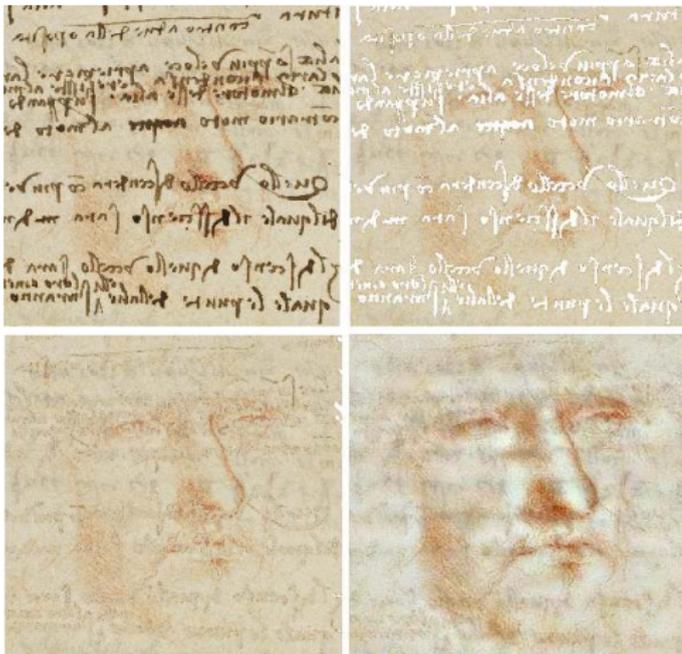




## How Free Software Revealed Self-Portrait of Young Leonardo

*A self-portrait of Leonardo da Vinci, which was lost for 500 years, has been restored using simple techniques and free software*

KFC11/23/2011



In 2009, an Italian science journalist made a remarkable discovery while studying the pages of Leonardo da Vinci's Codex on the Flight of Birds. The journalist noticed what looked like a nose under a line of text. Further study revealed an image of a man which Leonardo had obviously overwritten to produce the Codex. This image had remained unnoticed for 500 years.

The question that art historians immediately asked was whether this could be a self-portrait of the great artist. So they got to work, painstakingly restoring a digital copy of the portrait by removing the text, a process that took months.

That gave them a relatively clean image of a man. They then used forensic software to digitally age this person so that they could compare it to the only other known self-portrait of Leonardo, which shows him as an old man.

When the results were announced, Italian TV broadcast them live. The conclusion of various art historians was that this was indeed a self-portrait of Leonardo in his younger days, a story that generated global media coverage.

Today, Amelia Carolina Sparavigna at the Politecnico di Torino in Italy re-examines this issue using only software that is easily available on the internet at no cost.

She first notes that while the portrait itself is drawn in red chalk, the text is in black ink (the top left image in the pictures above). So she replaces all the black pixels in the image with white ones (top right). She then changes every white pixel to the average colour of the pixels around it, and iterates this procedure to produce the bottom left image.

Next she uses a free wavelet filtering program called Iris, more commonly used in astrophotography, to improve the resolution of the portrait (bottom right).

Finally, she uses the free image processing software GIMP to superimpose this image on top of

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the self portrait of Leonardo as an older man (see below). "The two faces seems quite coincident: in particular, the relative distances of eyes, nose and mouth are the same," she says.

So in relatively little time, using entirely free software, Sparavigna has reproduced the original months of painstaking effort using a simple technique that almost anybody could repeat at home.

The power and beauty of free software!

Ref: [arxiv.org/abs/1111.4654](http://arxiv.org/abs/1111.4654): A Self-Portrait Of Young Leonardo



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