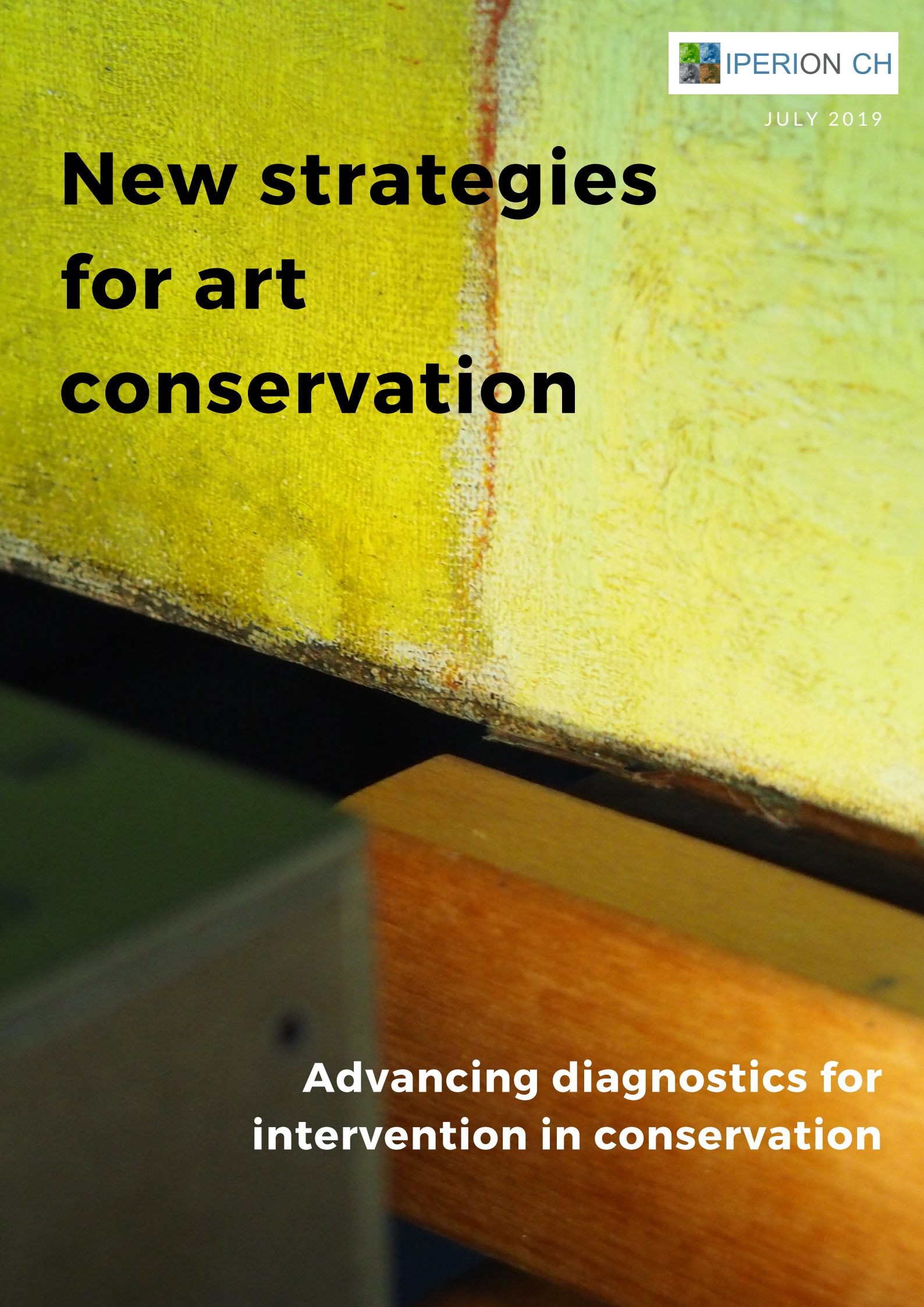

IPERION CH

JULY 2019

New strategies for art conservation

Advancing diagnostics for intervention in conservation

NEW STRATEGIES FOR CONSERVATION

BY MAARTEN VAN BOMMEL

Maarten Van Bommel - is Professor of Conservation Science at the University of Amsterdam. He studies the characterisation and behaviour of dyes and organic pigments, both of natural and synthetic origin, and their application in moveable cultural heritage.

