UNIVERSITÀ DEGLI STUDI DI PAVIA
Sistema Museale di Ateneo

Museo della Tecnica Elettrica / *Museum of Electrical Technology*

Un anno al Museo 2012
Museum Year 2012

a cura di Antonio Savini
edited by Antonio Savini

Pavia University Press
Editoria scientifica

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Museo della tecnica elettrica <Pavia>

Un anno al Museo 2012 = Museum year 2012 / a cura di Antonio Savini. - Pavia : Pavia university press. - VIII, 34 p. : ill. ; 30 cm.

ISBN 9788896764435

In testa al front: Università degli studi di Pavia, Sistema Museale di Ateneo, Museo della tecnica elettrica

1. Pavia - Università - Museo della tecnica elettrica - Annuari

I. Savini, Antonio

621.3 CDD-22 – Ingegneria elettrotecnica

ISBN: 978-88-96764-43-5

Prima edizione: agosto 2013

Il file PDF per la stampa, con immagini a colori, è disponibile ad accesso aperto nella sezione “Catalogo” del sito web <http://www.paviauniversitypress.it>.
Virtual URL <http://purl.oclc.org/paviauniversitypress/museo-elettrico/2012>

Editore / Publisher: Pavia University Press
Edizioni dell’Università degli Studi di Pavia
Via Luino, 12 – 27100 Pavia - Italia
<http://www.paviauniversitypress.it>

Stampato da / Printed by: DigitalAndCopy S.a.s., Segrate (MI)

Sommario / *Contents*

Presentazione

L'anno 2012 è stato un *annus mirabilis* per il Museo, che ha ricevuto una consacrazione internazionale ospitando HISTELCON 2012, l'IEEE International Conference on the History of Electrical Technology, conferenza organizzata dal Centro di Ricerca per la Storia della Tecnica Elettrica e dalla Sezione Italiana di IEEE.

I contributi scientifici, su argomenti vari nell'ambito del tema generale della Conferenza che è stato "Le origini delle tecnologie elettriche", sono stati pubblicati nella biblioteca Xplore di IEEE.

L'anno si è aperto con il Museum Day 2012 caratterizzato dall'affascinante Conferenza Annuale di Paolo Brenni sull'uso delle correnti ad alta tensione e alta frequenza nelle terapie e negli spettacoli scientifici. Nella tradizione delle Conferenze Annuali la brillante esposizione è stata accompagnata da avvincenti dimostrazioni pratiche del funzionamento di apparecchiature ad alta tensione e alta frequenza.

Sempre a cura del Centro di Ricerca il 14 aprile è stata rievocata la tragedia dell'affondamento del Titanic, a 100 anni di distanza. Particolarmente emozionante è stato rivivere le ultime ore del Titanic nella sala dei telegrafisti, ricostruita e fatta funzionare simulando così ciò che accadde quella notte.

Le attività svolte nel Museo e le sue nuove acquisizioni sono descritte in questo Rapporto Annuale che si aggiunge ai precedenti per documentare quanto il Museo ha realizzato nella sua ancor giovane vita di 5 anni.

Preface

The year 2012 was an annus mirabilis *for the Museum which received international recognition by hosting HISTELCON 2012, the IEEE International Conference on the History of Electrical Technology, organized by the Pavia Research Centre for the History of Electrical Technology in cooperation with the Italy Section of IEEE.*

The general theme of the Conference was "The origin of electrotechnologies", and the contributions on various subjects were published in the Xplore Library of IEEE

The year started with the Museum Day 2012, the highlight of which was the fascinating Annual Lecture delivered by Paolo Brenni on the use of currents at high voltage and high frequency in electrotherapies and in scientific shows.

As usual for the Annual Lectures, the Lecture was accompanied by spectacular demonstrations of the operation of apparatus at high voltage and high frequency.

Again by the initiative of the Research Centre on April 14 the tragedy of the Titanic was commemorated, one century after his sinking. The telegraph room on board of the liner, reconstructed and simulated in its operation on that terrible night gave a special emotion to those who attended the event.

Activities in the Museum, and its latest achievements, are described in this Annual Report which, together with the previous reports, records what the Museum has achieved in its first five years.

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Eventi dell'anno al Museo della Tecnica elettrica

Events in the Museum

2012

Museum Day e Annual Lecture

"Il fulmine domato. Le correnti ad alta tensione e alta frequenza nelle pratiche di elettroterapia e negli 'spettacoli scientifici' (1890-1930)", P. Brenni, Firenze
5 marzo 2012

Mostra Temporanea

"1912 Titanic 2012 – Cent'anni dopo la tragedia del Titanic"
14 aprile 2012-31 maggio 2012

Conferenza

HistelCon 2012
IEEE Conference on the History of Electrical Technology
5-7 settembre 2012

Mostra Temporanea

"Disegni Romani"
24 ottobre 2012-26 novembre 2012

Sabato 3 marzo 2012

Museum Day 2012

Sabato 3 marzo si è fatta festa al Museo della Tecnica Elettrica di Pavia in occasione del quinto anniversario di apertura del Museo.

Momento centrale del Museum Day 2012 è stata la Conferenza Annuale tenuta dal Dr. Paolo Brenni, dell'Istituto e Museo della Storia della Scienza di Firenze, che ha sviluppato una riflessione storica sull'uso delle correnti elettriche ad alta tensione e alta frequenza nelle pratiche di elettroterapia. Tra Ottocento e Novecento tali correnti furono sistematicamente impiegate nei laboratori medici per la cura di molte patologie. Ma le affascinanti proprietà delle correnti ad alta tensione e alta frequenza furono sfruttate anche da maghi e ciarlatani per "spettacoli scientifici" nelle piazze. Ancor oggi i visitatori di musei della scienza e della tecnologia sono colpiti dagli effetti sorprendenti di tali correnti.

Successivamente è stato inaugurato l'allestimento del negozio "REO Elettronica", trasferito nella Sezione del Museo dedicata agli ultimi cinquant'anni. Mancava in tale Sezione l'occasione per una riflessione sullo straordinario sviluppo dell'elettronica e sul suo impatto nelle varie tecnologie. La donazione al Museo di un negozio di componenti elettrici ed elettronici, ben conosciuto a Pavia negli anni '80, ha consentito di colmare tale lacuna.

