



# Reimagining cancer research with art

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With increasing appreciation for the interdisciplinarity needed for the success of cancer research, we asked — how can a seemingly disconnected discipline like art support researchers? Here, we explore ‘cancer art’ projects that enable new conversations for a broader audience, advocate for policy and disparity issues, and lead to creative innovations for research.

The fusion of art and cancer is not a new idea. Art has been used throughout history in medical illustrations to depict tumour anatomy, in art therapy as palliative care to improve patients’ well-being, and in science imagery for outreach. The use of sophisticated equipment for imaging and data collection in science lends itself to produce images that can be seen as artwork. Journal covers, press releases and science galleries are often popular outlets for these efforts, helping to communicate complex science to broad audiences. While artistry has utility in visualizing and promoting science and cancer research, some ‘cancer art’ projects blur these boundaries to support research in innovative ways.

## Defining cancer art and its use in research

The roots of cancer art lie in the practice of bioart, which utilizes living biology as an artistic medium. Coinciding with genetic engineering advances in the 1980s, several artists began to re-contextualize scientific work, by genetically modifying living organisms such as bacteria to portray new biotechnologies through society’s lens<sup>1,2</sup>. One seminal example is the ‘Tissue Culture and Art (TC&A) Project’ founded by Oron Catts and Ionat Zurr (Australia), whereby tissue engineering approaches are used to make sculptures using cells. Many of these works were exhibited in gallery spaces as ‘semi-living’ cellular structures on display in makeshift tissue culture hoods, and spoke to questions surrounding bioethics, immortality and harvesting laboratory-grown cells for use as foundational foods and materials.

The use of biological and technological approaches from the lab to enable the creation of new art is a natural interface for cancer art. Indeed, artists in recent history have used new technologies ranging from electronics, digital software, virtual reality to 3D printing. Recently, artist Joseph Cohen collaborated with Daniel Heller’s lab (Memorial Sloan Kettering Cancer Center, US) to produce ‘MSP 001 (Mult-Spectrum Painting)’ by using carbon nanotubes, originally engineered as cancer diagnostics, as ‘paints’ to produce images in visible and infrared light<sup>3</sup>. Sometimes, working directly with materials such as cancer cells is challenging for artists, but collaborations with scientists furthers these projects.

‘Colonies’ (FIG. 1), was a collaboration between artist Vik Muniz (Brazil) and one of us, Tal Danino, while being a postdoctoral researcher in Sangeeta Bhatia’s lab (Massachusetts Institute of Technology, US). The goal of the project was to create visual artworks out of living cells. Here, it was crucial for the experience to encompass both individual cells as well as the image as a whole. To achieve this effect, patterning cells via photolithography was combined with stitching together an array of microscopy images. Including gaps in the silicone stencil for plasma diffusion, while allowing cells to bridge these gaps, achieved highly resolved and complex images. While this approach was intended for producing art, it may also be used in the future for answering biological questions about the spatiotemporal relationships of cells in tissues.

Creating multisensorial experiences, artist Antonio Lai da Teulada’s installation ‘B Cell City’ fuses audio and visual media, featuring media by opera singer, Darynn Zimmer and videographer, Clare Ann Matz (US). Similarly, ‘Choreographing Genomics’, a college course created by Jill Bargonetti (The City University of New York, US), combines molecular biology with post-modern dance forms. Here, students move as multiple polymers and signalling molecules in space, utilizing choreography and spoken words to clarify scientific concepts. Interestingly, such performances in the context of the mutant tumour suppressor p53 and DNA replication were said to have helped the researchers formulate a testable hypothesis — “mutant p53 causes more replication origins to fire and this requires more DNA repair proteins to assemble at the converging replication forks.”<sup>4</sup> Thus, being involved in the art making process could provide a new mode of thinking for cancer researchers.

## Connecting patient and researcher experiences

As artists give form to immaterial experiences and feelings to help us see the world through their eyes, there have been many artists that have dealt with cancer-related themes abstractly in their artwork. For example, artist Charlotte Jarvis (UK) worked in collaboration with molecular geneticist Hans Clevers

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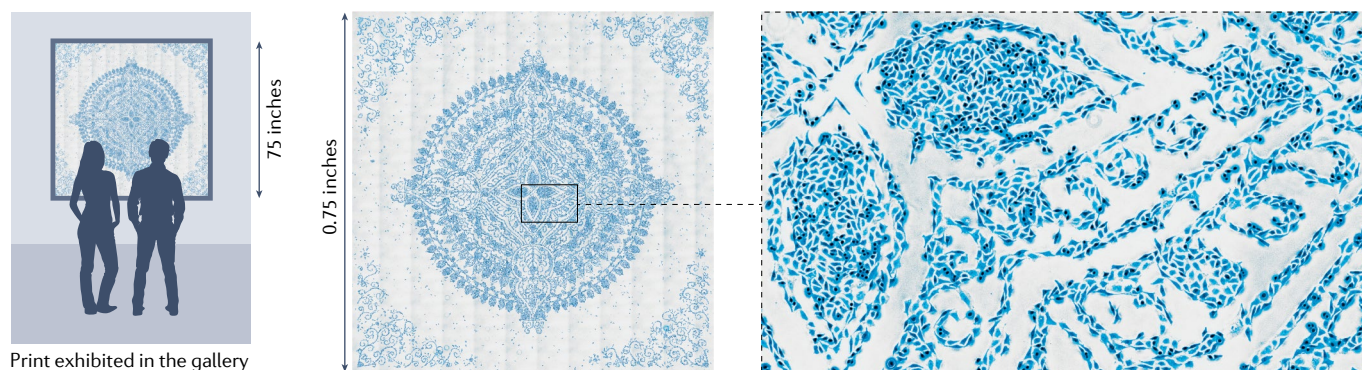


Fig. 1 | **Colonies, cancer cell photolithography, Vik Muniz & Tal Danino (2016).** © Vik Muniz/VAGA at ARS, NY and DACS, London 2021.

