

THE PHOTO-OXIDATIVE DEGRADATION OF MATISSE'S *LE BONHEUR DE VIVRE* (1905-6): X-RAY-BASED METHODS FOR DEGRADATION MECHANISM IDENTIFICATION

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Matisse's first major Fauvist work, *Le Bonheur de vivre* (1905-6) is an icon of early modern painting that has been called the most consequential modern painting before Picasso's "Les Femmes d'Alger" (1907), which is often considered to be Picasso's competitive response to it. The characterization of the materials Matisse used to prepare *Le Bonheur de vivre* and their degradation products has been carried out to address long-standing questions about the appearance of this work. The most important of these questions has been the origin of the chalking, fading, darkening, spalling, and flaking of several areas of yellow paint.

The most pronounced darkening of the painting's many fields of yellow paint is in the foliage of the upper left corner, which now appears as a mottled surface comprised of tan and yellow ochre tones. The most pronounced fading and spalling is in the yellow fruits of the tree in the upper right corner and the yellow field beneath the two central reclining figures, both of which have several areas of high impasto that have been lost. However, the bright and lemony fields of yellow above these two central figures appear to be in good condition and unchanged.

An x-ray fluorescence survey of the work's yellow paints was used to characterize the pigments Matisse employed in both the degraded and intact regions. This was followed by an elemental and molecular examination of yellow paint samples removed from the work using energy dispersive x-ray spectroscopy as well as infrared and Raman spectroscopies. The second phase of the project involved using x-ray photoelectron and XANES (x-ray absorption near edge structure) spectroscopies to more fully characterize the amorphous yellow pigments used and their photo-oxidative degradation products. The findings of this research will be presented in the context of Matisse's writings on his pigment choices and the financial circumstances surrounding these choices. Recommendations for the future display of this work, and implications for the interpretation of *Le Bonheur de vivre* will also be discussed.

