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Sala Azzurra  
Scuola Normale Superiore  
Piazza dei Cavalieri, 7  
Pisa

# FUTURAHMA

Materiali e tecniche tra  
Futurismo e Ritorno al Classico.  
Ricerche, analisi, prospettive

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Umberto Boccioni, *Idolo moderno*, 1911, Estorick Collection of Modern Italian Art, Londra. UV Fluorescenza (dettaglio).  
Fotografia di Ezio Buzzegoli © Estorick Collection, London, UK.

## Abstracts degli interventi

20 Giugno

**MARGHERITA D'AYALA VALVA**, Scuola Normale Superiore

*“Noi pittori di oggi siamo tutti avventurieri senza appiglio, timone o bussola”. Colori per pittori, colori di pittori. Arte industria e mestiere in Italia al volgere di secolo*

Il panorama offerto dagli studi di storia tecnica dell'arte è oggi complicato e approfondito dalla presenza di nuove fonti testuali e materiali, che ci permettono di delineare un contesto alle pratiche adottate individualmente dai pittori. Il sottotitolo del convegno “Ricerche, analisi, prospettive” costituisce una traccia per questo intervento, che si propone sia di sintetizzare i punti focali della ricerca condotta sulle fonti (la formazione, la ricerca scientifica e storica, i ‘pittori-scienziati’, il rapporto con il mercato, le implicazioni del mestiere), sia di porre l'accento sul legame con il lavoro condotto sulle opere, sia di illustrare le vie ulteriori dello studio sulle fonti, diramatosi dal progetto Futurahma e avviato su più fronti.

Nello scandire una cronologia attraverso la ricostruzione del discorso sui materiali e sulle tecniche, alimentato in polemica con il sistema accademico di formazione artistica, a partire dalla manualistica di fine Ottocento, è possibile dare voce ai pittori attraverso i loro scritti e la testimonianza delle loro letture, e comprendere l'offerta ricchissima fornita dall'esempio e dallo scambio con altri artisti (pittori-scienziati ‘al servizio’ del mercato dei prodotti industriali), trattatisti o sperimentatori dotati di vari gradi di consapevolezza tecnica.

La carente componente pittorico-tecnica della formazione accademica, incentrata sul disegno, è oggetto di una polemica che costituisce un topos reiterato, solitamente in apertura di ogni trattato e manuale in Francia, Inghilterra, Germania, Italia, a partire dall'epoca di diffusione dei prodotti industriali. Arnold Böcklin diceva in un'intervista a un allievo nel 1903 che “noi pittori di oggi siamo tutti avventurieri senza appiglio, timone o bussola”. Tale frase è indicativa di un'epoca, di un sentire comune degli artisti al volgere di secolo. La consapevolezza di una posizione di inferiorità rispetto alla perizia tecnica degli antichi porta tali artisti a documentarsi, a sperimentare materiali artigianali, e talvolta li conduce a cambiare mestiere, lanciandosi nella ricerca chimica. Proprio nella Germania di Böcklin – e del giovane de Chirico – a Monaco, Adolf Wilhelm Keim apre nel 1882 la sua *Versuchsstation*, all'Accademia di Berlino Berger ha la prima cattedra ufficiale nel semestre 1902-03. Sono anni fervidi di invenzioni e di dibattiti, sia sul fronte dei nuovi materiali, della trattatistica scientifica, del restauro e delle riletture degli antichi trattati che su quello della pubblicitistica al servizio del mercato dei colori. Su alcuni di questi ‘pittori-scienziati’ – Vibert, Muzii – il gruppo Futurahma si è soffermato grazie allo studio di documenti dell'archivio Lefranc.

Il ‘marchio Lefranc’ è indagato nelle scelte degli artisti, nelle loro discussioni - in Italia, alimentate dal gruppo divisionista lombardo, di cui il gruppo Futurahma ha studiato il caso Grubicy, o alcuni prodotti come le lacche, e il caso del giovane Boccioni nel momento della sua formazione vicino a Previati. Di ‘marchio Lefranc’ in realtà occorre parlare con cautela, perché – contrariamente all'immagine compatta che di sé vuol dare la *maison* francese come garante di risultati uniformi e di una scuola di artisti solidamente ancorati alla tradizione – non sono solo gli artisti del milieu dell'Ecole des beaux-arts ad adottarne i prodotti. Nel '19 troviamo Carrà scambiarsi con Morandi confidenze estatiche su “belle terre di Siena” che egli macinerebbe artigianalmente (ma lo stesso Morandi nei primi anni '40 userà disinvoltamente colori Lefranc e Winsor & Newton). Del resto, sono gli anni indicati da de Chirico come del “ritorno al mestiere” – cesura molto da rivedere, alla luce della ricostruzione del ricchissimo contesto del ventennio precedente, che inquadra ad esempio le sperimentazioni sulla tempera in una sequenza di molte varianti. In apertura di questi anni Venti, de Chirico si pone la questione del mestiere tornando a far copie dai musei e dipingendo con ‘tempere grasse’ di sua preparazione; Severini, che affronta concretamente la pittura murale, comincia a documentarsi in modo sistematico, interessandosi all'affresco, alla tempera, leggendo trattati antichi e moderni, e prende nota delle proprie ricerche in taccuini e quaderni che sono ora oggetto di studio come fonte primaria. Il frammento e il trattato: le note di mestiere (sul colore, i materiali, i supporti) non sono disgiunte, nel farsi dell'opera, dall'elaborazione geometrica, e lo studio delle leggi matematiche, che a noi appare oggi così teorico, di fatto conduce sia alla stesura del trattato *Du cubisme au Classicisme* che alla composizione delle opere di questi anni. L'exkursus su questo primo ventennio di secolo si chiude, nel 1928, con il *Piccolo trattato di tecnica pittorica*, nel segno della conciliazione tra mestiere e teoria, esemplificati in varia misura e non senza contraddizioni da de Chirico e da Severini, quando nel primo la fase della pittura a tempera è esaurita, e nel secondo è superata la pretesa del controllo geometrico nella creazione artistica.

*“We (Today’s Painters) are All Adventurers with no Foothold, Helm or Compass”.*  
*Colours for painters, Colours of painters. Art, Manufacturing and Craftsmanship in turn-of-the-century Italy*

Technical art history studies are currently developing thanks to newly recovered textual and material sources allowing us to draw a line and a background context to individual artists’ practices. This paper aims both at synthesizing FUTURAHMA’s research on sources and at outlining by chronologically ordering the controversies and discourses on painting materials and techniques, documented by a rich literature of manuals and treatises. The study on artists’ reading/writing practices allows us to establish connections between artists, artists-scientists committed with the market of industrially-produced materials, writers of treatises, experimenters with various degrees of technical expertise.

A research on the Academies of Fine Arts’ archives has highlighted how Italian Post-Unitarian Academic system provided classes of painting only at the end of the artists’ academic training, often not mandatory and conducted in unsystematic ways. A specific class on painting techniques seldom started, nor apparently were the Academies interested in painting material, although this period is notoriously rich for the invention and production of new materials and industrially synthesized colours. The polemic on this technical gap constitutes a *topos*, reiterated in the opening pages of every French, English, German and Italian treatise since the introduction of industrial products. Arnold Böcklin’s statement about “we (today’s painters)” defined as “all adventurers with no foothold, helm or compass” exemplifies an epoch and a common feeling among artists of the turn of the century. Driven by a strong inferiority complex towards the old masters’ craftsmanship, artists begin to research on artisanal techniques, sometimes to the extent of dealing with chemical research and compromising with the industry of new products. Meanwhile, in Germany Adolf Wilhelm Keim founds in 1882 his laboratory (the *Versuchsstation*) in Munich, and in the semester 1902-1903 Ernst Berger holds at the Academy of Fine Arts in Berlin the first official class on painting techniques. These are intense years for inventions and debates, both from the point of view of treatise literature and of the market of colours. The focus of Futurahma group on some of these artists-scientists – Jean Vibert, Alfonso Muzii – is related to several documents found in the Lefranc archives.

The ‘Lefranc trademark’ can be examined from the point of view of artists’ choices and debates, fuelled, in Italy, by the Lombard Divisionist group – case studied within Futurahma’s researches on Vittore Grubicy, on Lefranc lakes, and on Umberto Boccioni’s early activity related to Previati. The term ‘Lefranc trademark’, though, should be handled carefully, besides the compact image offered by the firm itself in its catalogues, advertisements and volumes.

Starting from the years of the so-called ‘ritorno al mestiere’ (1919-20), artists will begin to explicitly speak, write and deal with paint materials – not only the artisanal ones – and exchange views on grinded-by-hand colours such as the “wonderful Sienna” mentioned by Morandi to Carrà, 1919, and rediscover recipes of tempera-like emulsions (de Chirico). Much later, in the first 1940s, the same Morandi is repeatedly documented to making use of both Lefranc and Winsor & Newton colours.

This overview shows how the caesura of the “ritorno al mestiere” should be reviewed, beyond ideologies, taking account of the rich context of the first two decades of the century and of the multifaceted aspects of the artists’ practices. Opening the 1920s, Gino Severini starts to systematically collect recipes and documentation, to read and take notes on ancient and modern treatises, focusing in particular on fresco and tempera, which he experiments in his practice. The fragment and the treatise: notes on colours materials and recipes should not be isolated, in the practice, from the geometric conception and the study of mathematic laws, giving birth to Severini’s treatise *Du cubisme au classicisme*, 1921. In 1928, Giorgio de Chirico publishes his *Piccolo trattato di tecnica pittorica*, closing the 1920s in the sign of reconciliation between craftsmanship and theory.

**MARIA ELENA VERSARI**, Carnegie Mellon University, Pittsburgh

*L’avventura di una piuma, una biglia e un cavalluccio marino: riflessioni metodologiche sulla storia materiale delle opere futuriste attraverso i documenti d’archivio.*

Nel giugno 1958 tre polimaterici di Enrico Prampolini partirono per l’America con un transatlantico della Cunard Lines. Erano stati acquistati dalla coppia di collezionisti di Detroit Harry Winston e Linda Kahn Winston (poi Malbin) per la loro già notevole raccolta di arte moderna. All’apertura delle casse, i Winston si accorsero di una serie di danni che le opere avevano sostenuto durante la traversata atlantica. Iniziò così una fitta corrispondenza tra i collezionisti, il fratello dell’artista, Alessandro Prampolini (meglio conosciuto con lo pseudonimo di Vittorio Orazi), e l’artista Piero Dorazio. Questo scambio di lettere costituisce, insieme alle note di restauro conservate nell’archivio Winston Malbin, una fonte singolare e preziosa per rintracciare l’insieme di sostituzioni, manipolazioni e ricostruzioni che hanno scandito la vita di alcune fra le più importanti opere futuriste italiane.

Il presente contributo, basato su documenti d'archivio inediti, ricostruisce la serie di restauri eseguiti nel corso di diversi decenni sulle opere futuriste della collezione Winston Malbin (in particolare su pitture e sculture di Giacomo Balla, Gino Severini, Luigi Russolo, Enrico Prampolini e Umberto Boccioni). L'intervento si propone dunque due fini. Da un lato riconfigura l'importanza nel dibattito storico-artistico di diverse caratteristiche tecniche e costruttive delle opere in questione, rivelate attraverso i successivi restauri. D'altro lato, porta l'attenzione sull'utilità della documentazione archivistica relativa ai restauri, soprattutto per quelle opere moderne che, conservate in collezioni private, sono spesso di difficile accesso e/o conosciute attraverso riproduzioni fotografiche.