On Saturday March 3 the Museum celebrated the fifth anniversary of its opening. Core event of the Museum Day 2012 was the Annual Lecture delivered by Dr. Paolo Brenni, Istituto e Museo di Storia della Scienza, Firenze. The theme was an historical investigation into the use of electric currents at high voltage and high frequency in electrotherapy. At the end of the 19th century and the beginning of the 20th century such currents were systematically employed by physicians in a number of electrotherapies. The spectacular properties of high-voltage high-frequency currents were also exploited by magicians and quacks for "scientific shows" in streets. Now-a-days visitors of museums and science centers are still attracted by the fascinating effects of these currents.

After the lecture the "REO Elettronica" shop, transferred to the Museum and rearranged in Section 5 of the Museum, was opened. In this Section there was a need to reflect on electronics and its impact on various technologies. The donation of a shop of electrical and electronic components, well known in Pavia in the 1980s, offered the opportunity of meeting this need.

Annual Lecture 2012

Il fulmine domato

Le correnti ad alta tensione e ad alta frequenza nelle pratiche di elettroterapia e negli 'spettacoli scientifici' (1890-1930)

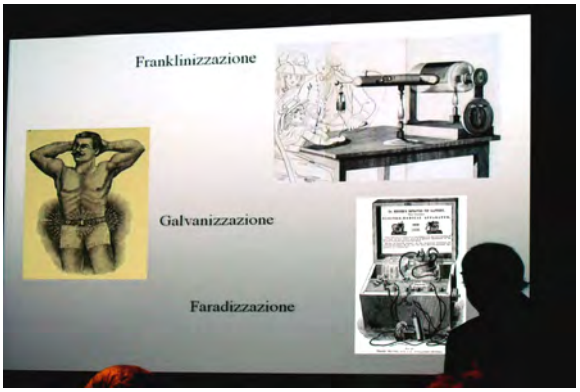
Paolo Brenni, Istituto e Museo di Storia della Scienza, Firenze

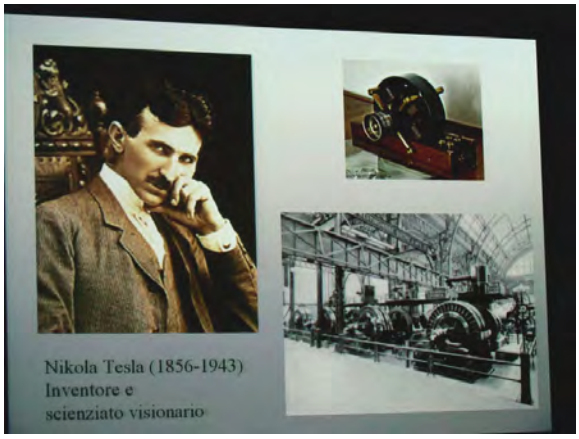
Sommario

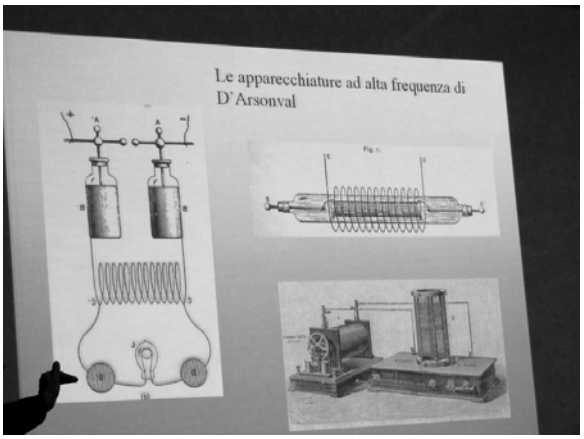
Sin dalla metà del XVIII secolo l'elettricità statica fu utilizzata nella speranza di guarire le più svariate patologie. Nel corso del XIX secolo, le correnti continue delle pile, quelle prodotte per induzione dai trasformatori e le correnti alternate, vennero sistematicamente sfruttate in numerosi tipi di terapie elettriche.

Negli Stati Uniti alla fine del XX secolo Nikola Tesla e Elihu Thomson studiarono le proprietà delle correnti ad alta frequenza e ad alta tensione e, grazie a esse, presentarono una serie di esperienze spettacolari e stupefacenti. Infatti, correnti di centinaia di migliaia di volt, capaci di produrre scariche e scintille, parevano non avessero alcun effetto doloroso sul corpo umano. In seguito a tali osservazioni, il fisico e fisiologo francese Arsène d'Arsonval sfruttò queste correnti per un nuovo tipo di elettroterapia, che divenne molto popolare e, sotto il nome di 'darsonvalizzazione' fu ampiamente utilizzata sino fino agli anni '30 del XX secolo. D'Arsonval e i suoi discepoli idearono numerosi apparecchi per i trattamenti ad alta frequenza che trasformarono molti gabinetti medici in veri e propri laboratori elettrici irti di solenoidi, bobine, condensatori, scaricatori ecc. La darsonvalizzazione, che fu applicata con successo alla cura di molte patologie e fu all'origine anche della diatermia (detta in Italia 'marconiterapia') fu alla fine soppiantata non tanto per la sua inefficacia ma soprattutto dall'introduzione di nuove terapie farmacologiche.

Ma le spettacolari proprietà delle correnti ad alta frequenza e ad alto voltaggio furono anche sfruttate in spettacoli di vaudeville e di cabaret che, soprattutto nei paesi anglosassoni, furono popolarissimi nei primi decenni del '900. Ciarlatani, pseudo medici e showman, forniti di impressionanti apparecchi derivati da quelli usati in laboratori e gabinetti elettroterapici, catturavano il pubblico sia promettendo cure e guarigioni miracolose, sia affascinandolo con esperienze di 'magia scientifica'. Da tale magia non è immune nemmeno lo spettatore contemporaneo che ancora oggi è affascinato dagli effetti sorprendenti che nei musei e negli science center, vengono prodotti con i trasformatori di Tesla.


Franklinizzazione
Galvanizzazione
Faradizzazione


Nikola Tesla (1856-1943)
Inventore e
scienziato visionario


Le apparecchiature ad alta frequenza di
D'Arsonval

Lightning under control

High-voltage and high-frequency currents in the practice of electrotherapy and in "scientific shows"

Paolo Brenni

Abstract

Since the middle of the 18th century static electricity was used in the hope of healing various diseases. In the following century direct currents from batteries, induction currents from transformers and alternating currents were systematically employed in a number of electrotherapies.

In the United States at the end of the 19th c. Nikola Tesla and Elihu Thomson investigated the properties of high-voltage and high-frequency currents and, thanks to them, provided a series of spectacular and astonishing experiments. In fact, voltages of hundreds of thousands of Volt, able to produce sparks and discharges, apparently had no painful effects on the human body.

