

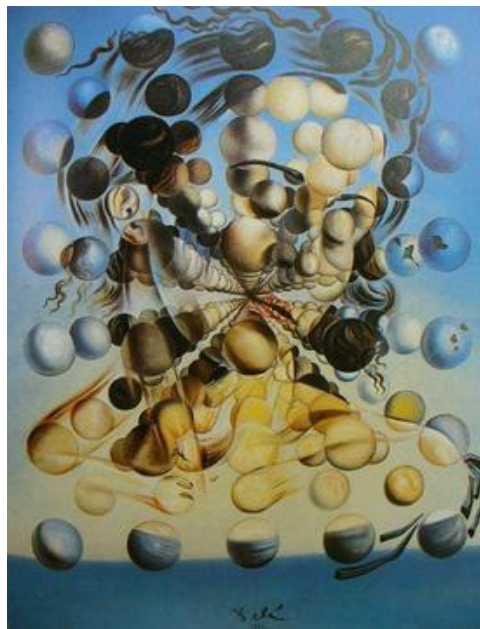
**"Film & Anti-matter:
Perspectives for
a New Metaphysics
of Digital Cinema"**

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"In the surrealist period, I wanted to create the iconography of the interior world – the world of the marvellous, of my father Freud. I succeeded in doing it. Today the exterior world – that of physics – has transcended the one of psychology. My father today is Dr Heisenberg."

Salvador Dalí (from his "Anti-Matter Manifesto"¹)



"Galatea of the Spheres" by Salvador Dalí

¹ <http://www.ngv.vic.gov.au/dali/salvador/resources/daliandscience.pdf>

The architect and sculptor Polycleitus the elder (approx. 5th century BCE) used geometry to calculate the correct proportions of the human body to create symmetrical statues that mirrored the natural forms of humankind. He prescribes in his "Canon" that the way to calculate the proportions of the ideal male nude should be based on the ratio $1:\sqrt{2}$ ². Thus mathematics *married* the arts long before the advent of Renaissance. Some 2500 years later, fractal geometry played a pivotal role at the birth of computer generated graphics, when developer Loren Carpenter (now chief scientist of Pixar Animation Studios) discovered that he could create realistic landscapes on his computer screen using Benoit Mandelbrot's principles for fractal composition³.

At birth cinema spoke an organic language. The so called natural light was harnessed by cinematographers to register images with film, through a process that seems to have had similarities with the way in which painters like Caravaggio and Vermeer created their pictures (the history of Western painting is closely intertwined with the history of optics, according to the Hockney-Falco thesis⁴). But film as we learned it once (celluloid based optics) is a non-existent

medium today. Digital Motion Pictures talk a completely different language: physics and mathematics. Yet there seems to be very little

*"These lines of light
endow luminous
"Matter" with such a
penetrating force, such
Punctiform virility that
only knowledge can
attempt to understand,
only creative research
can attempt to
represent, only love
can attempt to fully
satisfy".*

*Vittorio Storaro / from
his book "Writing with
Light"*

² https://en.wikipedia.org/wiki/Mathematics_and_art

³ <https://www.youtube.com/watch?v=ZbK92bRW2lQ>

⁴ <https://wp.optics.arizona.edu/falco/art-optics/>

or no awareness about the necessity to integrate science as a branch of filmmaking studies for both artistic and practical purposes.

I am not proposing that neither we nor our students become pupils of science as such, but I deem it essential that we master its most important breakthroughs, especially in a time when those same breakthroughs are having an exponential impact on the new cinematic technology - and also on the lives of human beings all over the world. To have a profounder understanding of relativity, quantum physics, DNA and biotechnology would not only increase our awareness of the medium with which we are producing our films today: it would provide us with a metaphysical consciousness that could perhaps expand the language of digital cinema narrative into the realm of the multiverse (aka parallel universes). Cosmologist Max Tegmark has said that "our world has only mathematical properties"⁵, using video games and digital photography as analogies. A digital photo looks like the image it replicates, but when we zoom in we realize that it is really a field of pixels, with each one representing a set of three numbers that specify the amount of red, green and blue of every individual area of the picture.