*The adventure of a feather, a marble, and a seahorse. Methodological reflections on the material history of Futurist works through the archives.*

In June 1958, three polymateric works by Enrico Prampolini left for America on a Cunard Lines cruise ship. They had been acquired by Harry Winston and Linda Kahn Winston (later Malbin), the Detroit couple already known for their considerable modern art collection. When the boxes were opened, the Winstons realized that the works had sustained some damage during the trip. A lengthy correspondence ensued between the collectors, the artist's brother (better known under his pseudonym Vittorio Orazi), and the artist Piero Dorazio. This exchange constitutes, together with the restoration notes held in the Winston Malbin archive, a unique source for retracing the substitutions, manipulations, and reconstructions that determined the existence of some of the most important Italian Futurist works.

The current paper, based on unpublished archival materials, retraces the restorations that the Futurist works in the Winston Malbin collection (and in particular those by Giacomo Balla, Gino Severini, Luigi Russolo, Enrico Prampolini and Umberto Boccioni) underwent during the course of several years. The paper has two goals. On the one hand, it demonstrates the relevance that some of the technical and constructive aspects of the works, revealed during their restorations, have for contemporary art historical debates. On the other, it underscores the important role that archival documentation plays in understanding works that are held in private collections, are rarely shown, and are often known only through photographic reproductions.

**FEDERICA MARINI RECCHIA**, Istituto Superiore per la Conservazione e il Restauro, Roma  
*La libreria di Ferruccio Ferrazzi: studio delle fonti tecniche*

La scelta di studio affrontata sia per la tesi di diploma all'I.S.C.R. di Roma, sia per quella di laurea in Storia dell'arte contemporanea, all'Università degli studi della Tuscia di Viterbo (Dipartimento di scienze dei beni culturali), ha riguardato il dipinto murale, la Resurrezione (1953-56) di Ferruccio Ferrazzi (1891-1978), nella chiesa di S. Maria Assunta ad Amatrice. L'obiettivo del lavoro svolto è stato quello di tentare di comprendere a fondo le motivazioni che indussero un artista contemporaneo, come Ferrazzi, ad affrontare lo studio delle tecniche artistiche tradizionali; il modo del loro recupero e, infine, il loro superamento. Il dipinto murale a fresco di Amatrice rappresenta per l'artista il punto di arrivo di precedenti studi, letture, corrispondenze con altri artisti, riflessioni tecniche e realizzazioni formali che hanno origine e si innestano in quella che è la temperie artistica e culturale degli anni Venti, caratterizzata da un ritorno al classicismo formale, mutuato dai primitivi italiani del Quattrocento e del Cinquecento e da un recupero delle tecniche tradizionali. Sono questi gli anni in cui Ferrazzi, tornò alle antiche fonti d'ispirazione, ai maestri del Quattrocento e Cinquecento e, ormai maturo, si sentì pronto a tradurre le sue esperienze artistiche su una grande superficie. Di conseguenza, la sua volontà fu quella di studiare e appropriarsi delle diverse tecniche esecutive su supporto murario per riportare l'arte alla dignità dell'antica tradizione. Segni tangibili di tale volontà sono ripercorribili attraverso la visione e la consultazione dei testi presenti nella libreria privata dell'artista; opportunità di studio che ho avuto grazie alla generosità e disponibilità della signora Metella Ninetta Ferrazzi, figlia dell'artista.

In questa sede, infatti, è intenzione della sottoscritta esporre alcune delle informazioni desunte dall'analisi delle fonti tecniche consultate dall'artista, conservate nella sua libreria. L'analisi prende in esame circa venti testi teorici che riportano le annotazioni autografe dell'artista. Verrà, altresì, esposto il contenuto di alcune lettere, relative al periodo in questione, che compongono solo una minima parte della vasta corrispondenza che Ferrazzi ha intrattenuto sia con un ambiente strettamente legato all'entourage artistico dell'epoca, sia con un panorama culturale più vasto, non solo laico, ma anche religioso.

*The library of Ferruccio Ferrazzi: analytical study of technical sources.*

The mural painting representing the Resurrection by Ferruccio Ferrazzi (1891-1978), executed between 1953 and 1956 in the church of S. Maria Assunta in the town of Amatrice, was the object of my graduation's thesis at the ISCR of Rome, and of my master degree in Art History, at the Tuscia University in Viterbo. The aim of the

work was to understand the reasons why this contemporary artist had started the study of ancient traditional techniques, and the personal way in which he used them, following the ancient principles or trying an increase. The fresco mural painting of Amatrice is the result of previous studies, readings, postal correspondence with other artists, technical considerations and artworks that find their origin and their context in the artistic and cultural mood of the Italian 20s of the Twentieth century, characterized by a return to formal classicism inspired by a formal return reminiscent the Italian primitives of the Fourteenth and Fifteenth centuries. In these years, inspired by the technique of the great masters of the Renaissance, Ferrazzi began his challenge to transfer the composition on a large mural surface. Consequently, the study of different ancient techniques for the mural paintings was necessary and aimed at elevating his art to the dignity and majesty of the ancient pictorial tradition. The process of formation and evolution of his artistic concept is glaring thanks to the study of the artist's library (that still conserves texts and notes collected by Ferrazzi), available to my consultation thanks to the generosity and willingness of Miss Metella Ninetta Ferrazzi, the artist's daughter. This contribution wants to expose some information and discoveries deduced from the examination and the critical analysis of the texts and manuscripts conserved in Ferrazzi's library and deeply studied and consulted by the artist himself. The study was conducted on twenty texts and books about different technical and theoretical subjects, containing original annotations by the artist. A part of this contribution is dedicated to the artist's correspondence (limited to the first decades of the Twentieth century) both with the artistic entourage of the period and also with leading figures of laical and religious cultural environment.

**FRANCESCA ROSI, LAURA CARTECHINI, ALDO ROMANI, ANTONIO SGAMELLOTTI, BRUNO BRUNETTI, COSTANZA MILIANI:** CNR-ISTM, Perugia; Centro d'Eccellenza SMAArt, Università di Perugia  
*Exploring modern paintings through non invasive analytical methods: the MOLAB*

Founded in 2001 at Perugia University in collaboration with the Institute of Molecular Science and Technology of CNR, MOLAB has been conceived as a mobile facility which allows scientists, conservators, art historians and archaeologists to carry out non invasive scientific studies on cultural heritage objects. Since 2004, MOLAB has been the first (and unique) mobile transnational access supported by the European Commission through the Eu-ARTECH (FP6) and CHARISMA (FP7) project. Presently, it is one of the three platforms offering transnational accesses to European users within the H2020 IPERIONCH project ([www.iperionch.eu](http://www.iperionch.eu)). MOLAB is composed of a unique set of optical/spectroscopic techniques all sharing two essential features: the portability and the non-contact running mode for in situ and non invasive investigation of art-works, respectively. The MOLAB approach is based on the combination of both imaging and point analytical techniques exploring the wide electromagnetic spectrum, ranging from X-ray to the IR region. A brief description of the available facilities within the MOLAB will be presented including the well established and optimized spectroscopic techniques along with the newly developed systems.

Within the last decade of activity, the approach offered by MOLAB enabled an in deep investigation of a wide range of cultural heritage objects in the full respect of their integrity and value. In the present context some examples of non invasive studies of modern paintings will be discussed highlighting limitations as well as strengths of the proposed analytical approach. Results from case studies unveiling the artist's materials and painting techniques will be discussed and followed by examples of investigation on alteration and degradation phenomena of painting materials with important outcomes for their conservation.

**VALERIA MALOSSA, GIOVANNI CAVALLO, FRANCESCA PIQUÉ,** Scuola Universitaria Professionale della Svizzera Italiana, Lugano  
*Filippo Franzoni (1857 – 1911): materiali e tecniche pittoriche*

Questo contributo intende presentare i risultati dello studio della tecnica esecutiva del pittore svizzero Filippo Franzoni (1857-1911) e si basa sulle ricerche scientifiche condotte dall'Istituto Materiali e Costruzioni della SUPSI di Lugano, lo studio di tesi MA in conservazione e restauro, e le indagini del Schweizerisches Institut für Kunstwissenschaft di Zurigo, su mandato dei Servizi Culturali di Locarno. Sono stati studiati i materiali, la tecnica esecutiva, gli interventi di restauro e lo stato di conservazione di 49 opere di Filippo Franzoni.

Le ricerche preliminari d'archivio hanno permesso di visionare un corpus di ricevute d'acquisto di materiali presso la ditta Luigi Calcaterra di Milano, datate tra il 1884 e il 1891. Le informazioni parziali disponibili sono state verificate e confrontate con le informazioni ricavate dallo studio visivo condotto su 49 opere della Fondazione e integrate con analisi di tipo non invasivo e micro-invasivo. Durante lo sviluppo della ricerca si sono messi a fuoco i metodi e le scelte tecniche della pittura di Filippo Franzoni, mediante una serie di approfondite indagini visive e scientifiche ad integrazione e complemento delle analisi non invasive – fotografia tecnica (luce visibile e radiazioni UV e IR) e p-XRF – che hanno consentito di verificare e confermare già alcuni dati riportati nelle ricevute d'acquisto. L'indagine visiva ha permesso la documentazione delle caratteristiche ottiche e

morfologiche della superficie e del corpo pittorico, dal mezzo di sostegno ausiliario dei supporti alla lavorazione delle superfici, e laddove possibile, l'identificazione degli strumenti utilizzati. Sono stati identificati ed esaminati, inoltre, gli interventi di restauro eseguiti durante il corso del XX secolo e lo stato di conservazione delle opere. E' stato possibile prelevare dei micro campioni da una decina di opere. Lo studio dei campioni con Microscopia Ottica, FTIR, Spettrometria Raman e SEM-EDX ha permesso di caratterizzare la stratigrafia dei dipinti e di identificare alcuni materiali.

I risultati mostrano che Filippo Franzoni è stato un pittore di paesaggio e di ritratti che rispecchia ampiamente le caratteristiche di un pittore ottocentesco. Infatti, la tecnica pittorica e i materiali sono coincidenti con quelli impiegati dai pittori lombardi e svizzeri dell'Ottocento. Osservando l'insieme dell'opera di Filippo Franzoni emerge il percorso di un artista che ha lavorato nella continuità della tradizione dei maestri ma che, al tempo stesso, si è aperto a innovazioni nei materiali che il progresso tecnologico andava offrendo. Questi i materiali identificati: i supporti sono costituiti da tele di lino, tavolette di legno, subordinatamente cartoncini e carta; le preparazioni sono a base di carbonato di calcio, olio e biacca; i pigmenti rinvenuti sono stati impiegati puri e in miscela, i leganti rinvenuti sono prevalentemente a base di olio ad eccezione di alcuni dipinti eseguiti a tempera; le vernici esaminate sono costituite da resine naturali. La tecnica pittorica è caratterizzata dall'applicazione di numerosi strati sottili di colore, caratterizzati da una complessa mescolanza di pigmenti. La complessa struttura della superficie è il risultato dell'uso di strumenti diversi impiegati per lavorare l'impasto pittorico allo scopo di ottenere effetti decorativi e preparare la superficie alla stesura di ulteriori strati successivi.

Per quanto riguarda lo stato di conservazione delle opere, è possibile pensare che la giusta scelta dei materiali e la loro preparazione abbiano determinato una buona riuscita dell'opera ed abbiano contribuito alla buona conservazione nel tempo. Infatti, fatta eccezione per craquelure e puntuali lacune nella pellicola pittorica, i dipinti sono in condizioni stabili.

