

TWENTY YEARS OF BIOMEDICAL IMAGING AND SPLINES

SPLINE MINES: DIGGING DEEPER THAN ANY HUMAN EVER DUG

Knock on the door...?



Step 1

28 Nov 2001, 14:25

Dear Prof. Michael Unser,

I would like to ask for a few moments of your time. [...] As part of future research, and possibly very well suited for exploration during a **post-doctoral visit of a few months**, I would like to study in depth the **foundations of the general spline basis**. I was thinking of EPFL, and especially the group you are heading, because your expertise about splines and resampling is well-known throughout the world and many of your publications were very inspiring to me during my research.

[...]

Step 2

28 Nov 2001, 18:22

Dear Dimitri:

Thanks for the request and for your kind words. Your research sounds very interesting and most relevant to our activities. **I would be very happy to host you for a stay.**

How long are you planning to come ? Concerning housing, would you be coming with your wife ? There is no housing office at epfl, but I am sure that someone in my group could help you to find something.

In principle, we would also need you to go through some administrative work (visa) so that you can work here legally.

It should be started as soon as possible.

Very best regards,

-Michael

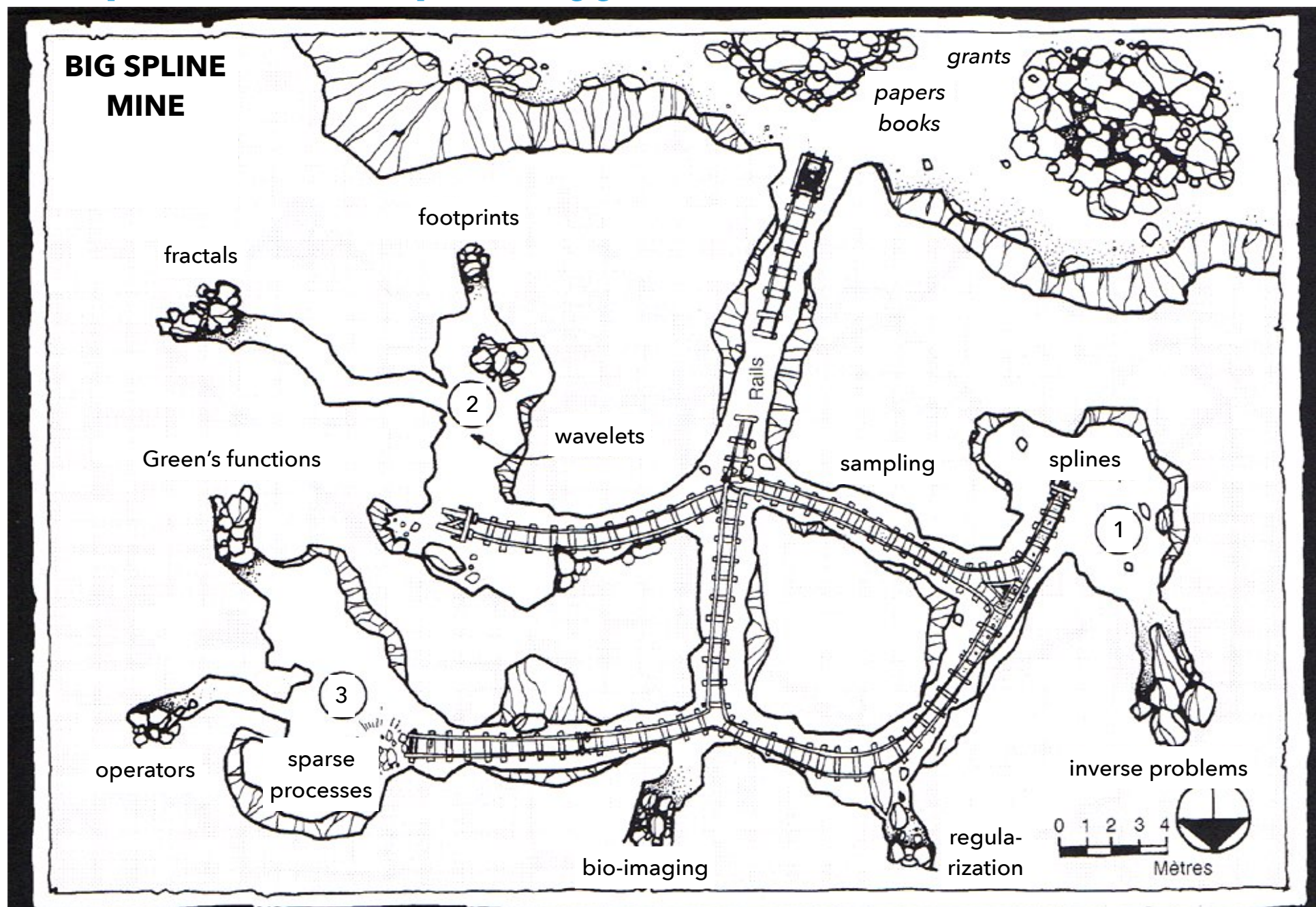
Spline diggers anno 2004



Discovering the spline mine



BIG spline mine: map for diggers



No free lunch

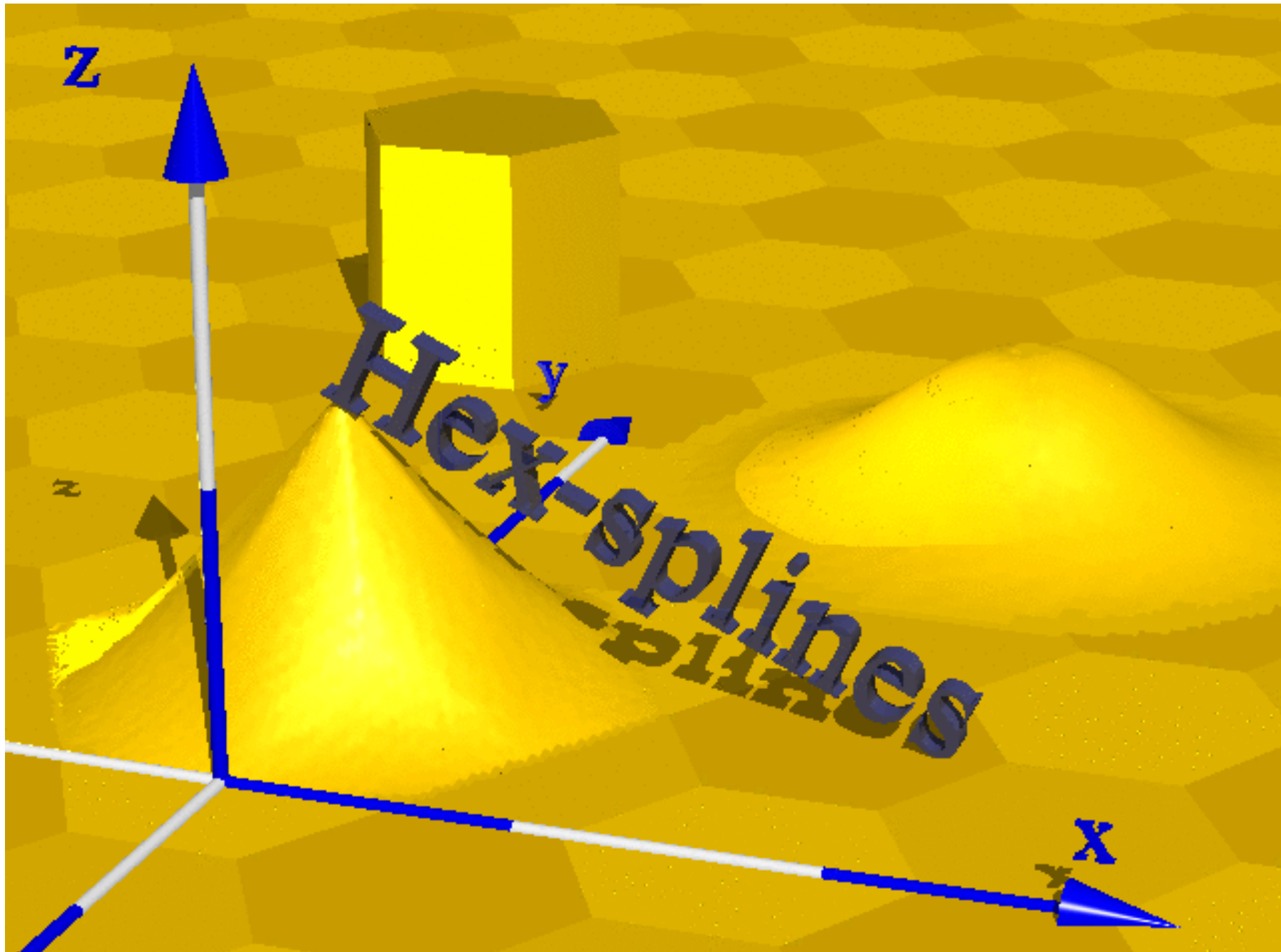


Careful sifting...

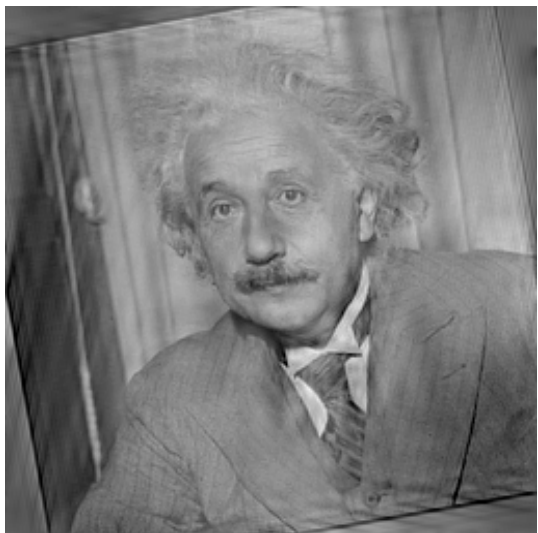
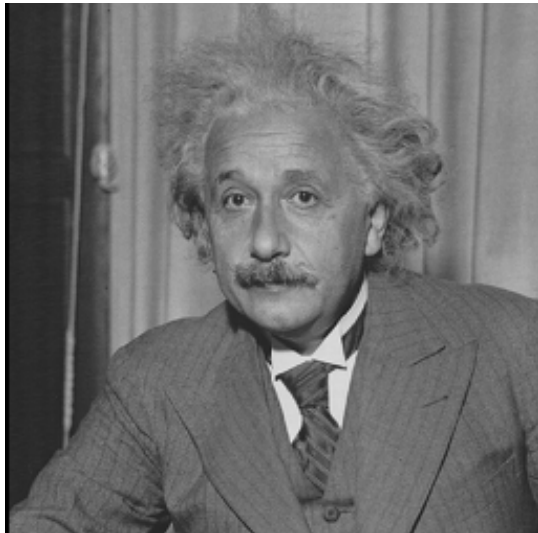


