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A Report on the FRESNEL 2023 Seminar

# SUMMARY

The year 2023 marks the 200th anniversary of the installation of Fresnel lenses in the Phare de Cordouan, where they were first used. Accordingly, a seminar was held to commemorate the occasion at Le Verdon-sur- Mer, France, where the Fresnel lenses were installed in the Cordouan lighthouse. As is well known, the installation of Fresnel lenses changed the lenses of lighthouses all over the world, and it was a revolution that changed not only lighthouses but also human scientific civilization. Its impact continues to this day in various fields. Accordingly, in this seminar, experts from various fields such as physics, quantum mechanics, astronomy, architecture, and art exhibition organizers who were influenced by the meaning and role of lighthouses in the history of human civilization honored Fresnel and reviewed the historical significance of the Fresnel lens and the value of the lighthouse in the history of human civilization.

# BACKGROUND

The purpose of this report is to convey the contents, results, and impressions of the Fresnel 2023 seminar, which was held in Le Verdon-sur-Mer, France, from October 23 to 24, 2023. Along with this, the contents of the events on the 21st and 22nd, where the pre-event was held, were also summarized.

# DISCUSSION

* 1. **October 21, 2023**

1. Winery Chateau Lynch-Bages

The wine processing process is shown using cutting-edge high-tech techniques that integrate wine processing facilities and architecture using iron, and at the same time, the factory itself is turned into a gallery and shown as a cultural facility, enhancing the cultural value of the wine produced here. In particular, the works displayed on the walls of the entire space of the winery are works by Fabienne Verdier (1962-). She is a French painter who studied in China for many years and is the first Western female painter to receive a

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graduate diploma from the Sichuan Institute of Fine Arts in Chongqing, China. Her works resemble oriental calligraphy works painted with color paints, expressing the dynamic movement of natural forces.



*Figure 1* Winery Chateau Lynch-Bages

1. de Hourtin Lighthouse

The exterior consists of a four-cornered plan, and the material is made of brick. The interior consists of a circular space with a circular concrete staircase. In the case of lighthouses that are a little away from the beach, the lighthouse has a four-sided plan and a circular space inside, which is one of the characteristics of French lighthouses. The lighthouse keeper’s house in front of the lighthouse, the engine room, and the surrounding atmosphere have been preserved.

*Figure 2* de Hourtin Lighthouse

1. Le Saint Sabastien (11 rue Charles Plumeau 33340 Couqueques)

The performance at Cabaret, a theatre-style restaurant called Le Saint Sebastian in the north of Medoc, showcased a dynamic and passionate performance by artists that would be hard to imagine in such a rural setting. Dressed up as Lady Gaga, Beyoncé, Charlie Zeplin, and more. We were able to watch performances that satirized modern pop culture and showed it passionately.

The show continued and returned to the accommodation at 1:30 the next day

## October 22, 2023

1. La Coubre Lighthouse

It is a concrete lighthouse, but the interior is tiled. It has a wide base and decreases towards the top. It is characteristic that an emergency beacon is installed in the middle of the tower. The lighthouse museum and exhibition hall are quite well maintained. In this souvenir shop, you can find information about the Corduan Lighthouse and La Corvou Lighthouse.

1. Winery Uni Medoc (34, route de Soulac, 33 340 Gaillan-en Medoc)

This is a traditional winery where you can taste 4 different types of wine. You can enjoy the show at the winery using the lights.

## October 23, 2023: Fresnel lens and technical heritage

1. session 1: Opening speeches

It was conducted by Jean Marie Calbet and included keynote speeches by Mayor Le Verdon, Secretary General of French DGAMPA, and Henry Masson of the French Architecture Bureau.

1. session 2: Innovations around the Fresnel lens, the invariant component of lighthouses



* 1. Solutions for mercury alternatives by Michel COUSQUER
  2. The Ile Vierge lighthouse put to the test by climate actions by Nathalie DOMEDE
  3. Wave loading on offshore rock lighthouses in the UK and Ireland by Alyson RABY
  4. Great Lighthouses of Ireland – Delivering Sustainable Economic Benefits to Coastal Communities by Dave WARD

After the four presentations, a lively discussion was conducted by Solange MAJOUREAU.

1. session 3: Technical heritage and opening to the public
   1. Preservation of collections by Jean-Marie CALBET
   2. Complementary use case of the Palmido lighthouse, the first to use a Fresnel lens in Korea by Jonghun KIM After the two presentations, a round table meeting was conducted by Jörg UNTERDERWEIDE.

