the research done during the 2006-2007 period at the Central State Archive on the Patents and Trademarks Collections have secured new commitments. The Italian State Archives Department and GSES signed a cooperation agreement and established an ad hoc working group (Solar Archive Working Group) in 2008 to perform a nationwide survey of sources and create a multimedia database. The work already done in the Central State Archive's Patents and Trademarks Collection, and by GSES in the private archives of Italian solar energy pioneers, has produced useful technical and scientific results that can provide a starting point for this survey, which might well focus first of all on sources regarding patents and trademarks contained in the State Archives and in private archives.

The work ahead for Italy's Solar Archive was illustrated by Terenzoni from the State Archives Department at the seminar on April 4 [7]. She addressed the main aspects related to archival sources and tools for historical research on solar energy in Italy. Italy's archives contain miles upon miles of shelves filled with all kinds of documents, information and data produced by government bureaus and agencies, public and private enterprises, and individuals. Very often their contents are accessible only by means of "traditional" systems. To consult documents regarding a particular subject, it is sometimes necessary to be familiar with, or reconstruct, the history of the institution or the biography of the individual that produced the documents, as well as the



circumstances that led to their production, drawing one to look into all the ramifications (real or suspected) of a given activity.

The archival sources are heterogeneous and the existing research tools are complex and not easy to handle, and will thus require some terminological-control tools, for instance a glossary and dictionaries of standard terms, which can enable users to search through databases by keywords and identify descriptors. Moreover, language and terminology evolve; therefore, in order to produce a truly useful search tool it will be necessary to clarify linguistic ambiguities and the relationships among terms that belong to the same family.

The Solar Archive Working Group has already started looking into this. The systemic aspects of solar energy is guiding the terminology work, both when we think of solar energy resources on earth as well as when we think of solar know-how and technologies that can convert those resources in energy forms useful to us (food, heat at low, medium and high temperatures, daylight, fuels, electricity, materials etc.).

Inputs to clarify linguistic ambiguities and relationships among terms will also come from the material contained in the archives, documentation, and bibliographies collected thus far.

4. Examples of archives and documentation collected

Since 2002, more than 15 privately owned archives as well as those belonging to solar pioneers of different standing or their heirs, have been located or simply identified. It has been a time consuming endeavour. In fact, in the matter of just a few decades, the traces of people and events can be lost. For solar energy it is even more difficult to find firsthand witnesses with specific knowledge of projects as well as to locate and consult private archives and documentation produced just a few decades ago. While interest in solar energy has for decades been repeatedly left behind, and with it also its history and the history of its pioneers and advocates, interest has recently been growing again worldwide.

At any rate, this has been our experience in Italy, where interest in solar energy history and in the creation of Italy's Solar Archive increased at an institutional level essentially over the last three years, also due to the pioneering work done by the Eugenio Battisti Museum of Industry and Work (www.musil.bs.it) in Brescia and GSES [8].

This museum was promoted by the Luigi Micheletti (www.fondazionemicheletti.it) and Civiltà Bresciana Foundations. Branches have been established at multiple locations, based on a program agreement among the Lombardy Region, the city and the province of Brescia, and many other public and private organizations.

Thanks to a decades-long acquisition policy, the museum owns large collections of objects and documents related to the history of industry and work on the local, regional and national levels. The collections concern everything from motion pictures to printing and textiles, textile machinery, energy, large engines, machine tools and metallurgy.

The collections that deal with energy were assigned to three new branches of the museum, one in Brescia, another in Rodengo Saiano (Franciacorta) and the third in the Camonica Valley, at a



former hydroelectric plant from the early 20th century in Cedegolo. This last branch opened on September 13, 2008 [9].

Information about donation, inventory status, and references of a few examples of solar archives currently preserved at Eugenio Battisti museum are provided in Table 1.