Following these experiments, the French physicist and physiologist Arséne d'Arsonval exploited these currents in a new type of electrotherapy which became very popular and, under the name of "darsonvalisation", was widely used up to the 1930s. D'Arsonval and his school designed numerous devices for high-frequency treatments, which transformed many surgeries in real electric laboratories, full of solenoids, coils, capacitors, dischargers. Darsonvalisation, which was successfully applied in many pathologies and originated diathermy (in Italy named "Marconitherapy") eventually was abandoned because of its low efficiency and mainly after the introduction of new pharmacologic therapies.

The spectacular properties of high-voltage and high-frequency currents were also exploited in music halls and cabaret shows which, particularly in anglo-saxon countries, became very popular in the first decades of the 20th c. Quacks, false doctors and showmen, equipped with impressive devices based on those employed in laboratories and electrotherapy cabinets, attracted people both by promising miraculous recoveries and by fascinating shows of "scientific magic".

The astonishing effects produced by Tesla transformers still fascinate the public in museums and science centres today.

14 aprile 2012-31 maggio 2012

1912 Titanic 2012

Riflessioni sulla tragedia che scosse il mondo e sul ruolo della telegrafia senza fili nelle operazioni di soccorso

100 Anni del Titanic. Leggenda e tecnologia

La tragedia del Titanic del 14-15 aprile 1912 ebbe una straordinaria risonanza nell'opinione pubblica mondiale per le dimensioni del disastro e per il ruolo che ebbe la nuova tecnologia della telegrafia senza fili nelle operazioni di salvataggio.

A cent'anni di distanza il Centro di Ricerca per la Storia della Tecnologia dell'Università di Pavia, ha proposto una serie di eventi che si sono sviluppati nella settimana dal 14 al 22 aprile nell'ambito della Settimana nazionale per i beni e le attività culturali.

Sabato 14 aprile Flavio Testi di IET Italy Network e della Titanic Historical Society ha tenuto una conferenza su "100 Anni del Titanic. Leggenda e tecnologia".

La rievocazione della tragedia tra storia, leggenda e tecnologia è stata seguita dalla presentazione della ricostruzione delle apparecchiature telegrafiche impiegate a bordo del transatlantico a cura di C. Gilardenghi. Tali apparecchiature, basate sulla nuova tecnologia della comunicazione senza fili appena sviluppata da Guglielmo Marconi, consentirono di salvare un gran numero di persone.

Al termine della conferenza le apparecchiature disposte nella sala telegrafi del transatlantico sono state fatte funzionare, ricreando l'emozione della terribile notte dell'affondamento.

Voci dal Titanic

La serie di eventi "1912 Titanic 2012" si è conclusa il 22 aprile con la conferenza di C. Bossi e M. Salussolia su "Voci dal Titanic".

1912 Titanic 2012

Reflections on the tragedy that shocked the world and on the role of wireless telegraphy in the rescue operation.

The sinking of Titanic on April 14-15 1912 had a vast impact on the public worldwide both because of the size of the tragedy and the role of the new technology of wireless telegraphy in rescue operation.

After one hundred years the Pavia Research Centre for the History of Electrical Technology proposed a series of commemorative events that took place in the week from 14 to 22 April during the Week for Cultural Heritage.

On Saturday April 14 Flavio Testi, IET Italy Network and Titanic Historical Society, delivered a lecture on "One hundred years from the Titanic tragedy. Legend and technology".

The commemoration of the tragedy (history, technology and legend) was followed by the presentation of the reconstruction of the telegraph room on board of the liner made by C. Gilardenghi. The communication devices based on the new technology of wireless communication, developed by Guglielmo Marconi a short time before, made it possible to rescue a number of persons.

At the end of the lecture in a spectacular show all the transmission equipment was operated, recreating the emotion of the terrible night of the sinking.

Another lecture was delivered on April 22 by C. Bossi and M. Salussolia on "Voices from Titanic".

5-7 settembre 2012

HistelCon 2012

Conferenza IEEE sulla storia della tecnologia elettrica.

Al Centro di Ricerca sulla Storia della Tecnica Elettrica che opera presso il Museo, IEEE, la più grande associazione al mondo di operatori nel settore della tecnologia, ha affidato il compito di organizzare la terza conferenza internazionale HistelCon, dopo le edizioni tenutesi a Parigi nel 2008, nel corso della quale è stata presentata una memoria congiunta tra l'Università di Pavia e Sirti, e a Madrid nel 2010.

La conferenza HistelCon 2012 ha dato l'opportunità al Museo della Tecnica Elettrica dell'Università di Pavia di essere una vetrina mondiale per la tecnologia italiana, passata e attuale.

The IEEE International HISTory of ELectrotechnology CONference HISTELCON 2012, the third in its series (after HISTELCON 2008 in Paris and HISTELCON 2010 in Madrid), took place in Pavia, Italy on 5-7 September 2012. It was organized by CIRSTE (the Research Centre on the History of Electrical Technology operating at the University of Pavia), IEEE Region 8 and IEEE Italy Section. The Conference was followed by a meeting of the IEEE History Committee.

HISTELCON 2012 aimed to build a comprehensive view of the origin and early development of electrical, and particularly of telecommunication, technologies. Original and innovative contributions were discussed in areas including, but not restricted to, origins and early developments of technologies, milestones in electro-technology, scientists and technologists involved in the above, museum items illustrating the above.

Participants came from various countries and with different backgrounds – engineers, historians, museum curators etc.

HISTELCON 2012 provided also a special opportunity to experience Italy in a charming season of the year and to visit, in particular, the University of Pavia and the Museum of Electrical Technology recently established in the University where Alessandro Volta was a professor for a long time.

Antonio Savini
Organizing Committee
Chairman

The Conference theme of the origins and early development of electrical technologies clearly appealed to many people. We had 35 papers by 54 authors from 14 countries. Appropriately for a conference in Pavia, where Alessandro Volta produced the first continuous electric current, we began with a paper looking at the collection of electric batteries in the Museum of Electrical Technology. Papers looking at applications of electricity reminded us that the electric current has brought world-wide benefits.

Communications networks enable us to keep in touch with friends and colleagues around the world, and distribution systems bring power just where it is needed in the home, in industry, and in transport. Other papers on topics such as electrical regulations, publications, and museums broadened the theme beyond purely technical matters and also introduced us to some of the pioneers.

