Some DNA Issues for Art Law 13 April 2021

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Thanks to Eric Rayman for the opportunity to meet with the Art Law Committee of the New York City Bar. Thanks to biochemist Dr. Marguerite Mangin for helping prepare for this session.

The point of departure is that humans leave biological traces all over the place: on the clothes you wear, your eyeglasses, a glass from which you drink, a paint brush or palette that you hold, a canvas that you stretch, a sheet of paper on which you draw.

Most often the traces are skin and other cells from surfaces of your body, epithelial cells, which we shed all the time. The traces can also be blood or sweat or saliva or a hair. COVID has alerted us to how much biological material may be transmitted in your breath.

Every single cell of your body contains your DNA. And there is extracellular DNA, too, that may, for instance be floating around in your saliva.

Of course, if you ate a carrot for lunch, you may also have carrot DNA in your saliva. But our purpose today is not to investigate what was in your lunch box. Our interest is the human DNA, your DNA. Just as an active cellphone creates a digital trail of your movement, an animal leaves a biological trail. For millennia we were interested in scat and footprints.

Around 1800 anatomists realized that fingerprints are unique to each individual, and fingerprinting created the basis upon which the first forensic professional organization formed, the International Association for Identification, in 1915. Fingerprinting relies on pattern matching. Your cellphone may use it.

In fact, fingerprints often contain skin cells and thus DNA. A uniquely powerful identifier, DNA invaded American courtrooms during the 1990s through rape and murder trials. If forensic scientists can obtain the DNA, then there is a good chance to identify the individual from whom it came.

Of course, it takes two to make a match. We need a reliable source against which to compare the new evidence.

About 7 years ago, a colleague in Tuscany, a physical anthropologist interested in bones but also in DNA, realized that a group of us might have the skills and connections to obtain and sequence the DNA of Leonardo Da Vinci.

The challenge was to make a match from several independent sources. With the help of Eric and a talented network of associates in Italy, France, Spain, the USA and other nations, we are trying. One source of DNA could be from swabbing the cheeks of living descendants of his half-brothers whom we have identified in Tuscany in a 500-year long family tree based on baptismal and other records. Bones or teeth or other relics in tombs of members of the family, including his father (buried in a beautiful church in Florence), could be another. Leonardo's own tomb in a splendid chateau in Amboise in the Loire Valley might be another source, but alas strong evidence reports that the tomb was opened a few times and disturbed.

Most interesting is the possibility to obtain DNA from the notebooks of Leonardo, of which about 7000 pages survive, including more than 600 in the Spanish National Library in Madrid. He completely covered these sheets with writing and drawing, on both sides, and would have rubbed the side of his hand and his wrist across the sheets and held them firmly with his fingers, especially their borders. Our project teams have been developing techniques to extract human DNA from ancient paper.

If we find the same DNA on many sheets, and parts of the sequence match with DNA from living descendants or relics of dead relatives, we have powerful evidence that we have a handle on the DNA of Leonardo.

Let's suppose we can obtain quite a good portion of Leonardo's DNA.

What might we learn? A primary interest is visual acuity. Leonardo's drawings of birds, dragonflies, and water in motion suggest he had extraordinary eyesight, like the best baseball player or soccer goalie. Part of vision is genetic, and maybe Leonardo's genes can point us to favorable outliers.

Secondly, we might learn about Leonardo's ancestry. Little is known about his mother's family. We might learn the geographic origins of her family.

Importantly for the Art Law Committee, DNA can also contribute powerfully to attribution and authentication of artworks, and thus to historic and market value.

Let me briefly raise some potential Art Law issues. A basic issue is contamination. Not only Leonardo touched his notebooks. During the past 500 years many others did too. A major challenge is to isolate the DNA of the person of interest from many others, including assistants.

Another issue is the meaning of absence. Presence of DNA might strongly argue for association with a particular individual. But what does absence mean, particularly for older works or work extensively cleaned?

Cleaning itself is a third issue. Does the value of biological traces suggest that strategies for cleaning and preservation of works of cultural heritage should change to include preservation of the biological materials? Do we need more disclosure about cleaning materials and methods?

With regard to attribution, can DNA be used going forward as a hidden signature? Should artists deliberately drool or sweat on their works as a unique identifier?

With regard to forgeries, can we create a library of the DNA of forgers and use that library to reveal their work? Can a living forger create a work that is free of the forger's biological traces?

In turn, what are the possibilities for active fraud or deception with DNA? Suppose I arrange for Eric to lick an envelope or stamp. I might then rub this on a work of art or letter and use the presence of Eric's DNA to claim he authored it.

We could consider not only natural but synthetic fraud. In the foreseeable future, with digital information about the sequence of the four nucleotides that make a DNA strand, we might affordably synthesize an actual long strand that would appear to be the unique identifier. Should it be legal to synthesize the DNA of other humans? Could it be stopped? Could we dope it somehow to show a fake?

My penultimate issue is what should be standards of evidence about DNA for an auction house or art market to consider satisfactory or definitive? A related question is whether to license and certify practitioners.

A final issue, should institutions be created that would act as safe deposit boxes for the DNA sequences of artists, to be used confidentially for authentication?

In closing, let me mention that a small private philanthropic foundation, the Richard Lounsbery Foundation, is sponsoring a program to explore "Biology-in-Art" in a range of settings, including African Art and Medieval manuscripts. In this domain the artist has traditionally has not been identifiable and might now become known only by a DNA sequence. From cases of anonymous Medieval monks to Leonardo to pricey recent artists such as Magritte, Rothko, and Basquiat, to young living artists, Art Lawyers will have much DNA to consider.