... and never give up

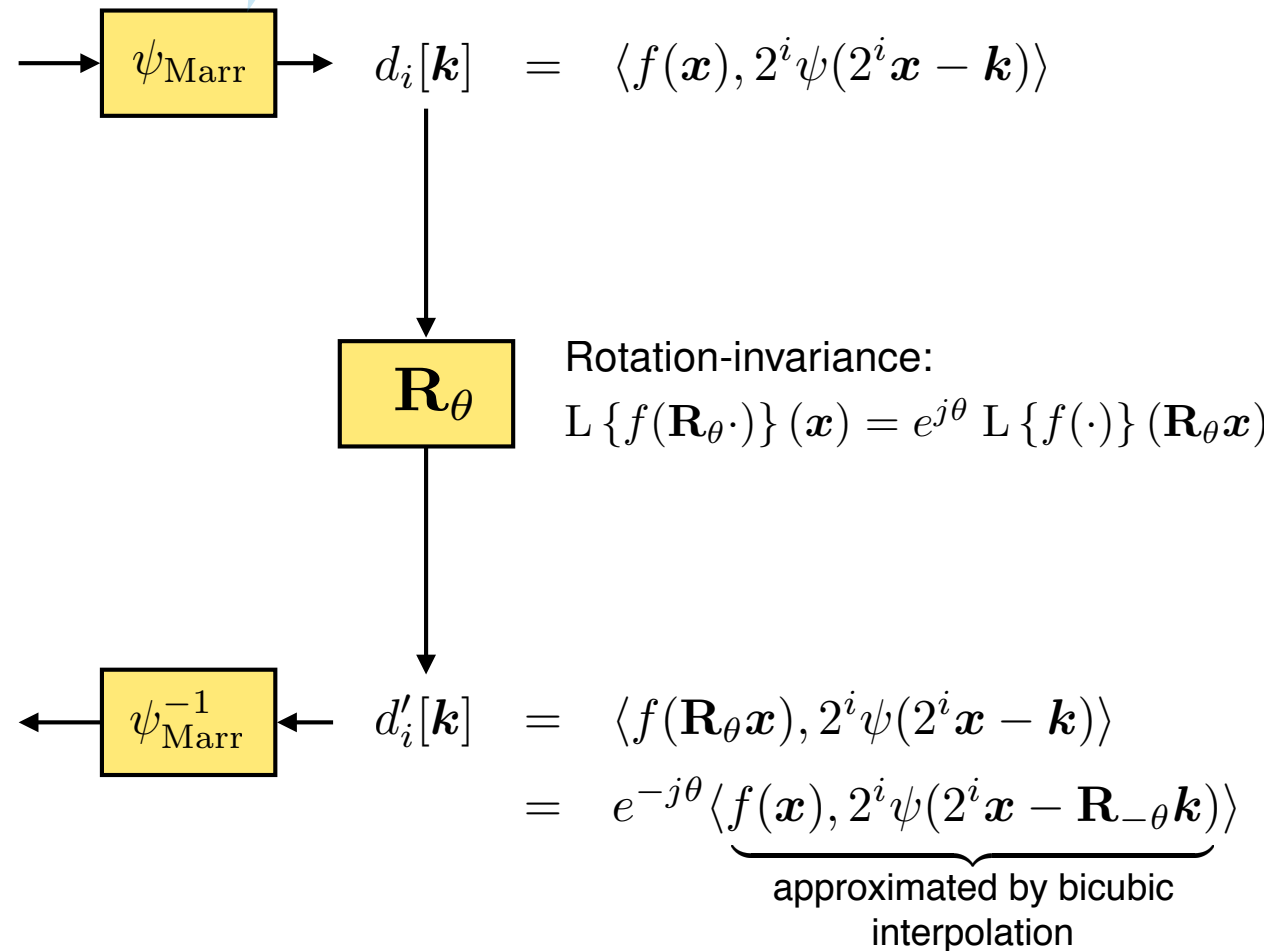
A couple of hexagonal gold bars...