After revision the papers presented were sent to the IEEE Xplore Library.

Brian Bowers
Technical Programme Committee
Chairman

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Antonio Perez Yuste, Technical University of Madrid
Lenore Symons, IET, London

HistelCon 2012 - Programme

Wednesday 5 September

Session 1: "General"

"From Volta onwards: a variety of electrical batteries in the Pavia Museum of Electrical Technology"

Paolo Brenni, Roberto Galdi, Francesco Pietra, Antonio Savini

Abstract:
The Pavia Museum of Electrical Technology preserves a remarkable collection of a number of electric batteries of the 19th and 20th centuries, deposited by the Govoni family. Starting from replicas of the original battery invented by Alessandro Volta, a professor of the Pavia University, it is therefore possible to make a journey through the history of electrochemical batteries, in particular, produced in the past two centuries. The variety of batteries includes primary and secondary batteries, different according to the nature of the electrodes and of the electrolyte, batteries with one or two liquids, wet and dry batteries, etc.

"The Anglo-Italian Connection Documented in the IET Rare Books and Archive Collections"

Lenore Symons

Abstract:
The IET in London hold the extensive collections of books and pamphlets on electrical and other topics gathered by Sir Francis Ronalds and Silvanus Thompson, who both travelled in Itlay. Other collections include correspondence and the diary which Michael Faraday wrote when he visited Italy and other countries in 1813-15.

More recently Gordon Rawcliffe visited Italy to study threephase railway electrification in the course of his work on induction motors.

"Some Challenges in the Popularization of History of (Electro)Technology"

Christine Blondel (paper not available for publication)

Session 2: "Telecommunications - 1"

"Electric Telegraph: Technology Implemented by the Watchmakers"

Oral Ahmet

Abstract:
It would be quite significant to mention that the most favored technology in the Ottoman Empire during the nineteenth century was the electric telegraphy. This technology did not only give the central government more direct control over the local officials, but also provided ordinary people and merchants with fast communication facilities.

This paper summarizes the transfer of electric telegraph technology to the Ottoman Empire and its implementation by the watchmakers in a small workshop.

"180 Years of Telecommunications in Russia"

Oleg Valentinovich Makhrovskiy

Abstract:
In capital of Russian empire, St.-Petersburg, on October, 21st, 1832 the Russian diplomat and scientist Baron Pavel L'vovitch Schilling in his big apartment has arranged the first public demonstration of the electromagnetic telegraph invented by him.

This day is considered as birthday of Russian telecommunication.

P. Shilling's invention of electromagnetic telegraph had been prepared by all previous development of physics (H.C. Oersted, A.-M. Ampere).

P.L. Shilling was the first to create such electromagnetic telegraph. He didn't patent the development, but scientists in the Europe and America knew about his invention.

Huge impact on Shilling's invention have rendered various constructive decisions and the devices developed and created by A.Volta, S.T. Sommering, F. Ronalds. Without all of these achievements there would be no also P. Shilling's telegraph.

"Optical Telegraphy in Russia: 1794-1854"

Valery Shilov, Vladimir Kitov, Yaroslav Nazarov

Abstract:
By the end of XVIIIth century in the leading European countries the need for the systems of message transition on the long distances was felt. The optical telegraphy became the first technology on which basis national telecommunication networks were constructed. It determines the important place of this technology in the history of telecommunications.

Despite that the optical telegraphy was used in Russia for only 15 years it played a great role in the development of Russian telegraphy. During this time an invaluable experience was received in exploitation of high-speed extended lines for transmission of encrypted and open information. Just exactly on the stations of optical telegraph the first operators of electrical telegraph were prepared. First standards and rules, legal regulations of Russian telegraphy were established. Optical telegraph became the necessary step and condition for transition to the next stage of Russian telegraphy development – electromagnetic telegraph.

The article examines the history of optical telegraphy in Russia and describes some main projects of Russian inventors.

Session 3: "Telecommunications - 2"

"A common technical culture of telegraphy: the Telegraph Union and the significance of Technological Standardization, 1865-1875"

Simone Fari, Gabriele Balbi, Giuseppe Richeri

Abstract:
The Telegraph Union, founded in 1865, was the first supranational organization to link different countries with the aim of regulating a public service. Its objectives were: technological standardization, a set of regulations and the adoption of uniform international tariffs. The paper aims to establish how the Telegraph Union influenced the technical standardization process of the international network in the second half of the XIX century.

"Marconi's diktat: how Italian international wireless policy was shaped by a British company, 1903-1911"

Gabriele Balbi

Abstract:
Wireless telegraphy, born in late 19th century, was regulated at international level very soon in two conferences both held in Berlin in 1903 and 1906. These conferences were organized by Germany in order to break up the British Marconi Company's monopoly. Germany, France and U.S.A. opposed this trust, while U.K. and Italy defended it for different reasons. This paper aims to identify the political, economic, technical, and social reasons that led, or in some cases forced, Italy to protect Marconi's interests at international level. This defensive strategy put the country at the center either of the international debate on wireless, or of the Marconi Company's global strategy.

"Technical Standards and Political Constrains in the First Italian Submarine Cable Network (around 1850-1870)"

Andrea Giuntini

Abstract:
Submarine cables developed quite early in a backwarded country like Italy after 1850. That was due mostly to the British standardized technology in the field. For some years Italy profited of its unique central position in the Mediterranean sea.

"A Florentine in Paris: the Caselli Pantelegraph and its Successors, 1859-1871"

Jonathan Coopersmith

Abstract:
The world's first commercial facsimile service began between Paris and Lyon in 1865, reflecting a conjunction of good design, superb craftsmanship, need for a faster alternative to Morse telegraphy, and imperial patronage.

Although technological and economic shortcomings stopped Abbe Caselli's pantelegraphs in 1867, the French telegraph administration tested other fax systems to increase the speed and accuracy of telegram service. Facsimile machines proved faster than conventional Morse machines, but the automatic printing telegraph was even faster and less expensive. Other countries faced similar challenges with telegraphy, but patronage and craftsmanship distinguished facsimile in France.

"NE Picture Transmission Device"

Takayuki Nagata, Osamu Kamei, Itaru Ishii

Abstract:
The authors describe the creation of the NE picture transmission device (the precursor of the modern day facsimile machine) in 1928, which was in the early Showa Era. The device's creation was all the more marvelous because Japan was at a much lower technological level than other advanced countries. This paper contains a brief overview of the device compared with similar ones at that time and covers the device's technological significance.