Table 1 . Some of the solar archives donated for the Italy's Solar Archive

Private archive of	Donated by	Inventory status	References
Giorgio and Gabriella Nebbia (1926 –)	G. and G. Nebbia (2002)	To be completed (as of 2005, 462 pages)	Online at www.musil.bs.it
Giovanni Francia (1911 – 1980)	Heirs (2005)	To be completed (as of 2007, 216 pages)	[10] [11] [12]
Vittorio Storelli (1914 – 2005)	Heirs (2006)	Not yet started	[14]
Gaetano Vinaccia (1889 – 1971)	Heirs (2007)	To be completed (as of 2008, 14 pages)	[13]
Ferruccio Grassi (1897 – 1980)	Heirs (2007)	To be completed (as of 2007, 8 pages)	[15]
Daniele Gasperini (1895 – 1960)	Heirs (2008)	Not yet started	[15]

In addition to the archives at the Eugenio Battisti Museum, GSES and CONASES are promoting other acquisitions and preservation of documents at other organizations and institutions. For example, at the University of Bologna, the inventory of the archive of Giacomo Ciamician (1857 – 1922), known as the father of photochemistry, will soon be completed. The 150th anniversary of his birth was celebrated in Bologna in 2007 [16] [17]. Ciamician's famous paper on "The photochemistry of the future," presented in New York in 1912, is available in English, French, and Italian at www.gses.it.

The collected archives contain notes, letters, articles, patents, the proceedings of Italian and international conferences, journals, clarification notes exchanged with academics, companies and research centres. They also include photographic documentation on experiments and prototypes, and some personal documents that give us a better idea of each personality. Most of the documents are in Italian, but there are also many letters and documents in other languages, including English, French, and German.

These and other archives, as well as information preserved at public and private libraries, can be important for both the history of solar energy and for rediscovering overlooked concepts and solutions, concepts that can now be improved thanks to newly acquired scientific and technological knowledge [18]. The intention of the GSES and CONASES project is to make most of the archives easily accessible via Internet. Current cooperation among the Museo Eugenio Battisti, the Central State Archive, the State Archives Department, and other institutions and organizations should allow a first structure of the Archive to be on line by 2011.

5. Rewriting Italian solar energy history

The past, the present and the future are inseparable fields for research and study in any area of human activity. Italy's Archive on the History of Solar Energy is already providing new insights regarding the contributions made by Italian pioneers of the 19th and 20th centuries, which continue to play a role in *modern or future solar energy*.



For example, the archives of Giacomo Ciamician (chemist), Gaetano Vinaccia (architect and city-planner), and Giovanni Francia (mathematician) contain information that show how their pioneering work can also today be an inspiring source for researchers and scholars. Their pioneering ideas, including details that have never been published or were otherwise overlooked, can be found in a letter or in a private note, in a project or in drawings. These ideas can contribute to view Italian solar energy history in a new light.

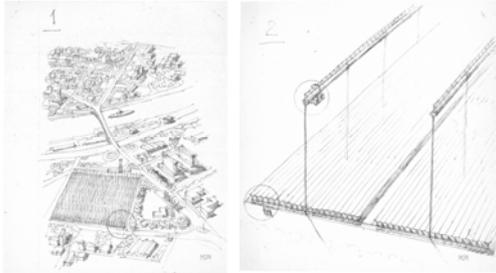


Fig. 5 . Drawings of a large Linear Fresnel Reflector Solar Power Plant integrated in a city designed by Francia in 1965 circa (Francia Archive donated by his heirs).

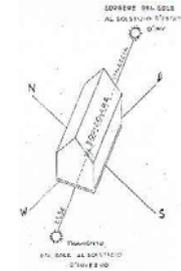


Fig. 6 . Vinaccia's 1939 book cover "The Path of the Sun in Urban Planning and Building Construction." (Vinaccia Archive donated by his heirs).

6. Conclusion

The solar archives collection put together so far shows that in Italy there have been scientists who made original and unique contributions to the understanding and application of *modern or future solar energy* long before the first oil shock of 1973, such as Ciamician, Vinaccia, and Francia. They were internationally acknowledged for their work, although they were soon forgotten after their death. Italy's Archive on Solar Energy History should contribute to rediscover the work of these and other pioneers to the benefit of, first and foremost, researchers and scholars, but also many other professionals interested in the advancement of solar energy science, technology, and application.

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