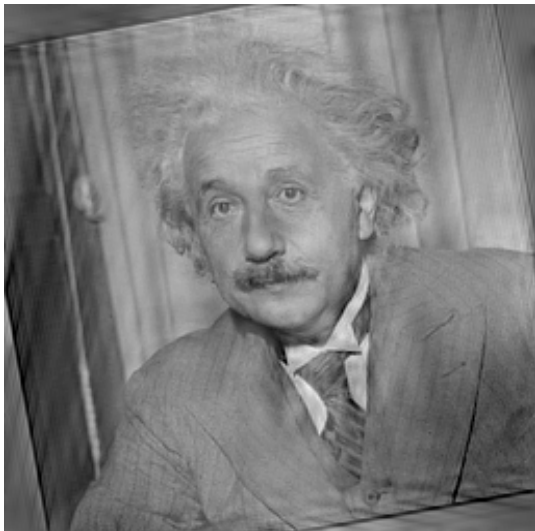
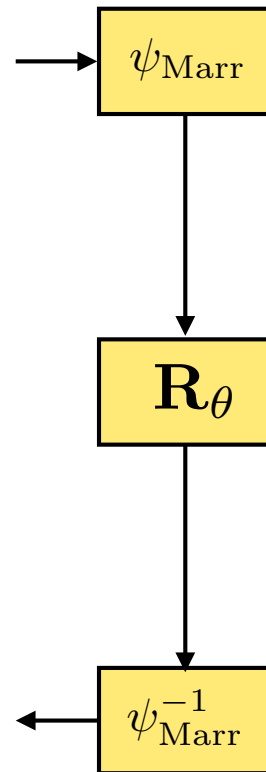
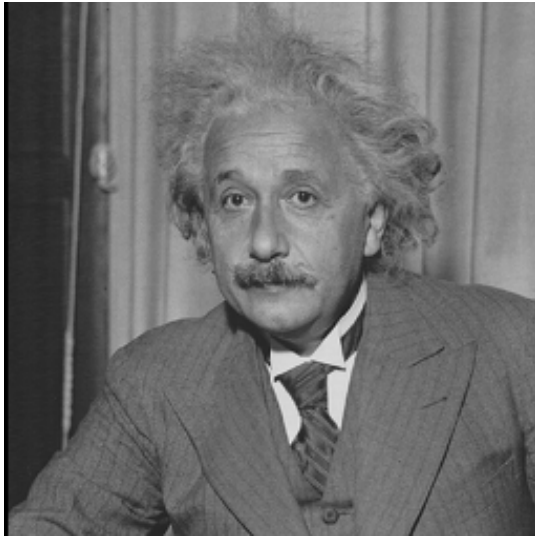
Marr-like wavelets



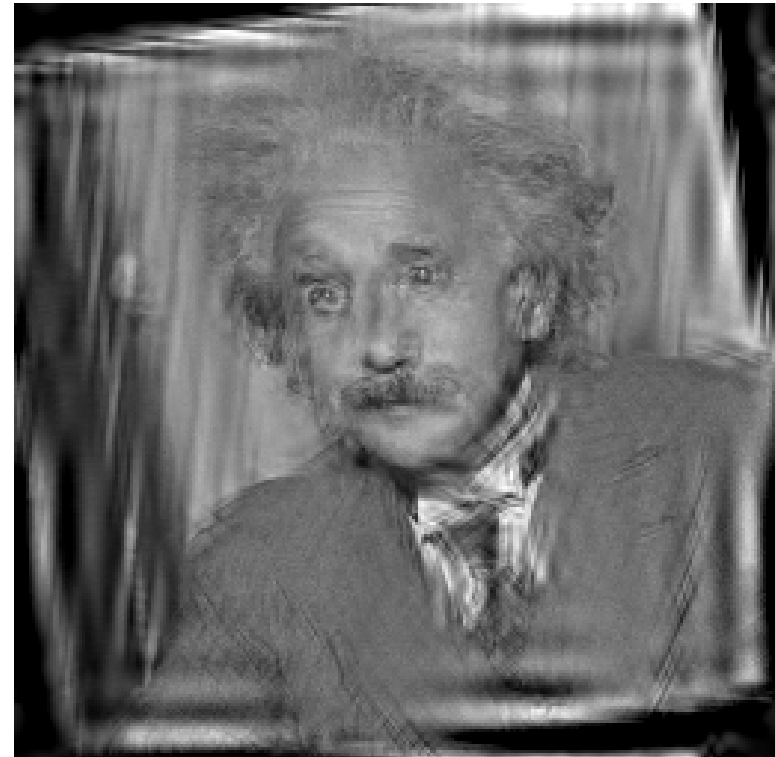
$$\psi_{\text{Marr}}(\mathbf{x}/2) = \Delta \left(-j \frac{\partial}{\partial x_1} + \frac{\partial}{\partial x_2} \right) \{\beta_6\}(\mathbf{x})$$