### *Filippo Franzoni (1857 – 1911): materials and painting techniques*

This presentation illustrates the results of the study of the painting technique of the Swiss painter Filippo Franzoni (1857-1911). The work is based on the scientific investigations by the Institute of Materials and Construction of the University of Applied Sciences and Arts of Southern Switzerland (SUPSI) in Lugano, on the investigations carried out for a Master thesis in conservation and restoration, and on the surveys lead by the Schweizerisches Institut für Kunstwissenschaft in Zurich, commissioned by the Servizi Culturali of Locarno. Focus of the study were the original materials used, the painting technique, the restoration interventions and the state of preservation of 49 paintings by Filippo Franzoni owned by the Franzoni Foundation at the municipality of Locarno.

Archival research provided a significant corpus of receipts, between 1884 and 1891, which document the type of materials purchased by Franzoni at the Luigi Calcaterra's paint company in Milan. This information was compared with the data obtained by investigations on the 49 paintings studied. Visual examination, non-invasive or micro invasive analysis were used to study the paintings. Visual investigation allowed the characterization of the optical and morphological characteristics of the surface of the painting and provided indication on the tools used by the artist to apply colors. Non-invasive investigations included technical photography (using visible light and UV and IR radiations) and p-XRF. These allowed researchers to verify and confirm some of the data found in the receipts from the archives, to document the 20 th century restoration interventions, and to assess the state of preservation of the works. Micro samples were taken from about ten paintings and where analyzed in cross-section with optical microscopy, FTIR, Raman spectroscopy and SEM-EDX to characterize the stratigraphy of the paintings and the materials used.

The results show that Filippo Franzoni was a landscape and portrait painter of his time, working with materials and with a painting technique typical of 19 th century southern Swiss and northern Italy (Lombardy) painters. The study of this large body of work also showed his development as an artist and his interest in innovation even if he always remained strongly linked to the traditional masters. His paintings are on canvas, wood, and, occasionally, on cardboard and paper. These various supports were prepared with calcium carbonate, oil and lead white. The pigments were used pure or mixed, and the binders identified are mostly oil-based with the exception of some tempera paintings; some of the examined paints are made with natural resins. The painting technique's main characteristic is the application of multiple thin color layers and complex pigment mixtures. The structure of the surface is often tridimensional and is the result of using different instruments to mix the painting and to apply it. The set of paintings examined is in relative good conditions with the exception of some craquelure and small lacunae. This is related to the choice of mainly traditional painting materials and on the good storage condition.

**LUCIA GIORGI, FRANCESCA CATERINA IZZO, ELISABETTA ZENDRI**, Università Cà Foscari, Venezia; **AUSTIN NEVIN**, CNR-IFN, Milano; **DANIELA COMELLI, SARA MOSCA**, Politecnico di Milano; **LUCA NODARI**, CNR-IENI, Padova; **ROBERTO ALBERTI, MICHELE GIRONDA**, XGLab Srl, Milano; **MATTEO PICCOLO**, Fondazione Musei Civici, Venezia  
*Studio dei materiali e della tecnica pittorica di Alessandro Milesi (1856-1945) tramite metodologie di indagini non invasive in situ*

Per la prima volta sono stati analizzati e studiati la tecnica pittorica e i materiali di dieci opere del pittore veneziano Alessandro Milesi (1856-1945) conservate presso la Galleria Internazionale di Arte Moderna Ca' Pesaro di Venezia. Alessandro Milesi è uno dei maggiori rappresentanti della pittura veneta di fine Ottocento. Le sue opere sono caratterizzate da rapidi e materici tocchi di colori che danno voce alle calli veneziane e ai personaggi che le popolano (gondolieri, artisti, pescatori ecc.). Ciononostante, finora, nessuno studio analitico ha approfondito l'attività artistica di questo singolare pittore. I dipinti selezionati, datati tra il 1880 e il 1940, sono stati studiati con approccio multianalitico non invasivo mediante l'uso di tecniche di Imaging e analisi elementari e spettroscopiche in situ. Le tecniche di Imaging basate sulla fluorescenza UV, la Riflettografia IR, le immagini in falso colore e Fluorescence Lifetime Imaging (FLIM) hanno permesso di osservare la presenza di disegni preparatori permettendo così di acquisire informazioni sullo stile e sulla tecnica pittorica, di identificare la presenza di alcuni pigmenti e di mapparne la loro distribuzione. Tramite le analisi di spettroscopia Raman, Fluorescenza raggi X (XRF), Spettroscopia ER-FTIR (External Reflection Fourier Transform Infrared), Laser-induced fluorescence (LIF) è stato possibile caratterizzare la tavolozza di Milesi, sia dal punto di vista organico (leganti) che inorganico (pigmenti, riempitivi, estensori di carica e/o adulteranti). Nella tavolozza del Milesi si ritrovano sia pigmenti tradizionalmente utilizzati nel corso dei secoli (biacca, gesso e carbonato di calcio) che pigmenti moderni sintetizzati a partire dal 1800 (Bianco di Zinco, Bianco di Titanio, Rosso di Cadmio, Viola di Cobalto). L'analisi spettroscopica ER-FTIR ha permesso l'identificazione di olii siccativi utilizzati come medium, e l'identificazione di carbossilati di Zinco. Trattandosi di pitture moderne di tipo industriale è però difficile riuscire a determinare se i carbossilati rilevati sono attribuibili a processi di invecchiamento del film pittorico o aggiunti in pasta, durante il processo industriale, sotto forma di stabilizzanti. I risultati ottenuti da tale studio hanno inoltre permesso di conoscere l'evoluzione nella scelta dei materiali utilizzati: questi cambiamenti, strettamente legati agli sviluppi tecnologici della produzione delle pitture artistiche tra la fine dell'Ottocento e gli inizi del Novecento, collocano Milesi fra gli artisti all'avanguardia che si avvicinano all'utilizzo di materiali commerciali, più fruibili e in continua evoluzione. Questo lavoro ha inoltre dimostrato come un approccio multianalitico e l'uso di metodologie complementari siano di fondamentale importanza per lo studio dei materiali e della tecnica pittorica di un artista, in questo caso ancora non ben conosciuto.

### *In situ non-invasive investigations on painting technique and materials by Alessandro Milesi (1856-1945)*

For the first time, the painting technique and the materials used by the Venetian artist Alessandro Milesi (1856-1945) were studied in selected artworks belonging to the collection of the International Gallery of Modern Art Ca' Pesaro in Venice. In the late nineteenth century, Milesi was one of the most important painters in the Venetian area. During his long artistic career, Milesi mainly painted genre paintings as "the gondolier's family" series and portraits. He created the picture from freely brushed colours that took precedence over rapid lines and contours; he usually used short "broken" brushstrokes of mixed and pure unmixed paints to achieve an intense colour vibration. The paintings, dated from the 1880s to 1940s, were analyzed with an in situ non-invasive multi-analytical approach based on imaging and spectroscopic analysis. Imaging techniques based on UV Fluorescence, IR Reflectography, including false color imaging and Fluorescence Lifetime Imaging (FLIM), allow to identify pigments and to map their distribution, to highlight the presence of underdrawings and pentimenti. The analysis of pigments and binding media and their possible deterioration patterns were studied with a combination of X-Ray Fluorescence (XRF), External Reflectance- Fourier Transform Infrared Spectroscopy (ER-FTIR), Raman Spectroscopy, Laser Induced Fluorescence (LIF). The data obtained about the artist's palette highlighted the use of both traditional (Lead white, gypsum, chalk) and modern pigments (Zinc white, Titanium white, Cadmium red). Spectroscopic results suggest that the paint was bound in drying oil, and widespread of zinc carboxylates were identified, which are likely ascribed to degradation process. Nevertheless, it is difficult to determine if the detected carboxylates are attributable to aging processes of the pictorial film or added as dispersing agents in the dough, during the paint manufacture. The results demonstrate that Milesi changed his palette according to the technological advances in pigments production between the 19th and the 20th avant-garde artist approaching to the use of commercial materials, more accessible and constantly evolving. This research reports a methodology based on the use of in situ non-invasive techniques for the characterization of

modern painting materials and the necessity of a complementary and integrated approach in studying the technique of an artist who has received little attention.

**PAULINE HÉLOU-DE LA GRANDIÈRE, AMALIA RAMANANKIRAHINA, Paris**  
*La Parisienne de Montmartre, by Kees VAN DONGEN*

*La Parisienne de Montmartre*, the well-known portrait of a woman by Kees VAN DONGEN (1910, Musée du Havre) was suffering of a recurrent flaking in the blue paint layer. To understand and prevent other conservation issues, the Musée du Havre asked a study before treating the flaking paint. This was a good opportunity to study the technique of Kees Van Dongen around 1910, by following 3 axes: 1. By considering his successive studios (Bateau-Lavoir and rue Saulnier, Paris) and his potential suppliers (looking upon the addresses of suppliers vs Van Dongen's studio), 2. By observing closely the technique with microscope (pigments and brush strokes) and by analyzing of the painting (chemical analyzes of sample, X-ray pictures, raking-light observation, etc.). 3. By studying the other restored paintings by Van Dongen (1908-1925). This study gave the opportunity to closely observe the degradation of some pigments as red lake (discoloration) and ultramarine blue (flaking), and to understand the role of the underlayers and Van Dongen's technique. It also gave the chance to better know some aspect of his technique, in particular concerning the question of the varnish applied by Van Dongen on some areas (the painting is partially varnished, Van Dongen was playing with brilliant/mat surfaces). This may be highly ranking to make better choices in restoration (concerning the cleaning issue), and it is strongly important to imagine how the portrait was perceived by the Fauvist painter, with stronger contrast of brilliance and colors.

**AGATA GRACZYK, Paris**

*La Créole by Alexis Mérodack-Jeaneau, an unexpected witness for painting materials circa 1910*

*La Créole au perroquet* (the Creole with a parrot, 130x97,5cm, Angers, museum of Fine Arts) is a singular unvarnished oil painting on canvas created circa 1910 by French painter Alexis Mérodack-Jeaneau (1873-1919). This artist was famous in his own time but has nowadays sunk into oblivion. His influence on painters from the beginning of the XXth century such as K. Van Dongen has been acknowledged by Apollinaire (considered as one of the foremost art critic of the era). Indeed, the links with Fauvists are evident, as the precocity of Mérodack-Jeaneau, who seems to be one of the first having applied paint directly with the tube onto the canvas. A corpus of paintings by Mérodack-Jeaneau dated around 1910 from the Angers museum of Fine Arts collection has been studied, preceding their conservation for the purpose of a retrospective exhibition of the painter. The project is mainly based on a diploma thesis at the Institut national du patrimoine focusing on *La Créole*. This paper deals with the consequences the materials and the novel implementation have had on the deterioration of the painting, and hence their implications on the conservation treatment. A reconstruction work has been carried out to better understand the artist's technique and its implementations. It showed the importance of his deliberate choice of an industrial pre-primed canvas (unpainted areas are present on the painting, besides unvarnished, which increases the role of the ground regarding the final surface aspect), interaction between the oil of the paint layer and the charcoal under-drawing, and allowed the distinction between the colors applied with the tube from those spread pure (from the tube) with different brushes. *La Créole*, among the corpus of paintings realized by the artist circa 1910, appears to be one of the first having been created with paint applied directly with the tube onto the canvas. The impastos are damaged in a specific manner: loss of adhesion, underboundness, white deposits, water sensitiveness of some of the colors. Scientific analysis and other studies allowed to propose diagnosis hypotheses. Those are tending to put forward the fact that the deteriorations could be, among other causes, induced by the specific implementation and the materials used, especially additives added to industrial grounds and paint tubes. French technical bibliographic sources examined in this study and interviews of the manufacturers' descendants allowed to underline the early awareness of painters and manufacturers concerning the paint and ground recipes and ingredients issues and to propose reliable hypotheses. Similar damages have already been observed on later paintings characterized by thick impastos realized by K. Appel and G. Mathieu among others. This fact emphasizes the special "forerunner" character of *La Créole* not only in its technique but also in its damages.