Thursday 6 September

Session 4: "Power - 1"

"The Battle over the Transformer: Patentees and Patenting Strategies in Late-Nineteenth Century Britain"

Anna Guagnini (paper not available for publication)

"Dishwasher History and its Role in Modern Design"

Francesco Rosa, Edoardo Rovida, Serena Graziosi, Paolo Giudici, Claudio Guarnaschelli, Dino Bongini

Abstract:
The fundamental steps in the development of electrical technologies have determined their strong diffusion in several applications that were previously hand operated and controlled.

The household appliance industry is one of the sectors where this permeation had the major effects, fostering a continuous search for new design perspectives. Capturing such product evolution is fundamental in order to preserve knowledge coming from past experiences, which could act as a stimulus for new technical solutions or socio-economic analysis. Starting from the description of the dishwasher historical evolution, in this paper an approach to preserve such precious knowledge is presented: a functional representation of that knowledge is proposed end its role in modern design is discussed.

"Survey on induction heating development in Italy"

Sergio Lupi

Abstract:
This paper presents a short survey of the development of induction heating technology in Italy, seen in the frame of the international outline. The paper is based on the lectio magistralis *given in Padua by the author on December 13, 2010 entitled "Research in the field of induction heating at the University of Padua".*

After a short historical background, focused on the period before the WWII, the paper deals with the activities in this field of the most important Italian companies and the research developed at the University of Padua.

"The Second World War and Industrial Development in Siberia"

Liudmila I. Sharygina

Abstract:
At the beginning of the Second World War (in Russia it is called Great Patriotic War) the Soviet Union performed enormous operation having no analog in the history: hundreds of factories and plants were moved from the European part of the country over thousand of kilometers to the east – to the Ural, Siberia and the Far East. These evacuated factories formed the ground of industrial development of the Eastern part of the country and the Central Asia Republics during the second part of the XXth century. There was created the powerful bases of electrical, electronic, nuclear and space industry. The paper describes the beginning of the industrial revolution in the field of the electrical and electronic industry in the 40-50s of the last century in some Siberian cities – Tomsk, Novosibirsk, Krasnoyarsk.

"Emil Stohrer and the Development of Electrical Motor Technology in the 1840s"

Frank Dittmann, Johannes-Geert Hagmann

Abstract:
After the discovery of the basic laws of electrophysics, many scientists, inventors, and mechanics ventured their work in this new field of physics. Among them was a Leipzig based mechanic Emil Stöhrer who is widely unknown today. However, in particular through a series of articles in prominent scientific journals, his work became known in the scientific community during his lifetime. This paper gives an introduction to his life and work in electrophysics.

"A Brief History of Direct Current in Electrical Power Systems"

Luis de Andrade, T. Ponce de Leão

Abstract:
This article summarizes the history of the use of Direct Current (DC) in power systems, and various problems associated whit its commercial implementation.

DC technology has been associated with power systems since the early uses of electricity; it has boomed and then fell into disuse in several occasions. This article aims to review the development stages of electrical systems where DC technology has been used, and also to analyze the reasons that led to its use, the advances that brought to DC technology, as well as the reasons that led to their subsequent abandonment.

Finally, is analyzed the new DC technology boom of recent decades and the promising development expectations that this technology brings to power systems.

"Looking Back to Electric Cars"

Massimo Guarnieri

Abstract:
Very early experimental electric cars appeared just after electromagnetism was discovered, in 1820. During the nineteenth century they underwent improvements, staying in advance of internal combustion engines. A breakthrough came with the inventions of the rechargeable battery and of powerful and efficient electric motors, around 1870. Electrics peaked around the turn of the century, when they hold 38% of the automobile market in the US, compared with 40% of steam and 22% internal combustion. Their decline started in the second decade of the twentieth century when the internal combustion engine had a major boost, thanks to important advancements in the infrastructure, product and production technologies.

"Historical Notice Regarding the Development of Type H-Cable"

Martin Höchstädter and Friedrich W. Heilbronner

Abstract:
In the book by Robert Black The History of Electric Wires and Cables *(Peregrinus, London, 1983), the author deals with the individual screening of the three cores in a belted power cable, beginning on p. 109 and highlighting on p. 111: "In the opinion of the writer this development, the introduction of the Hochstadter screen, was the most important single contribution to the art of cable making during the first quarter of the twentieth century." Martin Höchstädter (1883-1973) – in original German spelling with two umlauts – left a type-written English manuscript of 7 pages, titled as in the headline and signed by him in 1967 when he was 84 years of age. Höchstädter's text is published here*

with comments by the editor, because after 50 years MH did not correctly remember the facts. A short biography is included with a portrait photo and an explanatory drawing of three-phase cable cross sections."

"The Giovi Line and the three-phase electrification"

Brian Bowers, Roberto Galdi, Sándor Jeszenszky, Francesco Pietra, Antonio Savini

Abstract:
The three-phase railway electrification was largely developed in Italy early in 20th century and became known as the "Italian system" for railway electrification. It proved a suitable system, in particular, for railways facing high slopes. The first experiment, carried out for the Valtellina line in 1902, was followed in 1911-1913 by that of the Giovi line connecting the Mediterranean sea (Genoa) to the Po valley and the continental Europe. In the following three decades in Italy over 1800 km where electrified at 3400 V 16.7 Hz. The paper describes the origin and the characteristics of the Giovi line.

"'Le dispatching' at Electricité de France: The Control, Command and Synchronization of Power Networks (1960-1975)"

Pierre Mounier-Kuhn (paper not available for publication)

Session 6: "Computing"

"Rediscovering the Very First Italian Digital Computer"

Giovanni A. Cignoni, Fabio Gadducci

Abstract:
Until recently, the ELEA 9003 by Olivetti and the CEP by the University of Pisa were considered the first digital computers built in Italy. The CEP was the final outcome of a project carried out from 1955 to 1961 by the University of Pisa with a substantial participation of Olivetti. Actually, this seven years long project delivered a first fully functional computer already in 1957: the MR. However, for a number of reasons, the relevance of MR has been overlooked by previous researchers that underestimated its accomplishments. This paper offers a revised introduction to the history of the CEP project and adds an original chapter, devoted to the MR. We also briefly present the experimental archeology project that rediscovered the MR. In particular, we highlight the benefits that a rebuilding approach brings to the proper reconstruction and to the correct evaluation of historical events.