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INNOVATIVE

diagnostic strategies

FOR CONSERVATION

DIAGNOSTIC STRATEGIES FOR ASSESSING THE CLEANING OF PAINTINGS

In 2015 IPERION CH organized a workshop to discuss the topic together with scientists and conservator and to determine the main issue and research strategy.
After that scientific meeting, the research activities were focussed on the following issues:

Removal of (yellowed) varnishes - ??? (aim, results)

Removal of over-paint - ??? (aims, results)

The removal of aged varnishes and overpaints from painted surfaces remains one of the most critical and challenging interventions within paintings conservation. Non-destructive research to support conservators during the removal of aged varnishes and overpaint has been carried out in IPERION CH activities.
Mock-ups and three paintings dating from the 18th and 19th century were used. The paintings are from the study collections of the Cultural Heritage Agency of the Netherlands and the Rijksmuseum. The research is structured around four subjects related to the cleaning of paintings: 1) investigation of the painting structure and stratigraphy; 2) surface characterization; 3) chemical analysis in support of cleaning issues and cleaning residues; and 4) swelling studies.
During experiments were conducted on location with the partners on the three paintings: OCT, pFTIR, micro-profilometry,(macro-) XRF, NMR-MOUSE, Dino-lite, Ultrasound micro tomography, LIBS/LIF and RTI.
Analyses were supported by traditional micro-invasive studies : microscopy of paint cross sections, SEM-EDX, FTIR and GCMS,
The cleaning tests on the paintings were done with solvents/gels and with KrF laser cleaning.
So far, the cleaning experiments performed have shown successful combinations of primarily non-invasive analysis, brought together within MOLAB for monitoring varnish removal. The majority of the used non-invasive analytical techniques complements traditional analytical methods and micro-invasive methods and in some cases offers an alternative. The cleaning tests have also indicated that some of the techniques demand further development and testing to make them sufficient for monitoring cleaning on paintings.

The final results of the research in IPERION CH were presented in 2019 during a two-days conference entitled "New strategies for diagnostics of conservation treatments" held in Amsterdam.