**LAURA D'AGOSTINO, MARIA CAROLINA GAETANI, SARA IAFRATE, GIANCARLO SIDOTI, Istituto Superiore per la Conservazione e il Restauro, Roma**  
*Galileo Chini e il fregio dipinto sulla facciata di Palazzo Albergotti ad Arezzo*

Nel 1904 Galileo Chini (1873-1956) decora la nuova sede della Cassa di Risparmio di Arezzo nei saloni interni e sulla facciata prospiciente Piazza del Capitano, nel centro storico della città. Qui esegue un fregio di 12 metri circa, tripartito nel senso della lunghezza, raffigurante l'allegoria dell'Abbondanza e della Prosperità resa con



una teoria di putti danzanti che sorreggono ghirlande fiorite, cornucopie, ceste ricolme di frutta. Nelle fasce perimetrali dipinge motivi ornamentali a monocromo attinti al repertorio classico. Nella fascia inferiore, sotto l'emblema dell'istituto bancario, si legge il motto "Felix est qui divitias simul et mentem habet". Immediatamente prima, nel 1903, Chini aveva lavorato per la nuova Cassa di Risparmio di Pistoia dove a motivi puramente ornamentali alternava figure allegoriche della Fortezza e dell'Abbondanza. Nella poliedrica attività dell'artista, che si misura contemporaneamente con materiali e tecniche diverse, la pittura murale ha un peso significativo e la notorietà dell'artista in questo campo, confermata dal prestigioso incarico per la Biennale di Venezia del 1909, lo porterà fin nel lontano Siam per eseguire la fastosa decorazione del Palazzo del Trono a Bangkok fra il 1911 e il 1914. Il fregio aretino, di squisito gusto Liberty, esemplifica perfettamente dal punto di vista stilistico e tecnico la personale rielaborazione iconografica e materica del Rinascimento toscano. Chini, favorito dal suo apprendistato di pittore-decoratore e restauratore, con un'approfondita conoscenza delle tecniche esecutive classiche, diversamente da quanto prima realizzato torna a meditare sulla grande tradizione classica dell'affresco e propone nell'edificio di Arezzo un dipinto che segue i canoni tradizionali (giornate, incisioni indirette, spolvero, etc.). Lo studio che si intende presentare in questa sede è il risultato dell'osservazione ravvicinata dell'opera e delle indagini scientifiche (fisiche e chimico-fisiche) condotte sul dipinto della facciata di Palazzo Albergotti, in occasione del cantiere di restauro condotto dall'Istituto Superiore per la Conservazione ed il Restauro nell'estate 2008.

### *Galileo Chini and the painted frieze of Palazzo Albergotti in Arezzo*

In 1904 Galileo Chini (1873-1956) decorated the interiors of the building hosting the new headquarters of Cassa di Risparmio in Arezzo. In these years he also painted the frieze on the facade of this building overlooking Piazza del Capitano, in the old town center. The frieze (12 meters long) is lengthways divided in three sections and represents a theory of dancing children holding wreaths, horns of plenty, and heaped baskets of fruit, symbolizing the allegory of Abundance and Prosperity. The perimetral frame is decorated with ornamental patterns inspired to the classic repertory. On the bottom side of the frame, under the emblem of the banking-house, the Latin maxim saying "Felix est qui divitias simul et mentem habet", appears. Chini had already worked on similar themes, when he painted in 1903 the allegory of Abundance and Fortitude for the new location of Cassa di Risparmio in Pistoia. Although he faced different techniques and materials, mural painting acquired an important relevance for his versatile artistic attitude, and the renowned ability of the artist in this technique, confirmed by the prestigious engagement for the decorative project of Biennale in Venice in 1909, meant his journey to Siam where he painted the decoration of Palazzo del Trono in Bangkok between 1911 and 1914. The frieze of Arezzo, although inspired to contemporary art-deco manner, clearly represents his personal elaboration of Tuscan Renaissance both from an iconographic and a technical point of view. Thanks to his deep knowledge of ancient techniques, acquired during his apprenticeship as decorator and restorer, Chini, in spite of his previous experiences, returned to the great classical tradition of fresco, realizing a painting that followed traditional technical rules. This study is based on the analytical observation and scientific analysis carried out during the restoration of the frieze painted on the facade of Palazzo Albergotti in Arezzo. The restoration was executed by ISCR in summer 2008.

**ALESSANDRO GATTI, TIZIANA CAVALERI, ANNA PICCIRILLO, CRISTINA TRAPPELLA, Centro  
Conservazione e Restauro La Venaria Reale**

### *Giulio Cesare Vinzio: un pittore postmacchiaiolo e divisionista nel primo ventennio del Novecento*

La prima antologica dedicata a Giulio Cesare Vinzio (1881 - 1940), realizzata a Grignasco (NO) nel 2011, è stata preceduta da un articolato intervento di studio e restauro, non ancora pubblicato, condotto nei laboratori del Centro di Conservazione e Restauro "La Venaria Reale" (CCR), finalizzato al recupero di dieci dipinti provenienti dalla Galleria d'Arte Moderna Paolo e Adele Giannoni di Novara.

La possibilità di operare contemporaneamente su un cospicuo numero di quadri dello stesso autore ha consentito di attivare un virtuoso processo di conoscenza che, partendo dall'analisi delle singole opere, si è posto come obiettivo quello di ricostruire il percorso creativo adottato dall'artista indagandone fasi operative, tecnica pittorica e materiali costitutivi.

La realtà interna al CCR ha permesso infatti un approccio interdisciplinare allo studio di queste opere, per cui storici dell'arte, chimici, fisici, diagnostici e restauratori hanno condiviso personali competenze e esperienze pregresse per interpretare, contestualizzare e valorizzare i dati, inediti, emersi dalla campagna diagnostica. Questa è stata condotta dando priorità alle analisi d'immagine e approfondendo poi attraverso tecniche di tipo

puntuale, non invasive e/o micro-invasive, al fine di favorire lo snellimento di tempi e costi di analisi e incrementare la rappresentatività dei risultati ottenuti.

Le riprese fotografiche, in particolare quelle eseguite in luce radente, documentano una tecnica pittorica sfaccettata, riflesso di un solido legame con la pittura macchiaiola agli albori della sua formazione e, nel medesimo tempo, di un accostamento fugace al movimento divisionista. Nelle opere prese in esame predomina l'attitudine all'uso di vigorose e sintetiche pennellate

realizzate con colori ad olio: creste e accumuli di materia pittorica si alternano a zone piane, dove affiora la superficie dei supporti e degli strati preparatori. Questo aspetto, che diventa parte integrante dell'espressione artistica, è messo in evidenza dalle indagini in transilluminazione: informazioni relative alla distribuzione e allo spessore degli strati pittorici palesano, ad esempio, nei ritratti, un *modus pingendi* "a risparmio".

L'integrazione dei dati, a partire dalle riprese della fluorescenza ultravioletta e dalle elaborazioni in infrarosso a falsi colori fino ai risultati delle tecniche puntuali di spettrofotometria di riflettanza, spettrometria di fluorescenza X e spettroscopia infrarossa, ha permesso di caratterizzare le vernici originali e di ricostruire la tavolozza impiegata dall'artista, riconoscendo pigmenti post-industriali, quali ad esempio blu e violetti di cobalto, gialli, rossi e verdi di cadmio, giallo cromo e litopone, il cui impiego conosce un'ampia diffusione proprio tra la fine del XIX e gli inizi del XX secolo.

Gli esiti delle indagini si sono rivelati di fondamentale importanza per indirizzare in modo consapevole le scelte di restauro e dunque stabilire una metodologia d'intervento capace di risolvere le problematiche conservative preservando contemporaneamente l'integrità dei materiali e il loro naturale assetto acquisito nel corso degli anni.

### *Giulio Cesare Vinzio: a post "macchiaiolo" and divisionism painter in the first two decades of the twentieth century. Enforcement proceedings and painting materials*

The first exhibition focused on Giulio Cesare Vinzio (1881 - 1940), made in Grignasco (NO) in 2011, was preceded by a complex intervention of study and restoration, not yet published, carried out at Conservation and Restoration Centre "La Venaria Reale" (CCR): in that occasion, the CCR had the opportunity to restore ten paintings from the Gallery of Modern Art "Paolo and Adele Giannoni" of Novara. The possibility to study, simultaneously, a large number of paintings by the same author has allowed to deepen the knowledge about Vinzio and his work.

Starting from the examination of individual works, the study aimed to go back over the creative path, investigating painting technique and original materials. Thanks to the multidisciplinary approach, art historians, conservator scientists and restorers have worked together to understand, contextualize and enhance unpublished data, achieved by diagnostics campaign. This was carried out performing, at the beginning, imaging analyses such as multispectral ones. The results were then deepened by non-invasive and / or micro-invasive specific analyses.

First of all, the raking light photos highlighted a multi-faceted painting technique, reflecting a solid relationship with the early Macchiaioli's movement and, at the same time, a brief approach to the pointillist movement. In these artworks Vinzio used vigorous and synthetic brush strokes with oil paints: ridges and heaps of pictorial material alternate with flat areas, where the preparatory layers appear. This aspect, that is a part of artistic expression, was highlighted by transillumination pictures: information about distribution and thickness of paint layers are revealed by this technique, for example, in the portraits, with a pictorial mode called "saving". The integration of data, obtained by ultraviolet fluorescence analyses, infrared false-color elaboration, reflectance spectrophotometry, X fluorescence spectrometry and infrared spectroscopy, allowed to characterize the original paint and to understand the artist palette. We have found post-industrial pigments such as cobalt blue and violet, yellow, red and green cadmium, chrome yellow and lithopone; lithopone in particular was widespread in the late nineteenth and the early twentieth century.

The results of the investigations allowed to consciously lead the conservation choices and then establish a methodology of intervention able to solve conservation problems and, at the same time, preserve the integrity of the materials and their natural adjustment over the years.

**ELIANA BILLI**, Università di Roma La Sapienza; **BARBARA PROVINCIALI**, Istituto Superiore per la Conservazione e il Restauro, Roma

*L'Italia tra le Arti e le Scienze di Mario Sironi: primi dati dal restauro*

Nel 1935 Mario Sironi dipinge l'Italia tra le Arti e le Scienze, un murale di circa 100mq nell'Aula Magna del Rettorato della neonata città universitaria della Sapienza di Roma. L'opera viene commissionata da Marcello Piacentini il suo obiettivo è quello di illustrare la concezione ideologica dello Stato fascista nel cuore della nuova italianità, nello Studium urbis, dove si sarebbe formato in cultura e tecnica l'Uomo nuovo. Mario Sironi

dipingere la sua fede fascista e a distanza di pochi anni ne paga il prezzo. Con la caduta del Regime il dipinto dell'Aula Magna viene prima occultato e poi trasformato da un pesante intervento di ridipintura, gestito dallo stesso Piacentini che era diventato membro della commissione d'epurazione di quei simboli fascisti che lui stesso aveva provveduto a diffondere nella Città universitaria. Braccio esecutivo di questa operazione di 'bonifica', fu il pittore napoletano Carlo Siviero che si occupò di cancellare tutto quello che nel dipinto rimandava all'ideologia fascista che lo aveva concepito e di "abbellire" e "migliorare", a suo gusto, le ieratiche figure dell'opera di Sironi.