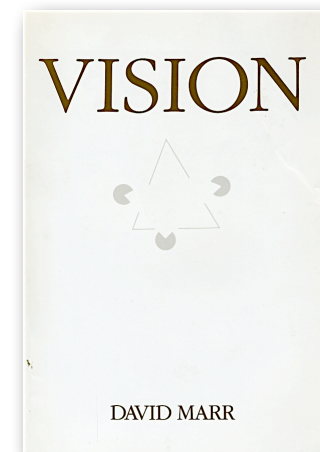
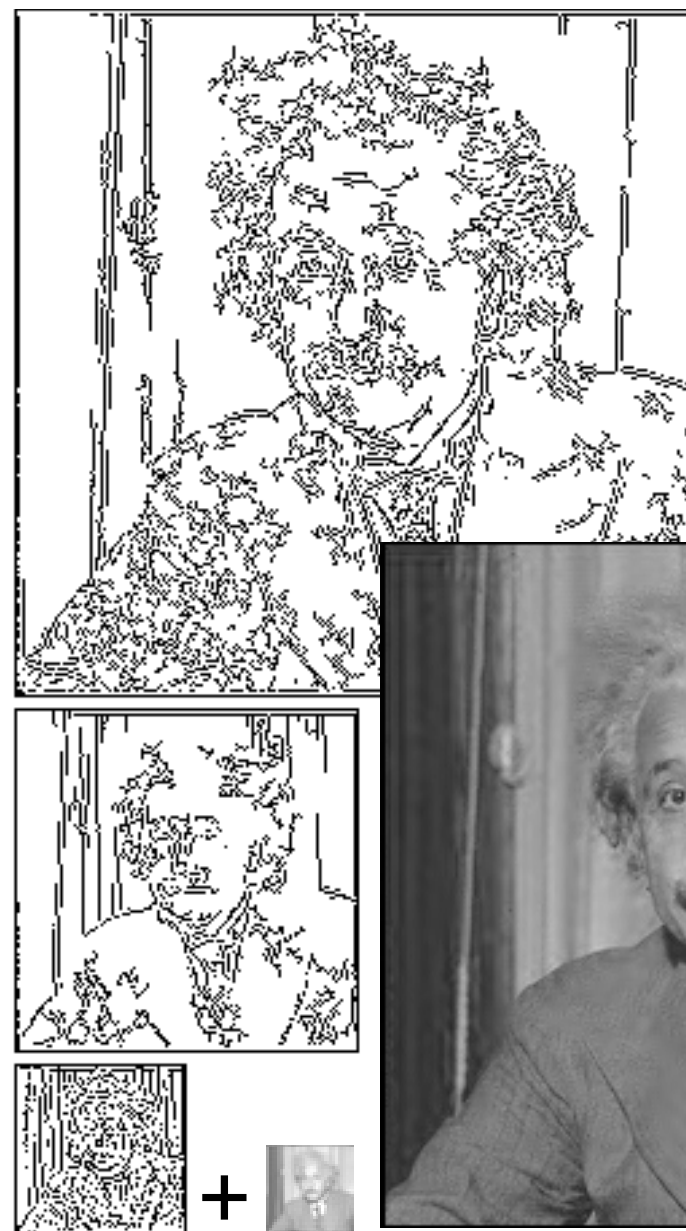
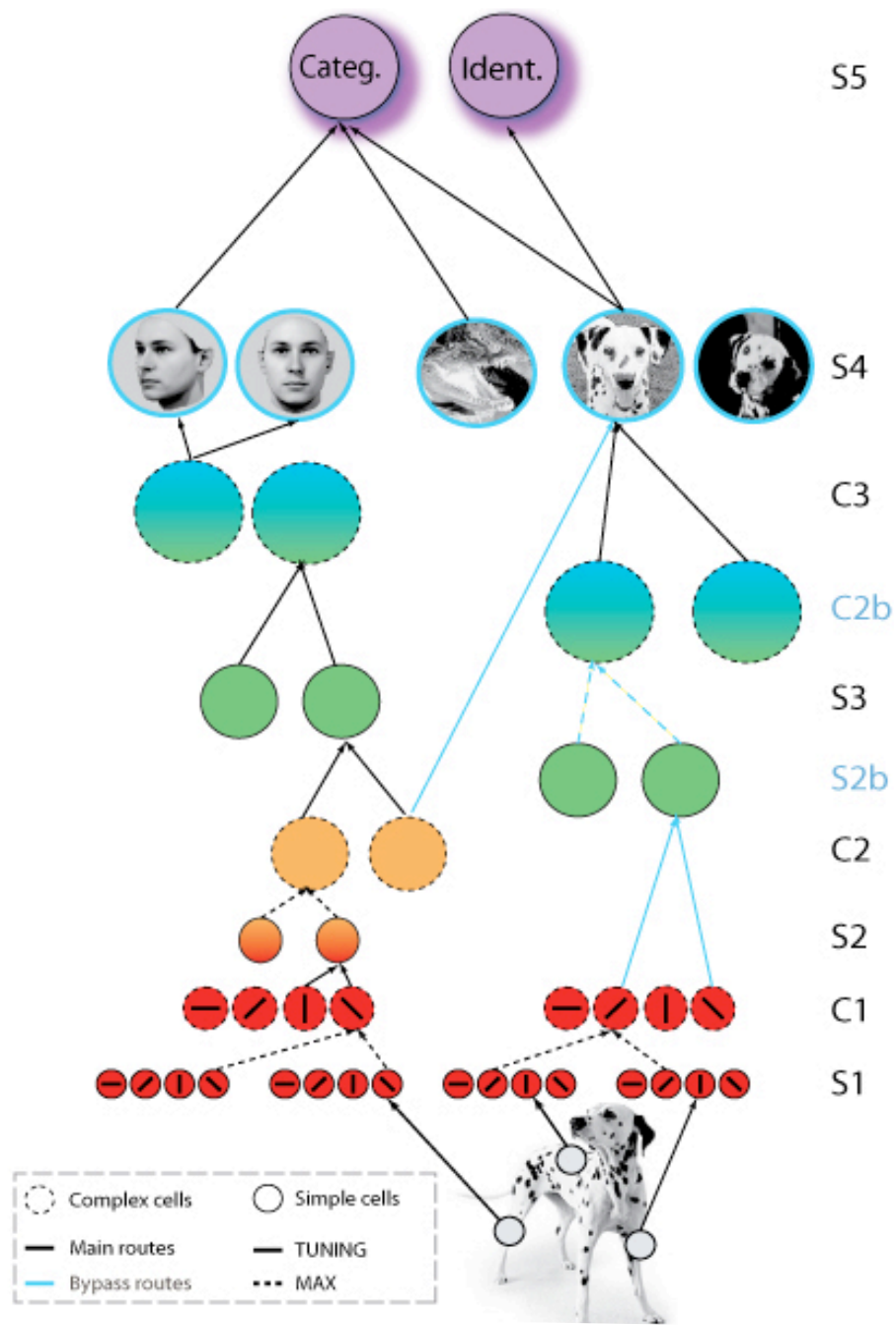
Marr-like wavelets



Don't try this at home!
(using separable wavelets)