"History of Developing and Commercializing Families of Solid-State Calculators"

Toru Chiba, Tetsuo Iwase, Yukihiro Yoshida, Isao Shirakawa

Abstract:
Beginning with the first all-electronic transistorized desktop calculator released in June of 1964, Sharp Corporation commercialized a sequence of solid-state calculators in rapid succession one after another by adopting germanium and silicon transistors, bipolar and MOS IC's, MOS and CMOS LSI's, LCD's, and photovoltaic-cells. The present article outlines Sharp's history of developing and commercializing these families of solid-state calculators, for which IEEE Milestone of Electrical Engineering and Computing was awarded in December 2005.

"The History of Liquid-Crystal Display and its Industry"

Hirohisa Kawamoto

Abstract:
Liquid-crystal display (LCD) was invented in 1964 at RCA Laboratories in Princeton, NJ. In 1970, twisted-nematic (TN) mode of operation was discovered, which gave LCD the first commercial success. The LCD manufacturers supplied small-size displays to portable products such as digital watches and pocket calculators. In 1988, Sharp Corporation demonstrated a 14-in. active-matrix full-color full-motion display using a TFT (thin-film-transistor) array. Observing this, Japan launched a true LCD industry. Large-size displays were first supplied to personal computers and then to television receivers. In the second half of 1990s, the industry has moved to Korea and Taiwan.

Friday 7 September

Session 7: "Miscellaneous"

"The Rise and Fall of the Military Wavemeter: British Military Wavemeters of the 20th century"

Anthony C. Davies

Abstract:
The instruments used in the 20th century to measure and set frequencies for the communications needs of land, sea and air forces are reviewed, with the aid of some examples of historic wavemeters used by British military units. The designs reflect the rapid advances in theory and practice of radio and electronics, stimulated particularly by World War I, World War II and the Cold War, and illustrate how the methods and equipment used for frequency measurement changed dramatically, with progress from spark transmitters to microwave recision navigation systems.

"Landscape and Electrical Transmission Lines: a Cultural Approach to the International Context"

Stefano Morosini, Fabrizio Trisoglio

Abstract:
From a technical point of view, the international debate about the history of electrical transmission lines is widespread. Overhead lines and pylons, however, could be also analyzed in their cultural, aesthetic and natural meanings. In fact, they are symbols of modernity keeping the pace with the evolution of structures and technologies – since their origins until the present time. This essay is based on a comparative method, focusing on the international, historical context. At the same time, it was conceived as a multidisciplinary approach, linked to different themes: History of technology, Geography, Social and Political History, Literature and Arts.

Session 8: "History of Region 8"

"Researching the Roots of IEEE Region 8"

Martin J. Bastiaans

Abstract:
This paper describes the preliminary steps towards the foundation and the early history of IRE Region 9 / IEEE Region 8. The information has been gathered mainly from the archives of the IEEE Benelux Section.

"Setting up the Basis for Region 8"

Jean D. Lebel

Abstract:
What follow are my personal recollections (fifty years old and more) of IRE/IEEE activities to which I participated:

- *The creation of Fairfield IRE subsection in Connecticut*
- *The creation of IRE sections in Switzerland and France*
- *The creation of IEEE European region.*
- *My term as IEEE Director (1965-66)*

"… Go East, Region 8, Go East…"

Anthony C. Davies

Abstract:
The development of IEEE activity and formation of new Sections and Chapters in Central and Eastern Europe following the fall of the "Iron Curtain" and the dismantling of the Berlin Wall is outlined, from the personal perspective and experiences of the author.

"Conferences, Technical Societies and Development – A History of Synergy"

Jacob Baal-Schem

Abstract:
This paper is about IEEE Region 8 Conferences, their raison d'être and their impact on the development of Electro-technology in Europe, the Middle East and Africa (EMEA), which constitute the geographical area of the Region.

The claim is that technology conferences, held by 'learned societies' in different parts of Region 8, were necessary for the technological development of the Region, in order to highlight and discuss the problems with which technology world is coping. In order to set up these conferences, technology experts needed technical societies, such as IEEE, to enable – among other activities – this facility.

On the other hand, the holding of these Conferences contributed to the technological development of the Region and to the contact between scientists and engineers, for the benefit of Humanity.

Thereby, IEEE Region 8 and the series of EUROCON, MELECON, AFRICON etc. conferences had a synergetic effect on the technological development of EMEA during the last 50 years (1960-2010). In a business application, synergy means that teamwork will produce an overall better result than if each person within the group were working toward the same goal individually and it is claimed that by creating the awareness about the latest inventions, issues

and concerns of technology among technologists, IEEE Conferences, organized by Region 8 Operating units, have largely contributed to the technological development of EMEA in the fields related to IEEE activities.

Session 9: "Education"

"History of Technology and Education: the Role of Associations"

Michael N. Geselowitz

Abstract:
Professional associations of scientists or engineers often have an interest in the heritage of their fields of interest. These associations often have formal history units, which can range from a handful of older volunteers to a full-fledged operation employing professional historians. Although some associations may support or even engage in primary research, their overwhelming interest is in public history. These associations hope to make known to the general public the history of their organization, its members, their professions, and related sciences and technologies for a range of reasons that are discussed in the paper. IEEE is used as an example.

"Bringing social studies to STEM. IEEE History Center Pre-University Outreach"

John Vardalas

Abstract:
In the U.S. a great deal of attention has been given to expanding the STEM skills of students graduating from high school. But the spread of STEM literacy also depends on fostering an appreciation of the role of STEM in society.

The IEEE History Center has developed a pilot project that demonstrates that the pre-university social studies curriculum is the ideal forum to explore the relationship of STEM to human development and to help students see the profound societal dimensions of STEM.

"Using History of Technology to Promote an Understanding of the Impact of Engineering Solutions among Practitioners at the University Level"

John Vardalas, Michael N. Geselowitz

Abstract:
The Accreditation Board for Engineering and Technology (ABET), the primary accreditation organization for post-secondary engineering and technology departments in the United States, requires that all engineering curriculum include courses that teach students about the relationship between engineering practice and society. This paper first argues that many engineering schools are having difficulty meeting this requirement in a meaningful way. This paper then argues that history offers a wonderful stage on which to illustrate the engineering-society relationships. This paper then goes to present the results of the IEEE History Center's efforts to develop history of technology courses for engineering students.