Tra gli anni Ottanta e Novanta il dipinto è stato oggetto di studi approfonditi e di campagne diagnostiche e attualmente è in restauro. Emergono da questo intervento importanti elementi conoscitivi sulla tecnica esecutiva e i moderni materiali dell'opera e sulla sua particolare storia conservativa di cui si possono già raccontare le tappe più importanti.

In 1935 Mario Sironi paints "L'Italia tra le Arti e le Scienze", a wall painting of about 100 sm in the Rectorship's Aula Magna in the newborn university town "Sapienza" of Rome. The work is ordered by Marcello Piacentini and its purpose is to illustrate the ideology of the fascist State in the middle of new Italianity, in "Studium urbis", where the "New Man" will be built about culture and technique. Mario Sironi paints his fascist convictions and in a few years he pays the price. After the fascism fall the wall painting in the Aula Magna is at first hidden and then changed with a heavy repainting conducted by Piacentini himself, who had become member of the purge committee of those fascism symbols that he had spread in the university town. Executive arm of this renewal was the neapolitan painter Carlo Siviero who erased everything that was referred to the fascist ideology that had conceived the painting, and "to embellished" and "to improved", according to his taste, the hieratic figures of the Sironi's painting. Between eighties and nineties the wall painting has been object of detailed studies and at present is under restoration, from which many cognitive elements emerge about the executive technique and the modern materials of work and its particular preservative history, about which we can already tell the most important steps.

**EZIO BUZZEGOLI, CNR-INO, Firenze; DIANE KUNZELMAN, Opificio delle Pietre Dure, Firenze**  
*Dai "Nuanciers" Lefranc dei primi decenni del '900 ai colori nei dipinti dei Futuristi della Estorick Collection, indagini multispettrali e stato di conservazione*

Durante le indagini non invasive eseguite lungo tutto l'arco di attività connessa al progetto Futurama abbiamo potuto osservare materiali simili fra le diverse opere. In particolare, sia sulle opere della Estorick collection di Londra sia sui Nuanciers Lefranc, abbiamo avuto modo di individuare la natura di alcuni colori e valutarne il loro stato di conservazione sia in relazione al normale invecchiamento sia conseguente ad alcune pratiche conservative risalenti agli anni '60 del secolo scorso. La possibilità di mettere a confronto osservazioni circa varie fonti e forme di degrado ci è sembrata occasione unica.

*From the colors used for early 20th century Lefranc color charts to those in Futurist paintings from the Estorick Collection of Modern Italian Art in London, multispectral investigation and questions of conservation*

Through non-invasive investigation carried out for the Futurama project, it has been possible to ascertain the presence of similar materials in various works examined. In particular, investigation has determined the material composition of certain colors in the Futurist paintings in the Estorick Collection of Modern Italian Art in London, which correspond to those in several historical Lefranc nuanciers. Furthermore, such comparative analysis involving different sources of information has proved particularly useful for the correct evaluation of the present state of conservation of the works' painting materials, whether the result of natural decay factors or in certain cases also connected to forms of intervention commonly practiced in the past.

**ILARIA DEGANO, PIETRO TOGNOTTI, FRANCESCA MODUGNO, MARIA PERLA COLOMBINI, Università di Pisa; DIANE KUNZELMAN, Opificio delle Pietre Dure, Firenze**  
*HPLC-DAD AND HPLC-ESI- Q-ToF Characterization of early 20th Century Lakes and Pigments from the Lefranc Archives*

The characterisation of atelier materials and of the historical commercial formulation of paint materials has recently gained new interest in the field of conservation science applied to modern and contemporary art. Assessing the composition of the original materials purchased by artists can guide not only their identification in

actual works of art, but also their restoration and preventive conservation. Thus, the need has risen for reliable databases of materials studied by micro-destructive state-of-the-art protocols. In studying the transition period corresponding to industrial revolution, when many such variants or combinations were hypothetically possible in paint formulation, advances in methods for characterisation and analytical models for data interpretation are particularly important, especially for conservation purposes, due to different degrees of stability of the various materials.

In this frame, more than thirty historical red lakes and colorants (dating from 1890 to 1921), provided by the Lefranc&Bourgeois Archive in Le Mans (France), have been investigated through a combined analytical approach based on chromatographic and mass spectrometric techniques. The focus of the research was to develop and apply a methodological approach based on the application of the techniques of election for the identification of such complex and interesting organic materials, namely: High Performance Liquid Chromatography using DAD or ESI-Q-ToF detectors. HPLC-DAD and HPLC-ESI-Q-ToF analyses allowed us to identify minor components in lakes and dyes composition, to discriminate between different recipes for the extraction of colours from the raw materials, and ultimately to distinguish among natural and synthetic formulations. The specific chromatographic profiles of synthetic dyes and lakes can also provide invaluable information on the reaction pathway followed by the different companies, in different times.

**LETIZIA MONICO, COSTANZA MILIANI, BRUNETTO GIOVANNI BRUNETTI**, CNR-Istituto di Scienze e Tecnologie Molecolari, Perugia; Centro d'Eccellenza SMAArt, Università di Perugia; **KOEN JANSSENS, UNIVERSITY OF ANTWERP**; **ELLA HENDRIKS**, Van Gogh Museum, Amsterdam  
*Physical-chemical factors influencing the darkening of chrome yellow pigments: a focus on paintings by Vincent van Gogh*

Chrome yellows (below denoted as CYs) is a class of synthetic pigments commonly encountered in paintings of the late 19<sup>th</sup>-early 20<sup>th</sup> century, such as those by Vincent van Gogh. [1-2] These materials are characterized by a different chemical composition ( $\text{PbCr}_{1-x}\text{S}_x\text{O}_4$ ,  $0 \leq x \leq 0.8$ ) and crystalline structure (monoclinic/orthorhombic), with shades that range from the yellow-orange to the paler yellow hues with increasing sulfate amount. [3] The understanding of the photochemistry of CYs is relevant, since in a series of paintings by Van Gogh and his contemporaries, the areas containing these pigments appear darkened today. Synchrotron radiation-based microscopic X-ray fluorescence analysis (SR  $\mu$ -XRF) and X-ray absorption near edge structure spectroscopy (SR  $\mu$ -XANES) in combination with Electron Paramagnetic Resonance (EPR) spectroscopy, permitted us to establish that the darkening of CYs in Van Gogh paintings [2, 4-6] and in artificially aged paint models [7-10] is due to the reduction of chromate anions to Cr III- compounds, with long lived Cr V - intermediates that are thermally formed through the interaction with the oil binder.

As a first step towards improving the long-term preservation strategies for these pigments, we have investigated the wavelength-dependence and the effect of the blue-green radiations on the photo-redox response of different CYs varieties. [9] As a second step, since in paintings, such as Sunflowers by Van Gogh, CY has been found to be present frequently in mixture with other pigments [such as zinc white ( $\text{ZnO}$ ), red lead ( $\text{Pb}_3\text{O}_4$ ), vermilion red ( $\text{HgS}$ ), emerald green  $3\text{Cu}(\text{AsO}_2)_2 \cdot \text{Cu}(\text{CH}_3\text{COO})_2$ ], [1,2] we have examined the influence of these additional materials on the stability of the yellow pigments.

At the conference, we will describe the results obtained by an integrated approach based on: (a) molecular spectroscopic methods (i.e., UV-Vis, FTIR and Raman) with bench-top and portable instrumentations and (b) metal-speciation techniques (i.e., SR-based X-ray spectromicroscopies and EPR) for the study of artificially aged CY paint models. These data will be complemented with those acquired in situ directly from different Van Gogh masterpieces and a selection of corresponding micro-samples, such as Sunflowers, Portrait of Gauguin, Bank of the Seine, View of Arles with irises (all in the Van Gogh Museum, Amsterdam) and Falling leaves (Les Alyscamps) (Kröller-Müller Museum, Otterlo). A semi-quantitative method for the digital reconstruction of the original color of selected CY painted areas will be also discussed.

## 21 Giugno

**ILENIA FALBO**, Università della Calabria

*I pigmenti Mussini-Schmincke: aspetti storico-artistici e tecnici*

Fratello maggiore del celebre pittore Luigi, Cesare Mussini (Berlino, 1804-Lucca, 1879) può considerarsi una figura del tutto dimenticata del panorama artistico fiorentino di metà Ottocento, la cui vicenda artistica, per molti aspetti, resta ancora da chiarire. A dispetto dell'attività pittorica tuttora poco nota, Mussini, mediante incessanti sperimentazioni, mette a punto, attorno la metà del XIX secolo, un metodo di preparazione di colori per la pittura che costituisce senza dubbio l'aspetto peculiare e sicuramente più fortunato della sua carriera. A partire dal 1881 la gamma di colori creata dal pittore toscano è prodotta industrialmente dalla fabbrica tedesca Schmincke, che ancora oggi commercializza i tubetti col marchio «Mussini».

Dal vaglio sistematico della documentazione autografa, costituita da una minuziosa autobiografia, da appunti di lavoro e da lettere, emerge con chiarezza il bisogno – quasi ossessivo – di Mussini di annotare numerose raccomandazioni per la conservazione della pittura a olio. Il materiale cui si fa riferimento è imprescindibile poiché non si limita a fornire comuni ricette di preparati per la pittura, ma rivela inaspettatamente un dato essenziale svelando il principale segreto della preparazione dei colori che Mussini custodisce gelosamente per tutta la vita, o più esattamente, sino al 1875 quando cede il diritto di produzione dei suoi colori alla fabbrica di Düsseldorf.

L'intervento intende esaminare la progettualità dell'artista, l'approccio alla materialità dell'opera d'arte e le considerazioni di Mussini sugli aspetti tecnici del mestiere di pittore mediante l'analisi delle sue ricerche e degli esperimenti condotti a partire dal terzo decennio dell'Ottocento, in una temperie culturale di profondi mutamenti che interessano non solo le tendenze e le poetiche all'interno del sistema delle arti, la produzione di materiali e le tecniche artistiche, ma anche il linguaggio utilizzato per parlare dell'arte e i procedimenti di creazione dell'opera d'arte stessa. Lo studio delle formule di Mussini consente di focalizzare l'attenzione sugli aspetti specifici dei suoi pigmenti e mette in evidenza l'aggiornamento dell'artista sull'evoluzione nell'ambito delle tecniche pittoriche che si registra alla metà del secolo, quando in Italia si intensifica lo studio e il recupero di tecniche del passato con l'intento di contribuire a un rinnovamento dell'arte presente. Nel medesimo periodo si diffondono le moderne teorie sulla luce e sui colori che introducono nell'arte una particolare vocazione scientifica che avrà i suoi esiti più importanti alla fine del secolo e, ancora, nei principali trattati sulla pittura si inizia a discutere del problema dell'ingiallimento dell'olio. La ricerca di Mussini sembra attestata sull'attenta osservazione di quanto accadeva oltralpe. Il pittore s'interroga sulle pratiche e sul senso dei nuovi procedimenti pittorici conducendo una personale lotta contro l'uso dell'olio in pittura e proponendo l'impiego della pittura a tempera. Un atteggiamento, quello di Mussini, che in modo del tutto pionieristico anticipa la convergenza che si verificherà alla fine dell'Ottocento tra artisti, scienziati e critici d'arte sul tema delle relazioni tra arte, scienza e tecnica.