Marr primal sketch



DAVID MARR

(after 20 iterations) PSNR=34.2dB

Wave
2006

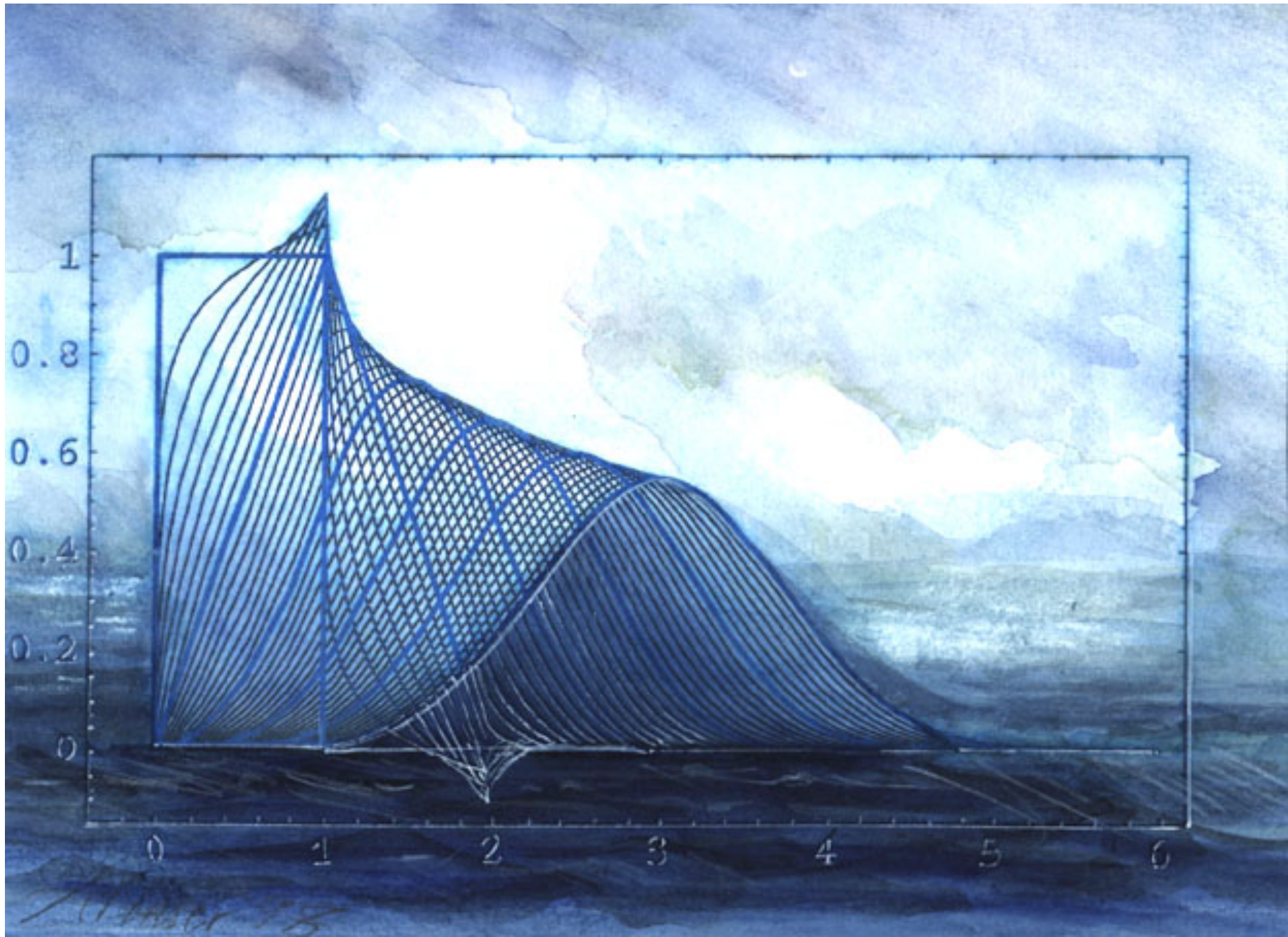
Wavelet Series Conferences

- ▶ Godfathers
 - ▶ Michael Unser
 - Akram Aldroubi
 - Andrew Laine
- ▶ Since 1993