Session 10: "Museums"

"Historic Phonetic Devices in the Education in Electrical Engineering and Information Technology"

Rüdiger Hoffman, Dieter Mehnert

Abstract:
This paper deals with some experiences with the application of historic phonetic devices in the education in engineering. The exhibits are part of the historic acousticphonetic collection (HAPS) of the Dresden University. This collection demonstrates the development of experimental phonetics and speech technology in Germany from the beginning at the end of the 19th century until the introduction of the computer in speech processing. Selected application examples are demonstrated for sound production, sound recording, sound analysis, and sound synthesis.

"Collecting the Old and the New at the Pavia Museum of Electrical Technology"

Antonio Savini, Roberto Galdi, Francesco Pietra

Abstract:
In 2011 the University of Pavia celebrated 650 years from its foundation as a Studium Generale. *During the long history of this ancient university scientific museums have been created to collect original and curious things as teaching aids. Most of these museums still exist, but their mission has changed. They no longer collect the new; they only preserve the old.*

The Pavia Museum of Electrical Technology is different. Its origin is in the last two decades of the 20th century when old and new apparatus began to be collected for teaching purpose, thus continuing the original mission of a University museum. An extensive collection was soon gathered and a modern building was erected to accommodate it.

The new Museum was opened in March 2007.

The paper describes the origin and the mission of this modern museum and its special features.

Report on HistelCon 2012

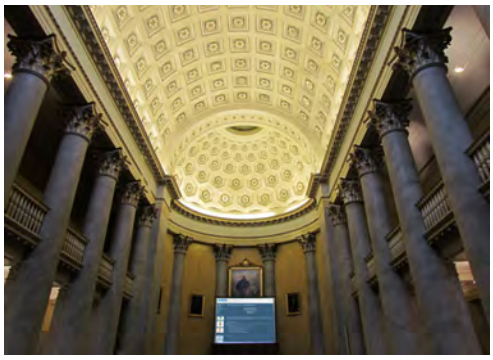
The attractive Italian city of Pavia was the venue for IEEE Region 8's third History of Electrical Engineering Conference. HISTELCON 2012 ran from 5 to 7 September in the 650 year old University of Pavia and its five year old Museum of Electrical Technology.

Fifty people from fifteen countries gathered for the meetings, which began in the Lecture Theatre where Alessandro Volta addressed students two hundred years ago. After that initial introduction, which showed how uncomfortable the seating was for students in Volta's time, the conference moved to the relatively modern Aula Magna. The third day was held in the Museum, which attempts to show the progress of electrical technology from Volta's time to the present day, and with a glimpse into the future.

The general theme of the conference was the origin of electrical technologies. Thirty-five papers were presented, beginning, naturally, with a survey of Volta's battery and other early batteries. The conference then continued with two sessions on telecommunications themes, two on power topics, and a session on computing. Together they illustrated the breadth of electrical technology today and prompted wide ranging discussions in the question and answer sessions.

As well as seeing the old university buildings, conference participants were taken on a tour of the city, passing by the house where Volta lived and the house where, later, the teenager Albert Einstein lived when he spent a few years in Pavia.

The conference concluded with a dinner in the museum. Professor Antonio Savini, the Director of the Museum and Chairman of the Conference Organising Committee, led tours of the Museum during the evening.






24 ottobre – 26 novembre 2012

Disegni Romani

Mostra Temporanea / Temporary Exhibition

Il Museo ha ospitato, dal 24 ottobre al 26 novembre, una mostra di disegni, opera di architetti romani negli ultimi 60 anni.

L'architettura moderna del Museo è parsa una cornice naturale e adatta per la mostra, curata da F. Purini, F. Ronconi e G. Toso, già esposta a Roma e inaugurata a Pavia con gli interventi di F. Purini, G. Contessi e E. Valeriani.

I disegni rappresentavano idee fantastiche di architetture, spesso rimaste nei sogni e talvolta realizzate. Uno dei disegni, in particolare, riguardava il Museo stesso e la sua concezione originale.

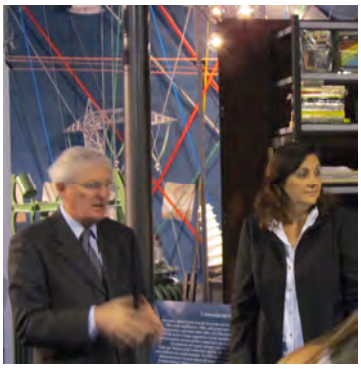
From October 24 to November 26, 2012 the Museum hosted an exhibition of drawings created by architects from Rome in the past 60 years.

The modern architecture of the Museum was a suitable location for the exhibition, planned by F. Purini, F. Ronconi and G. Toso, previously exhibited in Rome and opened in Pavia by F. Purini, G. Contessi and E. Valeriani.

Subjects of the drawings exhibited were fantastic ideas of architectures, often just dreamed and sometimes realized.

One of the drawings showed the original conception of the Museum itself.

Nuove acquisizioni



Il negozio di componenti elettronici “REO Elettronica” aprì a Pavia nel 1978 per iniziativa di Federico Aldo Roncelli, appassionato di elettronica e radioamatore con la sigla I2 REO (I = Italia, 2 = Lombardia).

L’attività iniziò nel garage della villetta di famiglia con gli scaffali e i banchi costruiti artigianalmente e con gestione computerizzata del magazzino.

Il negozio vendeva componenti e strumenti elettrici ed elettronici e, inoltre, apparecchi per la registrazione e riproduzione sonora e visiva, calcolatrici, i primi personal computer con accessori, manuali, apparecchi per radioamatori, saldatori e antenne. I frequenzimetri erano progettati e realizzati direttamente da I2 REO.

Era un negozio familiare, efficiente e dinamico dove non solo venivano venduti i prodotti ma veniva svolta anche una consulenza tecnica appropriata secondo le richieste del cliente.

Nel 1985 divenne uno dei venti negozi in Italia protagonisti della grande distribuzione elettronica e nell’anno successivo ottenne il Premio “Lavoro e Progresso” per l’alto sviluppo economico e sociale dato al paese.

L’attività terminò nel 2002. Nel 2010 la famiglia Roncelli decise di donare il nucleo del negozio al Museo di Pavia.

New acquisitions

The "REO Elettronica" shop was opened in 1978 in Pavia by Federico Aldo Roncelli, an enthusiastic practitioner of electronic technology, whose label, as a radio amateur, was I2 REO (I = Italy, 2 = Lombardy).

The activity started in the garage of the family cottage where stands and tables were handmade and the store was run by a computer.