*The Mussini-Schmincke pigments: the historical-artistic and technical aspects*

Elder brother of the famous painter Luigi, Cesare Mussini (Berlin, 1804-Lucca, 1879) can be considered a figure completely forgotten of the mid-Nineteenth century Florentine art scene, whose artistic life, in many ways, remains to be clarified. In spite of still little-known painting, Mussini by incessant experiments, develops, around the mid-Nineteenth century, a preparing colors method for painting which is undoubtedly the most important consideration and certainly most fortunate of his career. Starting from 1881 the range of colors created by the Tuscan painter is industrially produced by the German factory Schmincke, which still sells the tubes with the brand «Mussini».

By the systematic screening of handwritten documents, consisting in a detailed autobiography of working notes and letters, it is clear the need – almost obsessive – of Mussini to note a number of recommendations for the conservation of oil painting. The material referred to is essential because not only provide common recipes prepared for painting, but unexpectedly reveals an essential information revealing the main secret of the color preparation that Mussini jealously guards for life, or more precisely, until 1875 when it sells the right to produce its colors to the Düsseldorf factory.

This work will examine the artist's projects, the approach to the materiality of the work of art and Mussini considerations on the technical aspects of a painter by the analysis of his research and experiments conducted since the third decade of Nineteenth century, in a cultural mood/season of deep changes that affect not only the trends and poetics within the system of the arts, the production of materials and artistic techniques, but also the language used to talk about art and the processes of creating the work of art itself.

The study of Mussini formulas allows to focus on specific aspects of its pigments and highlights the artist's update on painting techniques that you register by mid-century, when in Italy escalates the study and recovery of past techniques with the aim of contributing to a renewal of art present.

The search for Mussini seems attested on the careful observation of what was happening across the Alps. The painter is uncertain about the practical and the sense of the new pictorial processes conducting a personal fight against the use of oil in painting and proposing the use of tempera paint. An attitude, which in a completely pioneering anticipates the convergence that will occur at the end of the nineteenth century between artists, scientists and art critics on the subject of the relations between art, science and technology.

## **EVA EIS, München**

### *About Brilliant Green Earth and Vermillion Lakes – pigment mixtures from a 19th century recipe collection*

During the 19th century new discoveries led to the development of many pigments and within a relatively short period of time a huge variety of new colours became available. Their production grew into a completely new industry: small pigment mills became work-sharing manufactories and later well-organized and more or less specialized factories. Throughout the 19th century the amount of paint factories in Germany increased. But while some of the larger companies became very well known for their products and are still remembered today, many smaller factories have been forgotten. The “Farbenfabrik Heinrich Wiesel” was one of those factories. The company was located in the city of Gehren in Thuringia, an area with considerable tradition in mining and pigment production. Founded in 1862 by Johann Christian Heinrich Wiesel, the company remained a family business until it was sold by his eldest son Otto in 1924. The factory produced a whole range of chromate pigments, Prussian blue and different kinds of lake pigments. In addition to that the company owned mines for gypsum, baryte and earth pigments. Products of the “Farbenfabrik Heinrich Wiesel” were sold not only in Germany, but even exported overseas.

Of particular interest is a collection of paint and pigment recipes from Otto Wiesels’ legacy. All of these recipes, notes and letters are handwritten and can be dated around 1890. The documents not only give a general impression of the work of such a factory, but also show that an enormous variety of colours was produced and traded at that time. A whole range of colours could be achieved just by varying the amounts of the ingredients or the production process. Chrome yellow could have been a light, lemon yellow shade as well as a bright yellow or a darker, brownish orange colour. Hundreds of so-called “Numbers” of chrome yellows were available on the market and the chromate pigments clearly form the largest group within the collection. But there are also many recipes for other colours: Prussian blue, Bremen blue, Schweinfurt green, vermilion, ultramarine and viridian. Additionally there are recipes for the production of lake pigments from natural and synthetic dyes. Synthetic Alizarine, Fuchsine and Brilliant green are used as well as natural dyewoods and their extracts. Furthermore the collection contains recipes for inks, oil paints and varnishes. Amounts, ingredients and production processes are described and provide detailed insights in pigment and paint manufacture around 1890. Synthetic dyes were used alone as well as in combination with natural dyes or inorganic pigments, but in addition to that the recipe collection contains a number of obscure mixtures: Fuchsine enhanced the colour of brazilwood lakes and Eosine turned red lead into vermilion. Yellow ochre dyed with Flavine was a fine replacement for chrome yellow and Brilliant green made green earth look even greener. The presentation will focus on this “grey area” of pigment production, on unusual combinations of the natural and synthetic, the organic and inorganic.

**EVA REINKOWSKI-HÄFNER, München; KAROLINE BELTINGER, Schweizerisches Institut für Kunstwissenschaft, Zürich; KATHRIN KINSEHER, Akademie der bildenden Künste, München**  
**WIBKE NEUGEBAUER, München; ALBRECHT POHLMANN, Kunstmuseum Moritzburg, Halle; SIMONA RINALDI, Università della Tuscia, Viterbo**  
*Commercial Tempera Products in Germany 1875 – 1930*

In the last quarter of the 19th century numerous new tempera products were brought onto the market by paint manufacturers and enthusiastically taken up by artists. The variety in the composition of the new paints which were all described as ‘tempera’ reflected on the one hand the outcome of tempera discussions by art historians, conservators and scientists in the first half of the 19th century, in which attempts were made to reconstruct the composition of historical tempera; on the other hand the expertise of artists and decorators, who mixed their own paints, was incorporated into the recipes for tempera tube paints. Paint manufacturers had been able to gain experience from the production of water colours. These were already available in blocks at the end of the 18th century (from 1776) and in tubes from 1849. Beginning in the 1870s tempera paints were offered packed in tubes, a particular challenge to the paint manufacturers, who overcame the difficulties involved by adding stabilizers and wetting agents (humectants), offering the paints as a multi-component system, or by simply just

selling the pure binder in tubes. The earliest known tempera tube paints were the egg-oil paints offered by the Dresden company Neisch & Co. in 1875, which were derived from the historical egg paints of Cennini. The 'Improved egg tempera paints' (Verbesserte Ei-Temperafarbe) produced from 1892 by the Düsseldorf company Schoenfeld were also packaged in tubes. The Syntonos paints introduced by Wilhelm Beckmann in 1893 were the first products offered as tempera paints, which contained a mixture of gum arabic and oil as binder and additional stabilizers. Other paint inventors, for example Alfons von Pereira-Arnstein, settled on a multi-component system by which the binder and components were first mixed on the palette or on the painting surface itself. His paints, which were on offer from 1890, were made up of honey, gum and size among other ingredients, and during the painting process were fixed repeatedly with an intermediate varnish. Artists showing dissatisfaction with the laborious multi-component system, from 1897 Pereira offered the "Medium Paint" (Mediumfarbe), a mixture of gum and oil with added size and honey, as tube paints. The oil-miscible products as the 'Wurm-tempera' and the 'Weimar paint' were a special form of tempera paints around 1900. For example, the 'Wurm tempera', which was already on the market in the 1870s and used by many German artists residing in Rome and Florence, was probably an oil and water miscible saponified oil colour. Painters had an extensive choice of tempera paints at their disposal, which they were glad to take advantage of due to the simplification of the work process. Painters, amongst them Franz von Stuck, Lyonel Feininger and Otto Dix used the various compounds of paints and paint systems for their respectively idiosyncratic painting compositions.

**REBECA BARQUERA, SANDRA ZETINA, Universidad Nacional Autonoma de Mexico**  
*Atl colors and their relation to encaustic tradition*

In 1921, the Mexican painters Gerardo Murillo Dr. Atl (1875–1964) and Diego Rivera (1886 –1957) were experimenting with wax, copal, dammar varnish, and other materials to recover the original encaustic technique or to produce new mediums for murals. They were looking for a bright, permanent medium that prevented changes and yellowing of the colors for the first murals painted on the walls of the National Preparatory School. In 1903, during Atl's stay in Rome, he invented a sort of solid oil crayons called atlcolors after him. They would merge the easy handling of pastel colors and the intensity of encaustic to be used on walls, canvas or paper. Both artists spent several years in Europe, traveling through Italy and looking for Renaissance and Antiquity's sources, but they also participated in the avant-garde movements. While Atl was interested in Giovanni Segantini's (1858-1899) divisionism, Rivera followed Gino Severini's (1883-1966) return to the classic. This art history research will explore several historic sources such as autobiographic texts, periodicals, artist's treatises, and other documents related to the production of atlcolors and its relation with encaustic. But our main sources will be the treatise written by Rivera and Juan O'Gorman, *Sobre la encáustica y el fresco* (1954), and the documents left by Atl which contain formulas for the production of atlcolor, and several interesting experiments related to variations of hue and saturation. We will use experimental reproduction to analyze some of Atl's recipes and studies of color, and the production of crayons to compare their properties, hue variations, and to relate them with the strokes or traces in Atl's paintings from the 20's. Since Rivera and Atl were aware of the material's status and its components as an important element of the act of painting, they became concerned about the encaustic aesthetic values, its relation to the painting tradition of Antiquity, and the incorporation of Mexican materials because of their link with pre-Hispanic painting.

We will also discuss the rivalry accounts on the invention of atlcolors by Rivera, who regarded them as a copy of the solid oil colors by Jean François Rafaëlli (1850-1924), which Atl mentioned as a failure in painting history in his treatise of landscape painting. 2 Atl and Rivera will return repeatedly to this point in their careers in order to rewrite their memories and establish a direct link with classicism, not only through the form, but also through the antique techniques of painting.

**BARBARA FERRIANI, Milano; DANKA GIACON, Museo del 900, Milano; FRANCESCA ROSI, LAURA CARTECHINI, MOLAB-CNR- ISTM-SMAART; FRANCESCA MODUGNO, Università di Pisa**  
*Boccioni e la materia*

Il contributo intende mettere in relazione diversi piani di ricerca: le conoscenze acquisite negli ultimi decenni grazie alle ricerche storico artistiche sulle fonti testuali, le indagini diagnostiche sui materiali utilizzati nei primi decenni del secolo scorso ed i dati emersi durante il restauro di un nucleo di opere di Umberto Boccioni di proprietà del Museo del 900. Gli interventi di restauro, eseguiti in un lasso di tempo di circa 20 anni, hanno evidenziato comportamenti fisico-meccanici delle stesure pittoriche che testimoniano le trasformazioni avvenute nei materiali e nelle tecniche adottate dall'artista. Leggendo la materia e le sue trasformazioni, a volte con il supporto di indagini scientifiche e a volte con l'analisi diretta, si cercherà di illustrare le complesse relazioni che hanno influenzato la percezione, la fruizione e la conservazione di queste opere nel tempo.

## *Boccioni and the material*

This presentation intends to link various investigative projects: the knowledge acquired in the last decades through historical artistic research on textual sources; diagnostic investigations into materials used in the first decades of the last century; and the data that emerged during the restoration of the nucleus of Umberto Boccioni's works owned by the 'Museo del Novecento'.

The restoration, which was carried out over a period of approximately 20 years, has underlined the physical-mechanical behaviours of the layers of paint, which demonstrate the transformations that took place in the materials and techniques adopted by the artist. Interpreting and understanding the material and its transformations, sometimes with the support of scientific investigation and sometimes via direct analysis, we will attempt to illustrate the complex relationships that have influenced the perception, realization and conservation of these works over time."

