

# CoIRICH

## Example of application: Fresco's and Mural Paintings

### RESEARCH ACTIVITY

For more than 30 years the CNR-ISAC unit of Padova (Italy) is performing microclimate measurements to evaluate the environmental dynamics. These analyses are realised by measuring the main thermo- hygrometrical parameters both in the air and near the surfaces.

For this purpose conventional instrumentation and ad hoc built sensors to fulfill specific needs, are utilised in wireless and wired systems. For the realisation of ad hoc instrumentation a special collaboration is set up with a spin-off (R.E.D.s.r.l.) born from a project founded by the Italian Ministry (MIUR) where the CNR is a shareholder.

### RESEARCH TEAM

#### CNR-ISAC – Padova (Italy)

- Adriana Bernardi
- Francesca Becherini

#### R.E.D.s.r.l. - Padova (Italy)

- Luc Pockelé
- Sandro De Grandi

### MICROCLIMATIC ANALYSES IN THE AIR AND NEAR THE SURFACES



MEASUREMENTS AT S.CROCE MUSEUM - FLORENCE (ITALY)



MEASUREMENTS AT THE PORTICO DELLA GLORIA - SANTIAGO DE COMPOSTELA (SPAIN)

### Examples

### RESULTS/ADVANTAGES

The collaboration between a group of experts in microclimate, active in the CNR for more that 30 years, and a SME able to built or modify ad hoc scientific instrumentation gives a high added value to the research and the development of specific technologies for the market. In fact this synergy leads to a more profound development and analysis of scientific problems.

### CASE STUDIES

- British Museum (London-UK)
- Sistina Chapel (Rome-Italy)
- Louvre Museum (Paris-France)
- The Last Supper (Milan-Italy)
- Royal Museum of Fine Arts, (Antwerpen-Belgium)
- Ducal Palace (Urbino – Italy)
- Cathedral of di Santiago de Compostela (Spain)
- S.Croce Museum (Florence- Italy)
- Museum of the Cathedral (Florence-Italy)
- Longobard Temple (Cividale del Friuli-Italy)
- Other national and international sites

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### RESEARCH ACTIVITY

At the occasion of a European project (VIDRIO), an instrument, called «DEW SENSOR», was developed at CNR-ISAC of Padova and successively patented

This sensor directly detects condensation on glass stained windows and other materials. The sensor has two pairs of emitter – receivers, one in the ambient air and one in an anhydrous housing. The difference between the two receiver signals indicates clearly the formation of condensation. As the two pairs of emitter- receivers are subject to the same disturbances (eg. lighting) the subtraction of these signals eliminates the influence of the external disturbances coming from the environment. This sensor was also improved inside a spin-off (R.E.D.s.r.l.) born out of a project funded by the Italian Ministry (MIUR) where the CNR is a shareholder.

### RESEARCH TEAM

#### CNR-ISAC – Padova (Italy)

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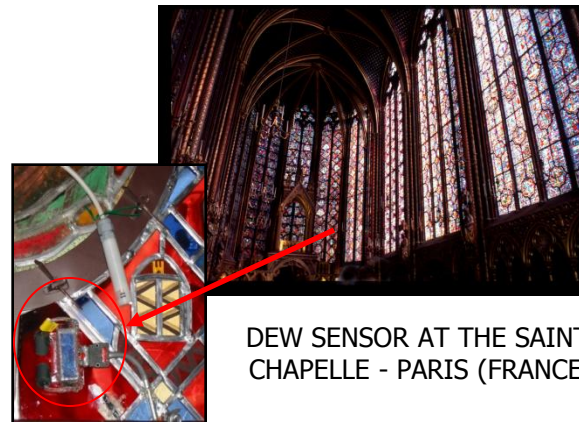
#### R.E.D.s.r.l. - Padova (Italy)

- Luc Pockelé
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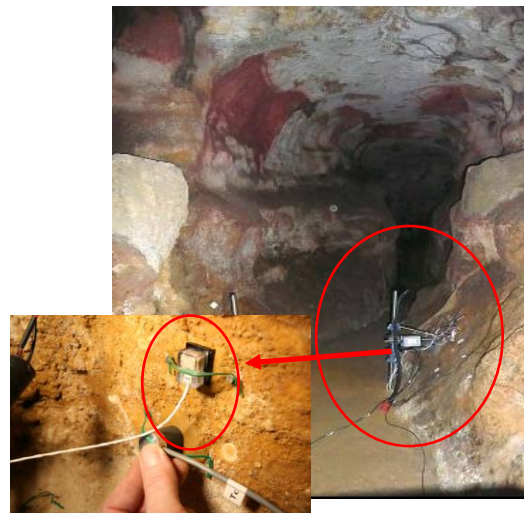
### DEW SENSOR

### Examples

### RESULTS/ADVANTAGES



DEW SENSOR AT THE SAINTE CHAPELLE - PARIS (FRANCE)



DEW SENSOR INSIDE THE LASCAUX CAVES (FRANCE)

The sensor detects faster and with more precision the start of the condensation in comparison with the traditional indirect measurements. The capacity to detect the phenomenon of the formation of the first layer of water called monolayer, permits to giving of a precise "warning" whilst eliminating the influence of the external disturbances.

### CASE STUDIES

- Cologne Cathedral (Germany)
- Sainte Chapelle (Paris - France)
- Lascaux caves (France)
- Santiago de Compostela Cathedral (Spain)
- Megalitic Temples (Malta)
- Petrarca's Tomb (Arquà Petrarca - Italy)

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### RESEARCH ACTIVITY

At the occasion of a European project (TeACH) of the 7FP a new, low cost and simple instrument was developed at CNR-ISAC of Padova, . It consist out of a mechanical arm and a colorimeter and is able to do regularly and automatically measure the color of a precise point thereby evaluating the rate of blackening of a surface exposed to environmental attack.

This sensor was realised in collaboration with Tecnopenta s.r.l. shareholder of the spin-off (R.E.D.s.r.l) where also CNR is another shareholder

### RESEARCH TEAM

#### **CNR-ISAC – Padova (Italy)**

- Adriana Bernardi
- Francesca Becherini

#### **Tecnopentas.r.l – Teolo (Italy)**

- Maura Bellio

#### **R.E.D.s.r.l. - Padova (Italy)**

- Luc Pockelé
- Sandro De Grandi

### Examples

#### **SENSOR OF SURFACE BLEAKENING**



SENSOR INSTALLED ON THE ROOF OF MUSEUM OF THE CATHEDRAL SANTA MARIA DEL FIORE - FLORENCE, ITALY

### RESULTS/ADVANTAGES

The device, an innovative prototype, is able to follow in real time and continuously the different phases of the blackening on a surface.

This permits to predict the pattern and to plan in time the cleaning or the maintenance of the cultural heritage, avoiding to reach dangerous threshold levels.

Moreover. The information coming from these measurements can help the politicians to a better management of the region surrounding the works of art.

### CASE STUDIES

Cologne Cathedral (Germany)

Arriaga Teather (Bilbao – Spain)

Museum of the Cathedral Santa Maria del Fiore (Florence - Italy)