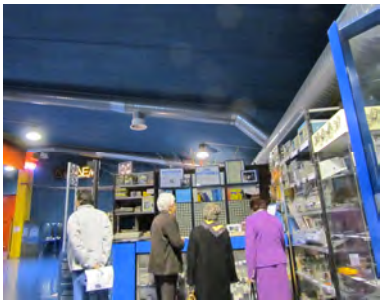
The shop used to sell electric and electronic components and instruments along with recording devices, calculators, the first personal computers with accessories and manuals, devices for radio amateurs, soldering devices, and antennas. Frequency meters were designed and realized by I2 REO directly.

It was an efficient and dynamic family shop where not only were products sold but technical assistance was provided to clients according to their needs.

In 1985 the shop became one of the twenty shops belonging to the Italian electronic sale market; in the following year it received the "Lavoro e Progresso" Prize for contributing to the economic and social development of the country.

In 2002 the activity of the shop came to an end. In 2010 the Roncelli family decided to donate the core of the shop to the Pavia Museum.





Pubblicazioni del Centro Interdipartimentale di Ricerca per la Storia della Tecnica Elettrica (CIRSTE)

Publications of the Research Centre

2012

LUCCI L. – SAVINI A. – TEMPORELLI M. – VALOTTI B.

Collections on telecommunication engineering in Italy

in *A Wireless World* (Grandin K., Mazzinghi P., Olander N., Pelosi G. eds.), Firenze University Press, Firenze, 2012, pp. 320-347, ISBN 978-91-7190-178-1

L'articolo passa in rassegna le principali collezioni sulla storia delle telecomunicazioni presenti nei musei e nelle istituzioni italiane. Tra di esse: il Museo della Radio e della Televisione di Torino, la Fondazione Guglielmo Marconi di Bologna, il Museo della Tecnica Elettrica di Pavia e il Museo Nazionale della Scienza e della Tecnologia di Milano.

BRENNI P. – GALDI R. – PIETRA F. – SAVINI A.

From Volta onwards: a variety of electric batteries in the Pavia Museum of Electrical Technologies

Proc. HISTELCON 2012, Pavia, 5-7 September 2012

Il Museo della Tecnica Elettrica di Pavia conserva una notevole collezione di batterie elettriche dell'Ottocento e del Novecento che è stata depositata dalla famiglia Govoni. A partire da repliche della batteria originale inventata da A. Volta, professore dell'Università di Pavia, è perciò possibile percorrere un itinerario attraverso la storia, in particolare, delle batterie elettrochimiche prodotte negli ultimi due secoli. La varietà di batterie comprende batterie primarie e secondarie, diverse secondo la natura degli elettrotoni e della soluzione elettrolitica, batterie con uno o due liquidi, umide o a secco, ecc.

BOWERS B. – GALDI R. – JESZENSKY S. – PIETRA F. – SAVINI A.

The Giovi line and Three-phase electrification

Proc. HISTELCON 2012, Pavia, 5-7 September 2012

L'elettrificazione ferroviaria trifase si sviluppò ampiamente in Italia agli inizi del Novecento e divenne perciò conosciuta come 'il sistema italiano' di elettrificazione, adatto soprattutto per ferrovie con forti pendenze. La prima installazione sperimentale per la linea della Valtellina nel

1902 fu seguita, alcuni anni dopo, dall'elettrificazione della linea dei Giovi che collegava il porto di Genova sulla costa del Mediterraneo con Torino e Milano nella valle del Po e quindi con l'Europa continentale. Nei tre decenni successivi in Italia furono elettrificati oltre 1800Km di ferrovia a 3400V trifase e 16 $^{2/3}$Hz. L'articolo descrive il progetto della linea dei Giovi e il suo contributo allo sviluppo dell'elettrificazione ferroviaria.

SAVINI A. – GALDI R. – PIETRA F.

Collecting the old and the new in the Pavia Museum of Electrical Technology

Proc. HISTELCON 2012, Pavia, 5-7 September 2012

Nel 2011 l'Università di Pavia ha compiuto 650 anni dalla fondazione come *Studium Generale*. Nel corso della lunga storia di questa antica Università sono sorti musei scientifici per raccogliere cose originali e curiose a scopo didattico. La maggior parte di questi musei esiste ancora anche se la loro missione è cambiata. Infatti non raccolgono più il nuovo ma si limitano a conservare il vecchio.

Il Museo della Tecnica Elettrica di Pavia è diverso. Ha avuto origine nelle ultime due decadi del Novecento quando si sono cominciati a raccogliere vecchi e nuovi apparati per scopi didattici, conservando così la missione originaria di un museo universitario. Presto fu raccolta un'ingente collezione e fu costruito un edificio moderno per ospitarla. Il nuovo museo fu aperto nel marzo 2007.

L'articolo descrive l'origine e la missione di questo museo moderno e le sue caratteristiche peculiari.

Il Rapporto *Un anno al Museo 2012* sintetizza un *annus mirabilis* per il Museo della Tecnica Elettrica, che ha ricevuto una consacrazione internazionale ospitando HISTELCON 2012, l'IEEE International Conference on the History of Electrical Technology, conferenza organizzata dal Centro di Ricerca per la Storia della Tecnica Elettrica e dalla Sezione Italiana di IEEE.

I contributi scientifici, su argomenti vari nell'ambito del tema generale della Conferenza "Le origini delle tecnologie elettriche", sono stati pubblicati nella biblioteca Xplore di IEEE.

L'anno si è aperto con il Museum Day 2012 caratterizzato dall'affascinante Conferenza Annuale di Paolo Brenni sull'uso delle correnti ad alta tensione e alta frequenza nelle terapie e negli spettacoli scientifici. Nella tradizione delle Conferenze Annuali la brillante esposizione è stata accompagnata da avvincenti dimostrazioni pratiche del funzionamento di apparecchiature ad alta tensione e alta frequenza.

Sempre a cura del Centro di Ricerca, il 14 aprile è stata rievocata la tragedia dell'affondamento del Titanic, a 100 anni di distanza. Le attività svolte nel Museo e le sue nuove acquisizioni sono descritte in questo Rapporto Annuale che si aggiunge ai precedenti per documentare quanto il Museo ha realizzato nei suoi primi cinque anni di vita.

Nella sezione "Editoria scientifica" Pavia University Press pubblica esclusivamente testi scientifici valutati e approvati dal Comitato scientifico-editoriale. www.paviauniversitypress.it/scientifica

ISBN 978-88-96764-43-5

€ 11,00

PaviaUniversityPress

Edizioni dell'Università degli Studi di Pavia