**LETIZIA MONTALBANO**, Opificio delle Pietre Dure, Firenze

*Il corpus di disegni di Umberto Boccioni della collezione civica del Castello Sforzesco di Milano. Analisi delle tecniche grafiche e dei materiali*

Nel 2014 è stato avviato un progetto di ricerca tra il Gabinetto Disegni e Stampe del Castello Sforzesco e il Settore Restauro Materiali Cartacei e Membranacei dell'Opificio delle Pietre Dure. Obiettivo l'indagine sul corpus grafico di Umberto Boccioni, tra i più ricchi e rappresentativi oggi ancora conservati in Italia. Con i suoi 62 fogli (61 disegni e una incisione), esso è infatti numericamente secondo soltanto alla collezione della Galleria Nazionale di Cosenza. Lo studio ha interessato tutti i fogli della collezione, che sono stati sottoposti, in situ, oltre che ad una analisi delle tecniche e dello stato di conservazione, ad una campagna di indagini fotografiche multispettrali, in luce visibile, fluorescenza UV e nel vicino infrarosso (ottenendo tra l'altro anche immagini in falso colore infrarosso). La ricerca sui fogli di Boccioni si è svolta in due fasi distinte: dapprima essi sono stati sottoposti a un attento esame visivo, condotto in luce diffusa e radente, volto a differenziare le tecniche grafiche adottate dall'artista. In un secondo momento è stato condotto un esame più approfondito e le carte sono state prese in considerazione individualmente.

Durante questa seconda fase, di ciascun disegno è stato effettuato un accurato esame dei materiali costitutivi, delle tecniche esecutive e dello stato di conservazione. Ciò ha permesso di evidenziare importanti dati sugli aspetti morfologici, sul degrado dei materiali e sulle vicende espositive e conservative, vicende a volte riconducibili già al momento di realizzazione dell'opera, ossia a fatti accaduti nello studio dell'artista. Dato che fino a oggi raramente sono stati condotti studi tecnici su disegni dell'avanguardia futurista e su Boccioni, questa ricerca può contribuire ad approfondire la conoscenza dei materiali costitutivi e delle tecniche grafiche dell'artista.

*The Castello Sforzesco Prints and Drawings department of Milan beholds some 61 drawings of Umberto*

Boccioni, dating from 1906 to 1916 circa, documenting the different phases of the artist's work, from his prefuturisms period to maturity. These works on paper come from various collections and therefore have different conservation issues. In 2014 The Castello Sforzesco Prints and Drawings department and the Opificio delle Pietre Dure Paper and Parchment department have launched a research project on the analysis and identification of the graphic techniques of this corpus. A multispectral imaging campaign was also undertaken. This phase was carried out in situ in Milan and can be considered the first step of a wider research on Boccioni's drawing techniques and materials.

**ROBERTA CREMONCINI**, Estorick Collection of Modern Italian Art, London

*Quando la pratica curatoriale incontra la scienza: l'esperienza alla Estorick Collection*  
*When Curatorial Practice meets Science: the Estorick Collection's Experience*

It is very rare for a small museum to have the works in its collection undergo sophisticated scientific research, and it is interesting to understand how the parameters of such research can evolve over time. When investigations began at London's Estorick Collection (in the context of the Futurama project) the idea was simply that of increasing the museum's knowledge about its individual works. However, the scope of the resulting 'discoveries' led to certain works becoming the focus of far deeper research. From that point on, the relationship between the museum and the scientific researchers changed, becoming far more collaborative in nature. Particularly interesting was the way in which a more 'complete' picture of individual paintings was



achieved by combining the art-historical knowledge of the curators with the technical analysis of the scientists – and how the latter sometimes challenged the supposed certainties of the former. Out of this combined effort an exhibition developed that has led to an entirely new interpretation of some of the most significant works in the Collection.

**SILVIA LUDOVICA MATINI**, Università di Pisa

*“Una parte necessaria del quadro”: la cornice nell’opera di Giacomo Balla, tra Divisionismo e Futurismo*

Ne *Il Manifesto tecnico dei pittori futuristi* dell’11 aprile 1910 Boccioni, Carrà, Russolo, Severini e Balla affermavano di voler rivoluzionare la costruzione del quadro, ritenuta «stupidamente tradizionale», e il rapporto con lo spettatore, ponendolo non più davanti alle cose ma «al centro del quadro». I dipinti futuristi, infatti, si presentavano, con la loro carica dinamica, come elementi in continuo contrasto con la bidimensionalità del supporto, dal quale intendevano idealmente svincolarsi. E anche il ruolo della cornice cambiò rispetto al passato: non doveva più essere la cornice ad attirare lo sguardo dello spettatore all’interno del quadro ma il quadro stesso a uscire dai suoi confini tradizionali e inglobare lo spettatore dentro di sé. In più occasioni questi artisti preferirono alla classica cornice dorata, che avrebbe contenuto la sensazione dinamica, incorniciature discrete, che non smorzassero lo slancio delle loro creazioni, o cornici molto elaborate, che partecipassero attivamente al funzionamento della composizione.

In special modo Giacomo Balla, che fin dagli anni prefuturisti aveva ragionato sulle potenzialità dell’incorniciatura e sul modo in cui questa avrebbe potuto partecipare attivamente all’espressione pittorica, elaborò cornici colorate, sagomate e intagliate per inquadrare i suoi polittici e i suoi dipinti. La cornice per Balla cessò di essere una struttura indipendente e intercambiabile e diventò «quasi una parte necessaria del quadro» che ne completava e rafforzava il significato. In particolare per *La mano del violinista* concepì simultaneamente al dipinto una cornice rettangolare bicolore strutturata in modo che la fascia chiara più interna seguisse il profilo trapezoidale della tela, mentre i due elementi triangolari più esterni dipinti di scuro facessero risaltare lo spazio in cui si compiva il movimento.

L’intervento tratterà delle diverse problematiche affrontate da Balla e delle relative soluzioni scelte per le varie opere, basandosi su accertamenti documentari, misurazioni e osservazioni dirette su dipinti e cornici dell’artista svolte in larga parte durante le campagne di analisi del progetto FUTURAHMA.

*«Una parte necessaria del quadro»: Giacomo Balla’s frames between Divisionism and Futurism*

In the *Technical Manifesto of Futurist Painters* published on the 11th of April 1910 Boccioni, Carrà, Russolo, Severini and Balla declared they want to revolt against the «foolishly traditional» construction of the pictures and change the relationship with the spectator. The intention being to place the spectator not in front of the picture but «within the centre of the picture». Futurist works seek to depict the dynamic sensation and try to free themselves from the bidimensionality of the canvas. The role of the frame also changed in relation to the past: traditionally the function of the frame was to draw the viewer to look towards inside of the painting, instead the Futurists wanted that their pictures went beyond the classical boundaries to lure the viewer into them. These artists sometimes preferred featureless or very particular frames to the traditional gilded ones in order to emphasize the dynamism of the composition. According to Giacomo Balla the frame was «a fundamental element of the picture», which completed the meaning of it. Since his early divisionist works, he created coloured and eccentric frames for his paintings and polyptychs. Especially in the case of *The hand of the violinist* he conceived the frame together with the work itself. He created a rectangular black and white frame in which the inner white bands follow the trapezoid shape of the pictorial surface and the outer black triangles underline the spatial area in which the movement of the hand develops.

The speech will consist of Balla’s framing solutions on the basis of documentary research, measurements and the direct examination on his paintings and frames mostly effectuated during the scientific campaigns of the research project FUTURAHMA.

**AUSTIN NEVIN, SARA BELLEI**, CNR-IFN, Milano; **DANIELA COMELLI, GIANLUCA VALENTINI**, Politecnico di Milano

*Imaging Cadmium and Zinc-based pigments in paintings by Futurists.*

The study of Futurist Paintings has been carried out with novel imaging instrumentation developed as part of the Futurahma Project 1. Results from Luminescence lifetime imaging of short and long-lived emissions from Futurist paintings in the Estorick Collection (London) and the Museo del Novecento (Milano) will be presented to demonstrate the advantages of a dual wavelength time-resolved approach utilizing two laser wavelengths for

imaging: 355 nm and 532 nm. Complementing conventional imaging using ultraviolet light and in situ analysis carried out with point-like spectroscopic techniques, laser-based lifetime imaging provides information regarding the lifetime of luminescence which may range from picosecond to microseconds depending on the emitting material<sup>2</sup>. While research on organic media and pigments using luminescence lifetime imaging has reported nanosecond time decays, semiconductor pigments including Zinc-based whites and Cadmium-based yellows, oranges and reds, yield long-lived microsecond emissions<sup>3</sup>. The presence of semi-conductor pigments and other luminescent paint and their distribution will be illustrated together with an explanation of the luminescence documented in historic samples of Zinc and Cadmium-based Pigments from historical samples studied in the laboratory. Examples will illustrate what information can be gleaned from the time-resolved luminescence imaging of the complex multi-material surfaces in paintings by Umberto Boccioni and others and how results can both guide the selection of suitable areas for point-like analysis and inform the identification of pigments and their use.

**ANDREA CARINI**, Pinacoteca di Brera, Milano

*Nuove riflettografie ed altre indagini non invasive sulle opere del primo Novecento della Pinacoteca di Brera*

Dal 2015 alla Pinacoteca di Brera è stata realizzata una campagna di riprese riflettografiche su quasi tutte le opere novecentesche del museo con l'IRR Camera Osiris (Opus Instruments), dotata di un sensore InGaAs con risoluzione finale fino a trenta linee per mm. Per la sezione del convegno dedicata allo studio diretto delle opere si propongono gli esiti più interessanti ottenuti su dipinti del periodo 1910-1922 (opere di Boccioni, Carrà, Severini, Modigliani, Sironi, Morandi), anche confrontati con altre indagini non distruttive. Lo studio permette di acquisire informazioni sui differenti procedimenti operativi attuati dagli artisti, sia rispetto all'elaborazione grafica delle composizioni che alla successiva stesura pittorica.

*New IR Reflectography and other non-invasive analysis on the XX century collection at the Pinacoteca di Brera.*

Since 2015 at Pinacoteca di Brera an infrared reflectography campaign was carried out on the XX century collection; the museum's conservation workshop is equipped with an Osiris IRR camera with an InGaAs array and maximum resolution of 30 lines per mm. On the occasion of this Conference we present some results obtained on paintings between 1910 and 1922 (works by Boccioni, Modigliani, Carrà, Morandi), also compared with other non-invasive analysis. The study allows to acquire information on the artist's technique, such as the underdrawings and changes in the paint layers.

**MATTIA PATTI**, Università di Pisa

*Tra disegno e pittura: progettazione grafica delle opere futuriste*

Nell'ambito del progetto FUTURAHMA sono state condotte numerose campagne di indagini su dipinti del gruppo futurista, con particolare ma non esclusivo riguardo per quegli artisti che nel 1910 sottoscrissero i primi manifesti programmatici della pittura futurista.

Molti tra i più importanti risultati sono stati ottenuti attraverso la riflettografia infrarossa multispettrale a scanner, una tecnica capace di individuare – fra l'altro – la presenza del disegno soggiacente la superficie pittorica (il cosiddetto underdrawing).

Lo studio dell'underdrawing permette di comprendere meglio il processo esecutivo adottato dall'artista, offrendo informazioni altrimenti non rilevabili sui metodi di costruzione della scena dipinta e sulle modifiche apportate in corso d'opera. A questa forma di documentazione si devono ovviamente aggiungere i disegni preparatori, schizzi o studi di composizione che anche i futuristi erano soliti realizzare in gran numero prima di affrontare l'esecuzione pittorica. L'integrazione di disegni autonomi, underdrawing e dipinto permette così di ricostruire il processo creativo delle opere futuriste, mettendo a fuoco l'attenzione sia sulle scelte espressive che sulle tecniche pittoriche.