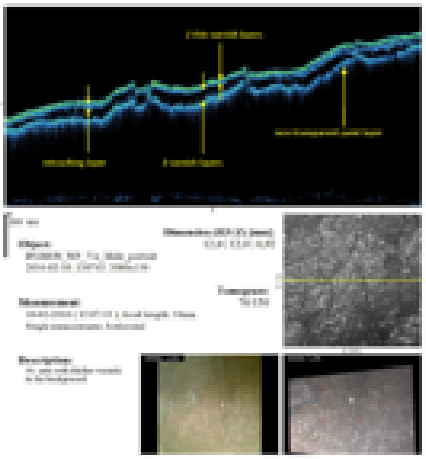
Book of abstracts - downloadable

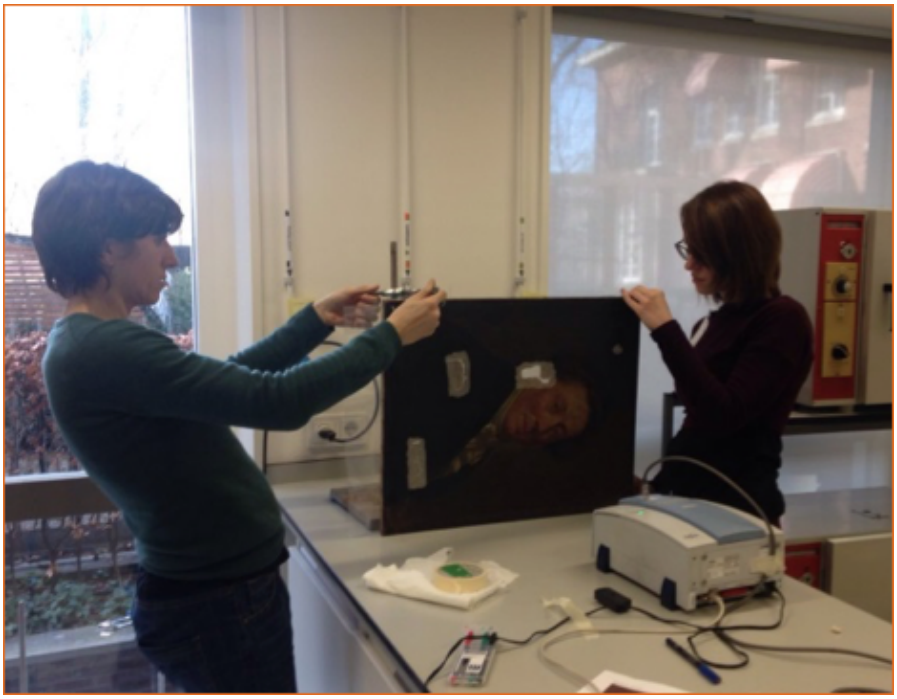
Analysis of mock-ups, characterised by:

-Microprofilometer
-Time-Domain Confocal OCT
-Colormetry
-Terahertz
-Ultrasound tomography
-Microscopy
-SPME
-ATR-FTIR
-XRF
-FIA-ESI-Q-TOF
-GC-MS
-SEM-EDX

Case studies

-Oil on canvas, (48.7 x 59 cm)
OCT: overview of conservation issues, measuring layers'thickness, choosing areas for cleaning tests
23 spots examined
Measurements were taken before-during-after cleaning with OCT, pXRF, mid-FTIR and colorimetry.

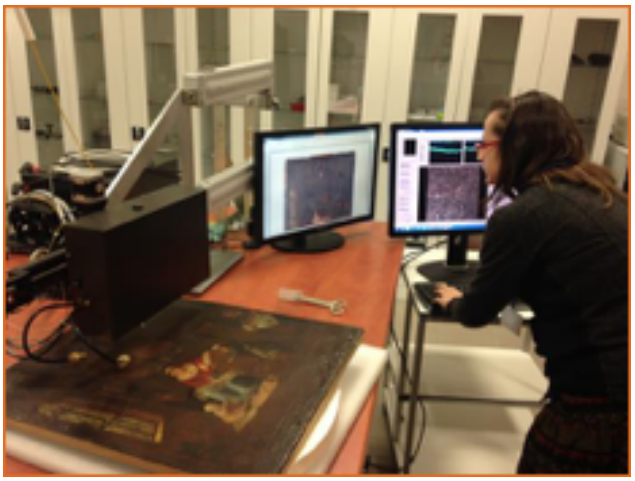




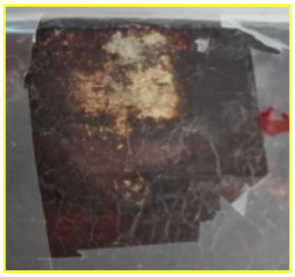
Case studies

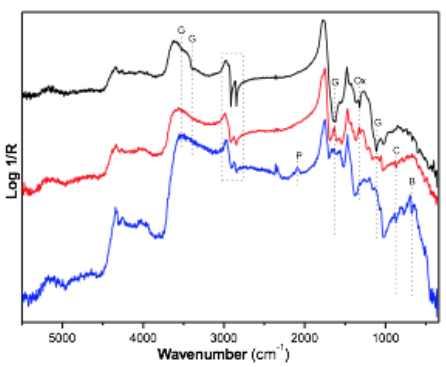
Title: Interior piece (17th century)
Oil on canvas (44.6 x 55.8 cm)

OCT:
overview of conservation issues, measuring layers'thickness, choosing areas for cleaning tests
23 spots examined
Measurements were taken before-during-after cleaning with OCT, pXRF, mid-FTIR and colorimetry.