*Figure 3* Speeches on the Fresnel lens and technical heritage

1. Cordouan Lighthouse

The Cordouan Lighthouse is an exceptional monument like the Great Wall of China or the Taj Mahal in India and was awarded UNESCO in 2021. It has been registered as a World Heritage Site. Built on a rocky island at the mouth of the Gironde estuary, it is still functioning in an uninhabitable and inaccessible environment and is over 400 years old. Built with the enthusiasm of the kings of France, the Cordouan Lighthouse was ambitiously built as the successor to the mythical lighthouse of Alexandra. Unlike other lighthouses, the Cordouan was designed from the ground up as a monument and as a symbol of maritime culture.

*Figure 4* Cordouan Lighthouse



## October 24, 2023: Fresnel lens and technical innovation

1. session 1: Opening speeches

It was conducted by Jean Marie Calbet and included keynote speeches by Solange MAJOUREAU who is the Head of the Navigation Safety, Risk Prevention Division, DIRM SA, France.

1. session 2: Issues and techniques, theories of light (wave, corpuscular, etc.)
   1. Fresnel and the lightning wave theory by Bernard MAITTE

In this lecture, Prof. Maitte looked at Fresnel's life. At the time, Newton's ideas had a powerful influence, and the Academy of Sciences was dominated by followers of Newton's ideas. He was discouraged when he refused to acknowledge the equations that the young Fresnel had made, but his uncle encouraged him not to give up and eventually create the Fresnel lens. This led to the creation of a new era in the principle of light, and it was his uncle's encouragement that young Fresnel's courage would not be broken.

* 1. Fresnel and the quantum mechanics by Alain ASPECT

He was awarded the Nobel Prize in Physics in 2022. Quantum entanglement is a core principle of quantum mechanics when two or more particles are intertwined with each other and then fall apart.

When one state is measured, it refers to a phenomenon in which the state of the other is determined at that moment. He used this principle to inject calcium atoms with a laser, produce the same photon, pass each photon through two polarizing filters in opposite directions, and measure four polarizations at different angles in the detector.

On this occasion, he explained how Fresnel's optical principles influenced quantum mechanics.

* 1. The history of the Fresnel bright point by Pierre LENA

French astrophysicist, born in 1937. He participated in scientific training and education for the general public. Here, he explains that the optical principles developed by Fresnel were developed in reverse and developed into astronomical lenses.

* 1. Modifications to Allard’s law by Malcolm NICHOLSON

He explained how accurate distance measurement and evaluation of the distance of the light becomes money (economic power).

After the four presentations, a lively discussion was conducted by Julia JORDAN

   

*Figure 5* Speeches on the Issues and techniques, theories of light

1. session 3: Fresnel and maritime A to N innovations today



* 1. Light sources, retrofit by Yves Marie BLANCHARD
  2. Plus and minus industrial lights instead of Fresnel optics by Vincent ROGET
  3. Augustin Fresnel Exhibition, Rio de Janeiro, Brazil by Alberto PIOVESENA Junior

After the three presentations, a round table meeting was conducted by Michel COUSQUER.

1. session 4: Other developments today, related to Fresnel’s findings
   1. The “European Route of Lighthouses” project (current results and challenges) by Volker KOHLER He introduced a movement to make some routes for European lighthouses.
   2. FRESNEL Lenses in Spaceborne Astrophysics by Peter Von BALLMOOS

He explained that the method of measuring the distances of very distant celestial bodies was applied by learning lessons from Fresnel's principles of optics.

* 1. Fresnel and art by Christian PALLATIER

Using light, optics, and mirrors from Fresnel lenses, he introduced his works in the exhibition, especially Kimchi & Chip, a combination of Korean and British artists, which attracted a lot of attention from the participants.

After the three presentations, a round table meeting was conducted by Yves DAMAY.

*Figure 6* Speeches on Other developments today, related to Fresnel’s findings

1. Visit Grave Lighthouse

We visited the Lighthouse Museum and Grave Lighthouse, which explains the Cordouan Lighthouse, and saw the exhibits on display in it. In 2019, there wasn't much to see, but the museum, which has been prepared with the new event, is very compact in space, and it is connected with interactive exhibitions, and it is very

effective and well presented. Above all, it was meaningful because of the abundance of data. There was a lot to learn about the exhibits at the Lighthouse Museum.

Even though it is a lighthouse that is still in operation, the exhibits are very interesting.



*Figure 7* Visit of Grave Lighthouse

1. Visit of the Subdivision des Phares et Balises & Closure Dinner

The dinner in the buoy maintenance yard or warehouse was very impressive. It was read as a demonstration of pride in one's work. It's a very impressive dinner and one of the most rewarding conferences ever.

*Figure 8* Visit of the Subdivision des Phares et Balises & Closure Dinner

# REFERENCES

1. Pierre Cordier, La Lentille de Fresnel, Phare de Cordouan, 2023
2. Jacques Peret, Yann WEROEFROY, Cordouan, La Geste, 2020
3. [www.phare-de-cordouan.fr](http://www.phare-de-cordouan.fr/)