A partire da queste considerazioni, attraverso l'esame di opere di Giacomo Balla, Umberto Boccioni, Carlo Carrà, Luigi Russolo e Gino Severini, saranno presentati alcuni casi studio particolarmente complessi e ricchi di informazioni.

## *Drawing and Painting. Planning and variations of futurist compositions*

Within the FUTURAHMA project several analysis campaigns have been carried out on futurist artworks, paying particular, but not exclusive attention to those paintings made by the signatories of the 1910 manifestos of Futurist Painting.

Some of the most interesting results came from the Multispectral Infrared Reflectography, a well-known non-invasive technique which allows us to detect the preparatory drawing lying underneath the pictorial surface (the so called underdrawing). The underdrawing offers crucial information about the creative process, shedding light on executive methods and changes of composition. In any case this type of documentation needs to be integrated by studying autonomous drawings on paper: sketches and studies for the composition which futurists used to realize before starting to paint. By studying the relationship between independent drawings, the underdrawing and the final painted composition we can better understand the artist's working method.

Case studies (paintings by Giacomo Balla, Umberto Boccioni, Carlo Carrà, Luigi Russolo and Gino Severini) will be discussed from this point of view.

**MARGHERITA D'AYALA VALVA**, Scuola Normale Superiore; **MATTIA PATTI**, Università di Pisa  
*Futurahma.it. L'informatica come strumento per la condivisione e la visualizzazione dei risultati di un gruppo di ricerca interdisciplinare sulle tecniche pittoriche*

## *Futurahma.it. Visualization and exchange technologies for an interdisciplinary research group on painting techniques*

In order to facilitate research and exchange among participants to the FUTURAHMA project, an online collaboration platform has been created for sharing and discussing data among partners and a website is used to document and disseminate results to the community. Taking into account the fundamental work made in the digitisation and access to the documentation of conservation, the project aims to define new instruments for working methodologies in art history and to find new tools encouraging cross-pollination among interdisciplinary competences.

The first tool developed for the project consists in a restricted-access blog-based collaboration site available to internal users for sharing and discussing materials. The second tool is an open-access website, devoted to disseminate results of works and analysis, including an online application allowing the user to explore painting details at very high resolutions. Both tools are developed using open source technology.

The platform is developed in WordPress; it is conceived for the exchange of various sorts of materials among the research group. The art-historical group provides documents and files concerning written sources, history of conservation, files from imaging analysis. The scientific team delivers results of non invasive in situ analysis as well as laboratory analysis of samples.

The website aims to present and disseminate the most relevant results of the research. Case studies most fruitfully stimulating debate and exchange within the platform are selected and published in the website for open access.

A final section is devoted to the database of works and analysis. The high-resolution viewer is built conforming to the project model "Closer to Van Eyck". The data resulting from imaging techniques are documented through the assemblage of extremely high-resolution files.

Materials are freely consultable online in cases where museums and proprietors give their express permission.

**ERIKA GOHDE SANDBAKKEN**, Munch museum, Oslo  
*Crystal formation on Edvard Munch's Aula sketches*

White surface crystals have been observed in 15 sketches from Edvard Munch's Aula sketches (1909-1910). These were visible in both exposed areas of the unprimed cotton canvases, on crayons and on strokes of paint. White crystals found on oil paintings are often identified as fatty acids and metal soaps. However, zinc-, magnesium- and zinc magnesium-containing sulfates were identified (XRD, SEM EDS/EDX) in several samples. Magnesium sulfate is an efflorescent salt more commonly found on the surface of porous buildings and mural paintings. The aforementioned salts have also been identified on other paintings on canvas and on paper. Previous analyses have been used to explain and understand the formation and reactions of these metal salts. No clear correlation was proved between the oil media, animal glue, wax and oil crayons and possible layers of casein that have been identified with FTIR, GK-MS and DTMS. XRF measurements indicated high amounts of sulfur (S), potassium (K), calcium (Ca) and zinc (Zn) in areas with bare canvas and on crayons and paint layers.

This may indicate that the sketches were exposed to pollution and/or that the canvases were pre-prepared with a substance that is not visible to the naked eye. Particles of pollution appear to readily adhere to porous and irregular surfaces and the general porous character of the surfaces have made it easier for the metal salts to crystallize and effloresce on to the surface. The crystals are chemically active, and will rehydrate or dehydrate under various relative humidity and temperature parameters (magnesium sulfate heptahydrate will rehydrate in room temperature at 41-51 RH). A rehydration of the salt could, in turn, cause damage as the volume of the crystals grows. The identified salts found on Munch's sketches were indicated by XRD to be in three different hydration states, which make it challenging to provide specific recommendation regarding storage conditions. Fiber samples from two canvases were examined by the means of SEM-EDX and XRD. The findings were intriguing as Sulphur 8 (S8) was detected. S8 could point to that the canvases have been pre-treated with molten sulphur and would exclude air pollution as the source for the relatively higher amount of sulphur found in the art works. Munch's treatment and use of his materials – such as his decision to paint the Aula sketches on unprimed cotton canvases that were potentially pre-treated with molten sulphur – as well as the storage history of these works both during and after Munch's lifetime will be considered to explain the current conditions of the sketches and the unique vulnerability that may have been posed to them.

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*Analisi spettrofotometrica puntuale e ad immagine dei nuanciers Lefranc*

*Spectrophotometric punctual and imaging characterization of pigments from the early 20<sup>th</sup> century Nuanciers Lefranc*

Analytical tools provide excitingly new and crucial information about paintings and artworks, generally not visible to the naked eye and not available by any other means. Non-invasive and non-contact methods are currently under constant development so as the integrity of the examined artworks can be maintained. The indisputable value of infrared reflectography is renowned among the conservation community. The method has evolved since 1990's into the multi/hyper spectral modality. This means that instead of a single spectrally wide image, many images (so-called reflectograms) at well-defined adjacent spectral windows are acquired. In this contribution, we discuss the spectrophotometric characterization of the Nuanciers Lefranc pigments performed with the aim to create a database accessible to restorers, art historians, conservation scientists or other experts operating in the cultural heritage field. The measurements were carried out both with our visible-near infrared (VIS-NIR) optical scanning device with extended 380-2500 nm coverage as well as with a highly spectrally resolved Zeiss spectrophotometer (303-1700 nm). The two-fold character of the data obtained with the scanner in spectral and spatial domain allows analysing the output also as a set of images so that the pigments can be distinguished, for example, by false colour imaging.

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*Understanding the Fugitive Nature of Geranium Lake: Characterization and Photochemical Properties of Eosin-derived Pigments*

In this study we present a structural, optical and photochemical study of eosin-derived pigments of interest due to their use in the nature of Geranium lake [1,2], a impermanent pink organic pigment widely used by van Gogh and his contemporaries,. Two different eosin lakes, with alum and lead respectively, were synthesized as model compounds for structural elucidations together with historical eosin lakes containing both Al and Pb according to 19<sup>th</sup> century recipes and examined along with commercially available references, namely eosin disodium salt, eosin Y and ethyl-eosin. A structural and optical characterization of the powder substrates by NMR, MS, FTIR and UV-vis, both in absorption and emission, was performed highlighting useful considerations to explain the chemical nature of Geranium lake. Moreover, oil paint models were reproduced using the synthesized powders by themselves and along with different white pigments (Lead White, ZnO and TiO<sub>2</sub>) both to investigate the lightfastness of eosin lakes and to evaluate their threshold detection limit in different eosin/white dilutions by non-invasive techniques. In particular, accelerated aging experiments were carried out irradiating in different spectral ranges trying to underline the various contributions in the fading mechanism (UV part, white pigments, binder), also considering the Br distribution on the paint layer before and after irradiation. For this purpose, we

followed by HPLC-DAD- MS, UV-vis spectroscopies, XRF and SEM-EDX the light-induced fading of the oil model panels, collecting useful means in the understanding of the photo-degradation mechanism of the fugitive Geranium lake.

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*Modern Oil-based Paint Media: a Comprehensive Study by Mass Spectrometry*

When paint tubes were introduced on the market in the 19<sup>th</sup> century, oil paint formulations evolved to meet new requirements, as the paint had to be stable during packaging, transport and storage, and meet industrial production sustainability and workability needs. Artistic paintings made with modern oil formulations exhibit nowadays conservation problems different to those encountered in traditional oil paintings, such as the formation of vulnerable ‘medium skins’ on paint surfaces, efflorescence, water sensitivity, migration and interactions of surfactants and other additives. The current JPI Cultural Heritage project CMOP - Cleaning Modern Oil Paintings (2016-2018) - aims at making essential progress in the safeguarding of modern oil paintings, by investigating the causes of their degradation phenomena, and to use this knowledge as the basis for developing methods for safe and effective surface cleaning. In this context, understanding the formulation of the paint medium is of fundamental importance. Vegetable oils used as paint binders consist of mixtures of triacylglycerols (TAGs), glycerol tri-esters of fatty acids. Since the beginning of 20<sup>th</sup> century manufacturers exploited new vegetable oils as paint binders, to partially replace traditional drying oils (linseed, walnut and poppyseed oils). Our research is aimed to the characterization of binding media in modern oil paints and to the study of their ageing pathways, and exploits the experience that our group gained during the “Munch’s Colour Tubes Project”; (The Munch Museum and University of Oslo, 2011-2014) and the FIRB Project “FUTURAHMA-From Futurism to Classicism (1910-1922) Research, Art History and Material Analysis”; (MIUR Future in Research 2012 program, 2013-2016). Traditionally, the analysis of lipid binders has relied on the evaluation of characteristic ratio values of fatty acids amounts by gas chromatography/ mass spectrometry (GC/MS). In our study, we apply high-performance liquid chromatography (RP-HPLC) coupled with high-resolution tandem mass spectrometry (ESI-Q- ToF) for comprehensive TAGs analysis, developing and optimising procedures for the determination of triacylglycerols, free fatty acids and diacids.

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*Reactivity of zinc oxide in oil binding media: macro and micro scale distribution of zinc carboxylates investigated by FTIR on models and actual paints*

Zinc white (ZnO) is one of the white pigments most commonly employed by modern artists.. Its interaction with binder in oil-based paintings causes the formation of metal soaps affecting the paint layer with pigment losses, changes in surface texture, increase of brittleness as well as delamination. Previous FTIR studies underlined the occurrence of a broad infrared band at 1580-90 cm<sup>-1</sup> addition to the sharp featured nas COOat 1540 cm<sup>-1</sup> and under vivid debate. The aim of this work is firstly to better understand the reactivity of ZnO in the lipidic medium investigating the different FTIR profiles of paint models composed of ZnO, ZnS and ZnCO<sub>3</sub> (as alternative white pigments based on zinc) in linseed oil and trilinolein. The polymerization step as well as the temperature and humidity ageing effect have been followed by FTIR spectroscopy. In order to investigate the effect of jellifying agents commonly added in the commercial paint formulation, some paint models were prepared adding aluminum monostearate to a ZnO-oil paint. Both aged and unaged models were investigated by bulk FTIR spectroscopy and micro-ATR-FTIR spectroscopic imaging. The possibility to obtain spatially resolved chemical images showing the distribution of specific substances through micro-ATR-FTIR spectroscopic imaging [3], allowed us to investigate at a micro scale level the interaction and evolution of the zinc carboxylate within the painting stratigraphy. The results obtained from the study of the laboratory models were compared and integrated with the macro and micro FTIR data gained on samples belonging to modern and contemporary art paintings.