FT-IR results:
-gypsum (G) and wax removal
-decrease calcium oxalates (Ox)
-calcium carbonate (C), lead white (B), Prussian blue (P), lipid and probably protein are observed in the cleaned area.





uncleaned

cleaned (ethanol on swab)

cleaned - light area (ethanol on swab)

DIAGNOSTIC STRATEGIES FOR ASSESSMENT OF TREATMENTS, PATINA AND COATINGS OF METALS

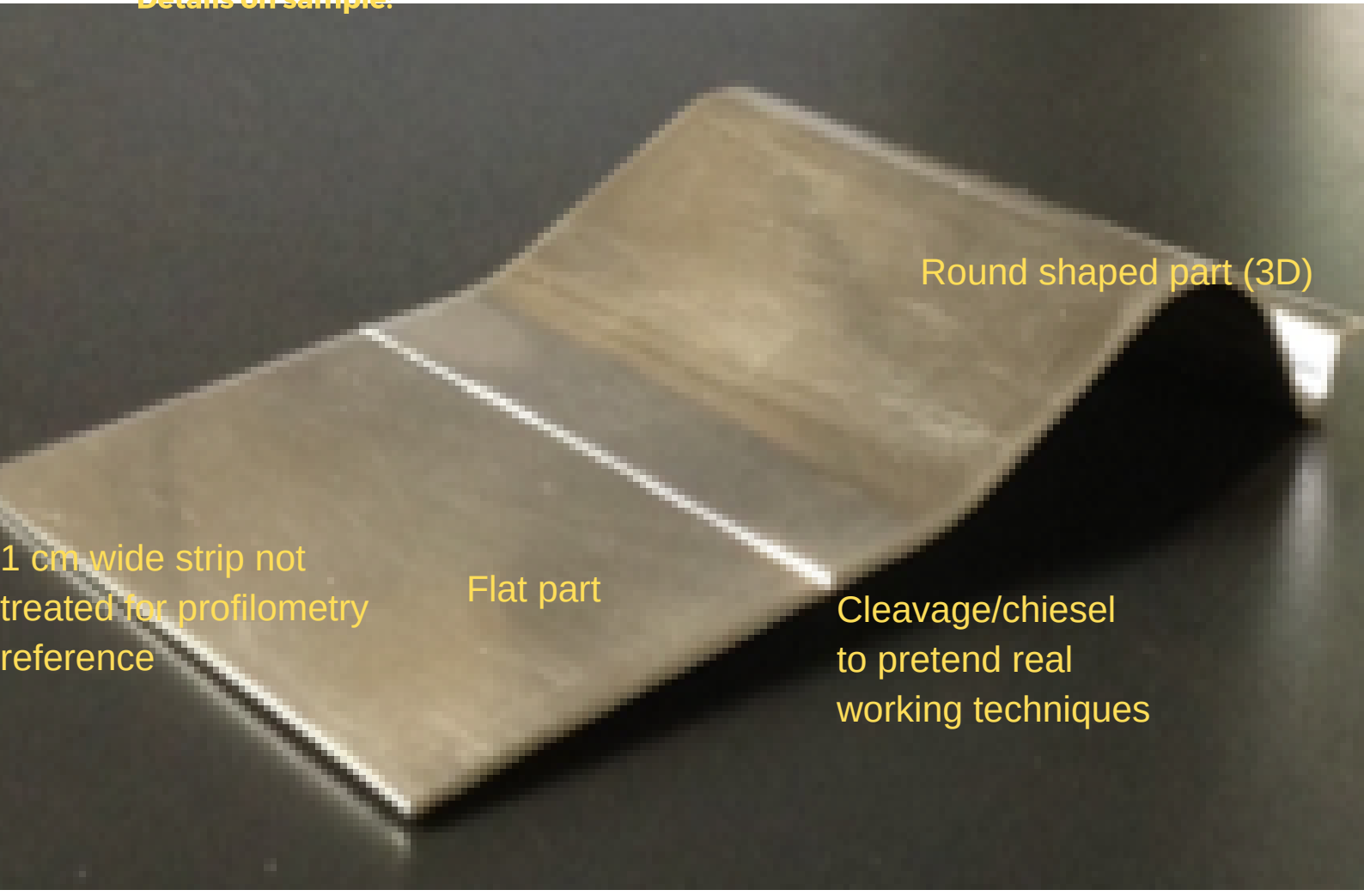
In 2015 IPERION CH organized a workshop to discuss the topic together with scientists and conservator and to determine the main issue and research strategy.
After that scientific meeting, the research activities were focussed on the following issues:

- Coating of Bronze, (sterling) silver and Iron (low carbon);
- Assessment of the best technique(s) for monitoring efficiency and durability of different coatings.

Preparation of mock-ups:

- Standardized samples
- Application of several coatings - Ageing
- Measurements

Details on sample:



Parameters to be measured

- Thickness (microscopy, SEM,acoustic techniques, profilometry, micro-photogrammetry, RBS, Eddy Currents, OCT, NMR) ICVBC, INO, MTA, NCU,OPD, Of-ADC, RCE, (RWTH)
- Uniform coverage and roughness (OCT, micro-photogrammetry, multispectral imaging, microprofilometry, SEM, acoustic techniques) ICVBC, INO, NCU, Of-ADC, OPD, RCE
- Permeability of the coating (EIS, contact angle measurement) CSIC, LMRH
- Adhesion (acoustic techniques, peeling test, microscopy) ICVBC, Of-ADC, OPD
- Molecular change (FTIR, UV-Vis spectroscopy) ICVBC, INO, MTA, Of-ADC,OPD, RCE
- Colour change
- (UV-Vis spectroscopy, colorimetry) CSIC, ICVBC,INO, MTA,Of-ADC, OPD, RCE
- Gloss change (gloss meter) CSIC, OPD, RCE,
- Corrosion rate (EIS, Rp) CSIC