(Still from the film "2046" by Kar-Wai Wong)

⁵ <https://www.youtube.com/watch?v=8mve0UoSxTo>

Now, if we look at soft-body dynamics, a physics engine (computer software) that allows us to create realistic imitations of both fabric and human muscles, we learn that this system uses Newton's Second Law of Motion, combined (in some cases) with variants of Hooke's laws, just to name a couple of principles of physics applicable to special cinematic effects⁶. This is not so strange considering that any given virtual imitation of our world and the way in which things move through space-time can only be replicated by the same set of laws that run it. Real-time physics simulation programs like Bullet (recently awarded with a scientific Academy Award), Maya (3D animation and modelling⁷) and Digital Molecular Matter (developed by Pixelux Entertainment to generate realistic destruction and deformation effects), are the advent of what might become the future of cinema: 'films' fully programmed and created using nothing but software (algorithms), engineered from start to finish to an extent unknown to us today (thus I am not envisioning the 'demise' of cinematography only, but also that of both acting by actors and of directing, all at the hands of biophysics, synthetic DNA and quantum computing!).

⁶ https://en.wikipedia.org/wiki/Soft-body_dynamics

⁷ <https://www.oscars.org/news/21-scientific-and-technical-achievements-be-honored-academy-awardsr>

This might sound like a tragic vision to some, but the *truth* is that technology will make it easier for us to create films without the need of either producers or the heavy machinery of studios. There is a trap however: the danger of approaching the new medium through its spectacular nature of endless possibilities, which is what I believe we see today, rather than approaching its *underlying nature*

(math, physics, DNA), which I propose might be the key to gain a new metaphysical understanding of our human essence.

"All perceptible matter comes from a primary substance, or tenuity beyond conception, filling all space, the akasha or luminiferous ether, which is acted upon by the life giving prana or creative force, calling into existence in never-ending cycles, all things and phenomena"
/Nikola Tesla

Artists like Leonardo da Vinci, Johan Sebastian Bach, Salvador Dalí (whose scientific libraries are well documented), and Pablo Picasso acknowledged in various ways the impact that science had on some of their creations. The latter is known to have been influenced by the French scientist Henri Poincaré's "Science and Hypothesis", published in 1902⁸, a scientific work that might have pushed Picasso's thinking as to how to portrait the fourth dimension (e.g. "cubism"). Conspicuously, the same essay made an impact on another iconic figure of the 20th century, Albert Einstein, who read the work before he developed his theory of relativity in 1905, a theme that was explored to some extent in the film "2001" by Stanley Kubrick.

The Renaissance thinking trained our minds to pursue the artistic interpretation of a three-dimensional reality, but since Einstein and Bohr, reality has become a multi-dimensional complexity. The

⁸ <https://www.theguardian.com/science/blog/2012/jul/17/henri-poincare-einstein-picasso>

continuous flow of new scientific knowledge should have a profound impact on the streams of thought that dominate our industry, not only when it comes to generate technology, but also by increasing the analogy between art, science and spirituality (yoga) at the most fundamental levels of education and creativity. What we see today are societies where the streams of thought are increasingly dominated by technology. What we should see, in my opinion, is the part that digital filmmaking can play by channelling a higher level of consciousness of digital-metaphysics to the public.

Today there is no apparent need for film students to know anything at all about mathematics or any of its branches, even though our medium has evolved from organic celluloid to a complex system of digital codes. Math is now the primary language of all media, throughout pre-production to distribution, but it seems to me that the three-dimensional thinking of the Renaissance is still somehow prevalent in the era of the multiverse.

*"The cinema that
I grew up with
and that I am still
making, is gone.
/Martin Scorsese*

(Source:
<http://www.cnsnews.com/news/article/martin-scorsese-cinema-gone>)

Jim Al Khalili, professor of Quantum Physics at the University of Surrey, has wisely stated that "a lamp of clay can be used to write a poem on, molecules of air can carry the sound of a symphony and a single photon is like a paintbrush. Every aspect of the physical universe can be used as a blank canvas, which we can use to build beauty..."⁹. For the time being we are using bits (aka binary digits) to make films. In the near future we might be using quantum computing and/or synthetic DNA. None of the above are just new means to make films: each one represents a new way of thinking and feeling the

⁹ <https://www.youtube.com/watch?v=833I2EaNGUs>

world that surrounds us. To match this requires new streams of thought and a completely different approach to our current pedagogic values.