(Utrecht University, NL) to create ‘*Et In Arcadia Ego*’. The artist provided healthy tissue samples in a colonoscopy, which the Clevers laboratory grew into organoids and transformed into in vitro tumours. Jarvis’ project aimed to examine mortality and create a dialogue with and about cancer. In her own words, “Cancer is very interesting and very difficult for us to deal with because it comes from our own bodies. And we feel very confused about cancer because it is simultaneously a part of us and something we want to get rid of, and something we want to destroy... Cancer is almost the ultimate symbol for human mortality”. The artist recreated a waiting room for patients conveying the emotional process and experience of someone with cancer. Similarly, the artworks from ‘Colonies’, shown as large 6-foot printed pieces or videos, create the emotions of the scary and visceral disease with images of cancer cells that turn into something beautiful (FIG. 1). The use of the immortalized cells of Henrietta Lacks’ (HeLa) to create an image of a mandala, a symbol of life, creates conversations about mortality. Involvement in such projects allows basic researchers to connect with the patient experience on a deeper level.

### The medium is the message

Artworks of advocacy or public health campaigns are often created as infographics or sequential illustrations. These include the European Commission’s ‘[EU cancer plan](#)’ campaign, as well as the [cancer care poster](#) of the International Federation of Pharmaceutical Manufacturers and Associations (Switzerland), which also contextualises disparities related to economic, regulatory and cultural issues. In contrast to the above artworks created in traditional media, ‘[Cancer Medium](#)’ is a series produced in collaboration with artist Soonhee Moon (US) and Handsiebdruckerei print studio (Germany), where cancer cells are utilized as ‘inks’ in traditional silk-screening producing large poster-sized prints to explore the landscape of communication surrounding cancer research and advocacy in the US. Here, the works create conversations about researchers’ responsibilities regarding appropriate biospecimen consent, HIPAA laws concerning patient privacy, and support concrete actions to improve research participants’ rights, as in the case of HeLa cells<sup>5</sup>. Viewing these types of work can generate reactions and raise questions about the state of cancer research.

Mapping the trajectory of cancer advocacy through art can also help understand where cancer research began and where it is going, and how disparities exist across geographical regions and ethnicities. For example, ethnic minority groups often experience poorer cancer outcomes, which can be due to factors such as health-care access barriers, stigmatization, underrepresentation in clinical trials, cancer literacy and cultural beliefs, all of which can delay help-seeking and affect timely diagnosis<sup>6</sup>. But, the universal language of art can transcend cultural and economic boundaries to raise awareness and provide accessible benefits for patients.

### Advocating for research

The future of cancer art has numerous possibilities. Borrowing the mentality of artists to work abstractly and in many directions simultaneously, researchers may approach questions from a high-risk angle<sup>7,8</sup>. Platforms such as Cancer Art-Sci Network, created by one of us, Dhruva Deb, connects cancer researchers and artists to form such collaborations<sup>9</sup>. For trainees, developing more formal skills in the visual arts for presenting figures and communicating research would be clearly beneficial. Other art forms such as music, creative writing and kinesthetics may also help with multi-modal thinking. For funding agencies and philanthropic organizations, artworks can raise funds and promote new research fields. Importantly, further documentation is needed, specifically reporting cancer art efforts that benefit researchers and ultimately break cross-disciplinary boundaries to support cancer research.

1. Kac, E. (ed) *Signs of Life: Bio Art and Beyond* (The MIT Press, 2007).
2. Yetisen, A. K., Davis, J., Coskun, A. F., Church, G. M. & Yun, S. H. Bioart. *Trends Biotechnol.* **33**, 724–734 (2015).
3. Budhathoki-Uprety, J. et al. Synthetic molecular recognition nanosensor paint for microalbuminuria. *Nat. Commun.* **10**, 3605 (2019).
4. Bargonetti, J. How Choreostorming Informs Thinking In Molecular Genetics And Cancer Biology. *Leonardo* **54**, 611–614 (2021).
5. Henrietta Lacks: science must right a historical wrong. *Nature* **500**, 207–211 (2020).
6. Zavala, V. A. et al. Cancer health disparities in racial/ethnic minorities in the United States. *Br. J. Cancer*. **124**, 315–332 (2021).
7. Dance, A. How the arts can help you to craft a successful research career. *Nature* **590**, 351–353 (2021).
8. Gewin, V. How to shape a productive scientist–artist collaboration. *Nature* **590**, 515–518 (2021).
9. Landhuis, E. Science and Culture: cancer researcher looks to artists for inspiration. *Proc. Natl Acad. Sci. USA* **115**, 826–827 (2018).

### Competing interests

The authors declare no competing interests.