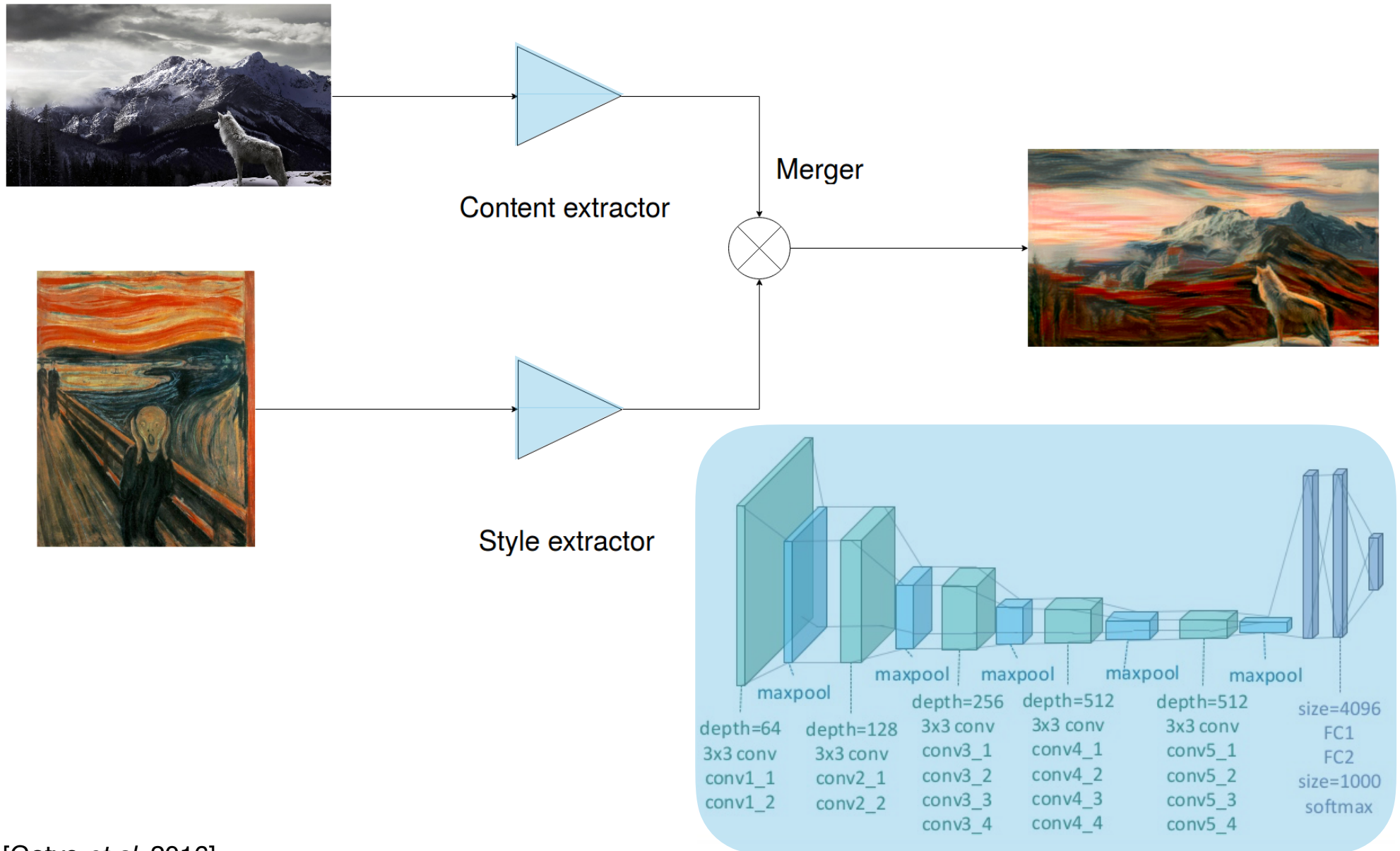


$$f(t) = \sum_{m \in \mathbb{Z}} 2^{-m/2} \sum_{n \in \mathbb{Z}} \langle \psi, 2^{m/2} \psi(\cdot - n) \rangle$$