Thickness of coatings on bronze

Treatment	Sample number	Eddy current FLAT(average on 20 areas) , µm	Contact profilometry FLAT (average on 6 areas), µm	OCT FLAT (average on 3areas), µm	Contact profilometry CURVE (average on 2 or 3 areas), µm	OCT CURVE (average on 2 areas), µm	OCT COUNTER-CURVE (average on 2 areas), µm
Not treated	1	1.1 (1.8)]					<2
	16	1.4 (1.5)					<2
erwax density 1	2	3 (1.7)	2.125 (0.41)	<2	0.76	-	<2
	17	1.3 (1.1)		<2		-	<2
erwax density 2	3	2.87(1.4)	4.265 (0.4)	<2	2.5 (0.3)	-	<2
	18	1.7 (1.9)		<2		-	<2
er 1 criss-crossed	4	2 (1.3)	1.640 (0.12)	<2	1.31 (0.21)	-	<2
	19	2 (2)		<2		-	<2
er 2 criss crossed	5	5.1 (1.6)	0.925 (0.07)	<2	-	-	<2
	20	2.1 (1.9)		<2		<2	<2
Cosmolloid	6	4.9 (1.8)	1.194 (0.18)	<2	1.05 (0.04)	-	<2
	21	2.2 (3.2)		<2		-	<2
osmolloid criss	7	4.2 (1.6)	1.630 (0.18)	<2	1.37 (031)	-	<2
crossed	22	2.7 (2.1)		<2		-	<2
Paraloid B44	8	1.5 (2.1)	1.894 (0.1)	<2	0.82 (0.1)	<2/5	<2/5
	23	3.3 (4.2)		3		<2	<2
raloid B44 criss	9	10.4 (2.2)	1.5 (0.34)	8.5	1.03 (0.08)	4/5	5/7
crossed	24	8.8 (2.8)		8.3		6/7	10
ayer of Paraloid	10	4.1 (2.1)	2.699 (0.38)	3	1.345 (0.18)	<2/3	4/<2
+1 layer of Soter density 1	25	5 (3.7)		5		5	5-11
ayer of Paraloid	11	5.1 (1.8)	3.325 (0.7)	5	1.04 (0.03)	<2/4	5/6
+1 layer of Soter density 2	27	6.8 (1.7)		4		<2/3	3/4
ayer of Paraloid	12	7.4 (4.8)	1.173 (0.25)	6	1.0	4/6-12	7/4
344+1 layer of Cosmolloid	28	7.1 (2.6)		5		<2/3	5
layer of Soter	13	2.3 (1.2)	0.808 ??	3	-	<2/3	<2/3
sity 1+ 1 layer of loid B44+ 1 layer Soter density 1	29	2.6 (1.2)		<2		<2	3/<2
er of Cosmolloid+	14	3.5 (1.6)	1.252 (0.34)	3.5	0.61 (0.18)	<2/3	4-24
ayer of Paraloid 344+ 1 layer of Cosmolloid	30	4.8 (1.5)		3		<2/3	4-6

Parameters to be measured

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FOCUS ON

https://bit.ly/2GiMWSy???

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IPERION CH

in few words

What is IPERION CH?

IPERION CH is a project funded by the European Commission under GA 654028. It aims at establishing a distributed RI with a sustainable plan of activities, including offering access to a wide range of high-level scientific instruments, methodologies, data and tools for advancing knowledge and innovation in the preservation of Cultural Heritage. IPERION CH connects researchers in the Humanities and Natural Sciences and fosters a trans-disciplinary culture of exchange and cooperation for the growth of the European Research Area.
IPERION CH offers Transnational Access (TNA) to its world-class laboratories and knowledge distributed in 11 countries with the submission of single or multi-technique proposals. IPERION CH selects the best proposals and covers the costs of this activity.
The TNA program offers a vast portfolio of services and activities centred on the needs of the heritage science community in Europe and Associated Countries. The combined activity promotes the development of advanced research in the examination and conservation of works of art, offering users the access to unique European resources for in situ and laboratory investigations on artwork materials through three TNA platforms: FIXLAB, ARCHLAB and MOLAB. Through the three programs of access, the project aims to deliver to the users (from experienced practitioners to primary users) not only experimental resources but also methodological approaches, compliant best practices, tools and technologies to permit them to carry out their projects in conditions otherwise impossible for them.
The access is offered to:
1. Archives in European museums or conservation institutes (**ARCHLAB**);
2. Advanced mobile analytical instrumentations for in-situ non-invasive measurements (**MOLAB**);
3. Integrated platforms where large scale facilities are coupled with medium scale installations (**FIXLAB**).

The Integrated Platform for the European Research Infrastructure ON Culture Heritage IPERION CH launches calls for proposals twice a year.
Discover how to participate in the IPERION CH website.

What's the future?

IPERION CH is a project funded by the European Commission under GA 654028. It aims at establishing a distributed RI with a sustainable plan of activities, including offering access to a wide range of high-level scientific instruments, methodologies, data and tools for advancing knowledge and innovation in the preservation of Cultural Heritage. IPERION CH connects researchers in the Humanities and Natural Sciences and fosters a trans-disciplinary culture of exchange and cooperation for the growth of the European Research Area.
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IPERION CH

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Produced by Laura Benassi (2019)

IPERION CH is a project funded by the European Commission,
H2020-INFRAIA-2014-2015, under Grant No. 654028