Making a connection between splines and art



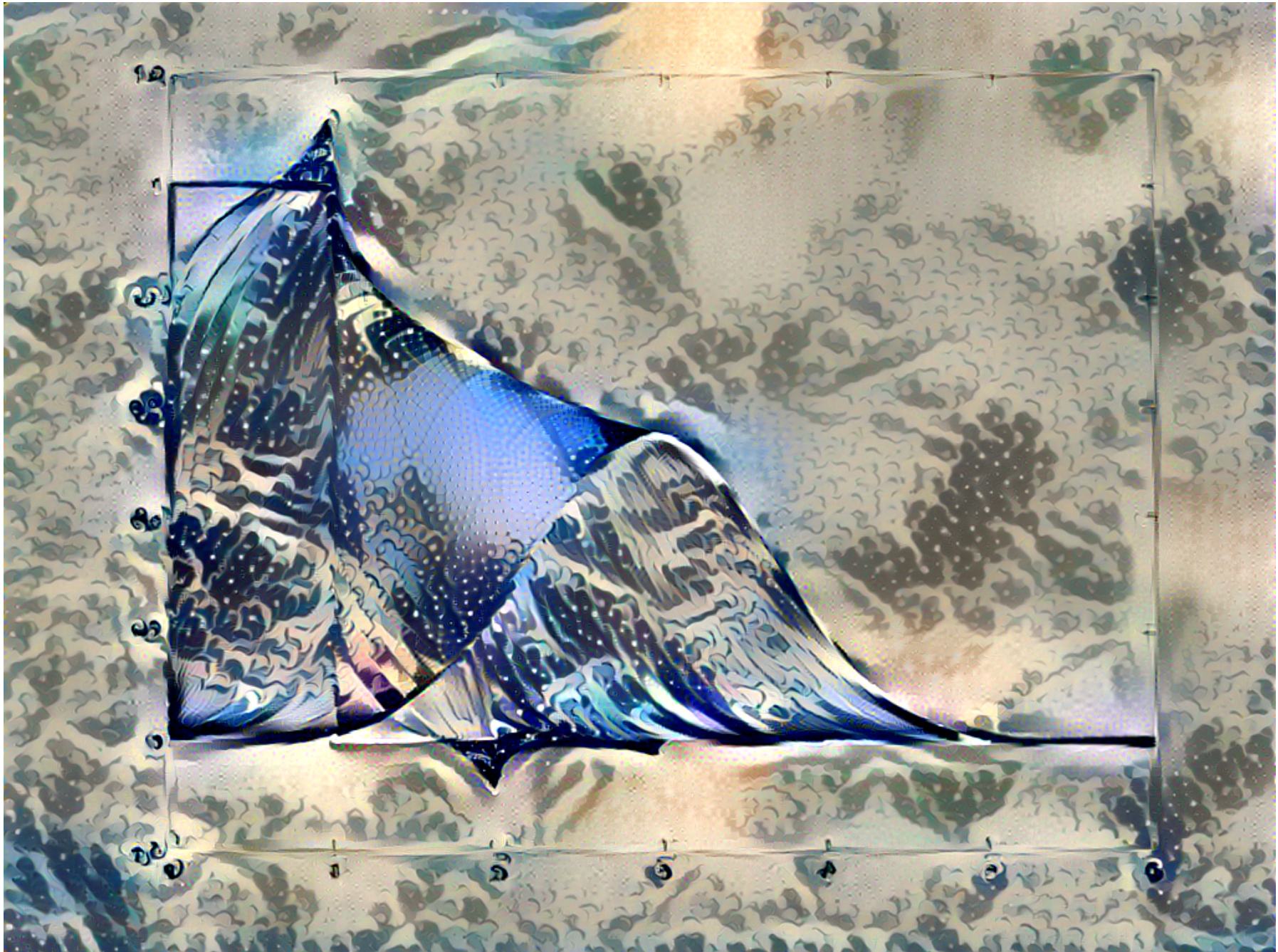
Neural style transfer



Splines à la Klee



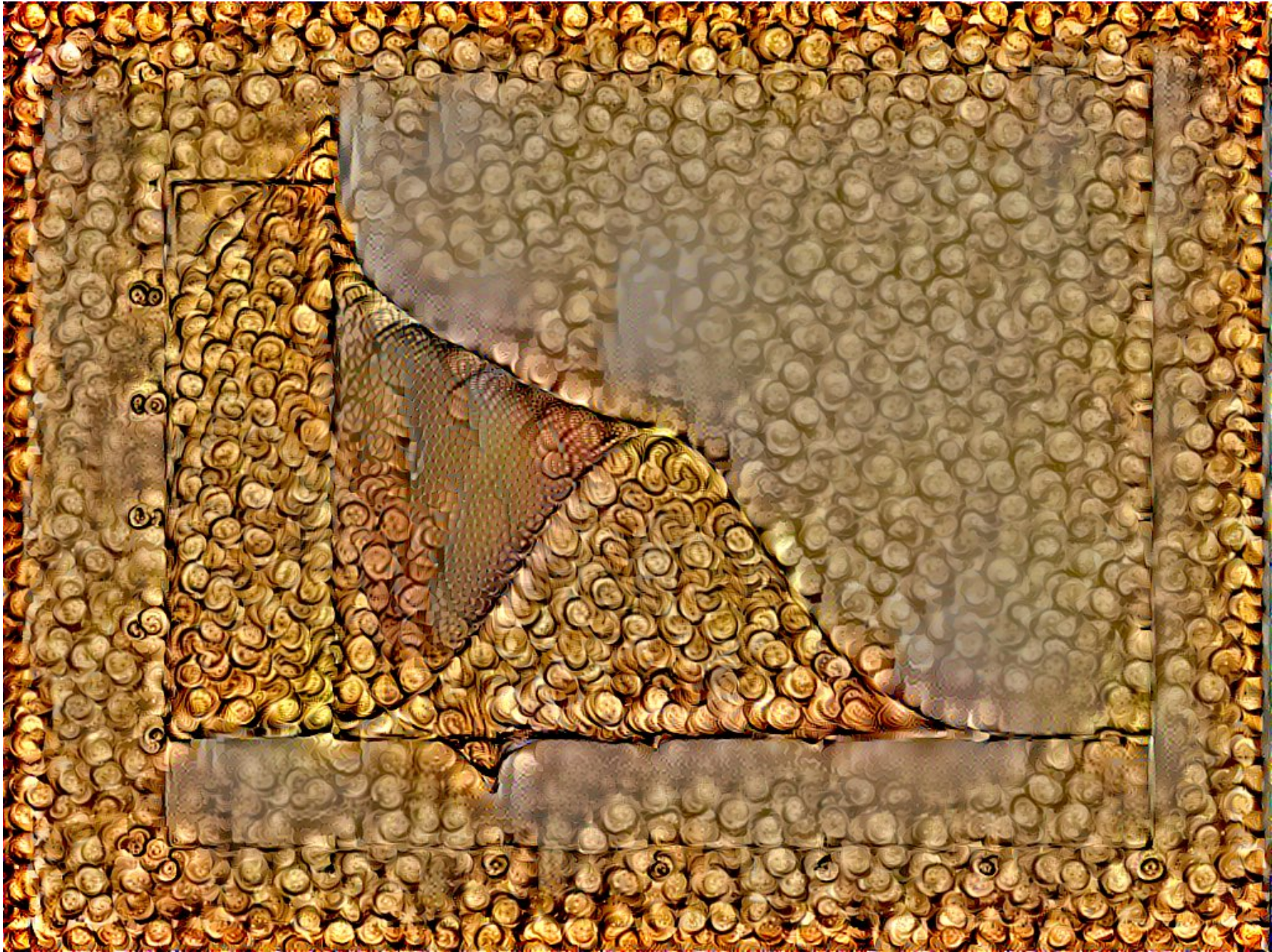
The BIG wave



Picasso splines



Forget about bitcoins... Spline coins!





ONE MORE THING

A final message from your dearest students!





Spline birthday cake