

the Analytical Scientist

Upfront

How to unravel art with SORS and microscopy

08

In My View

Black-box data analysis for spatial metabolomics

12 – 13

Out of this World

A curious selfie from the surface of Mars

43

Sitting Down With

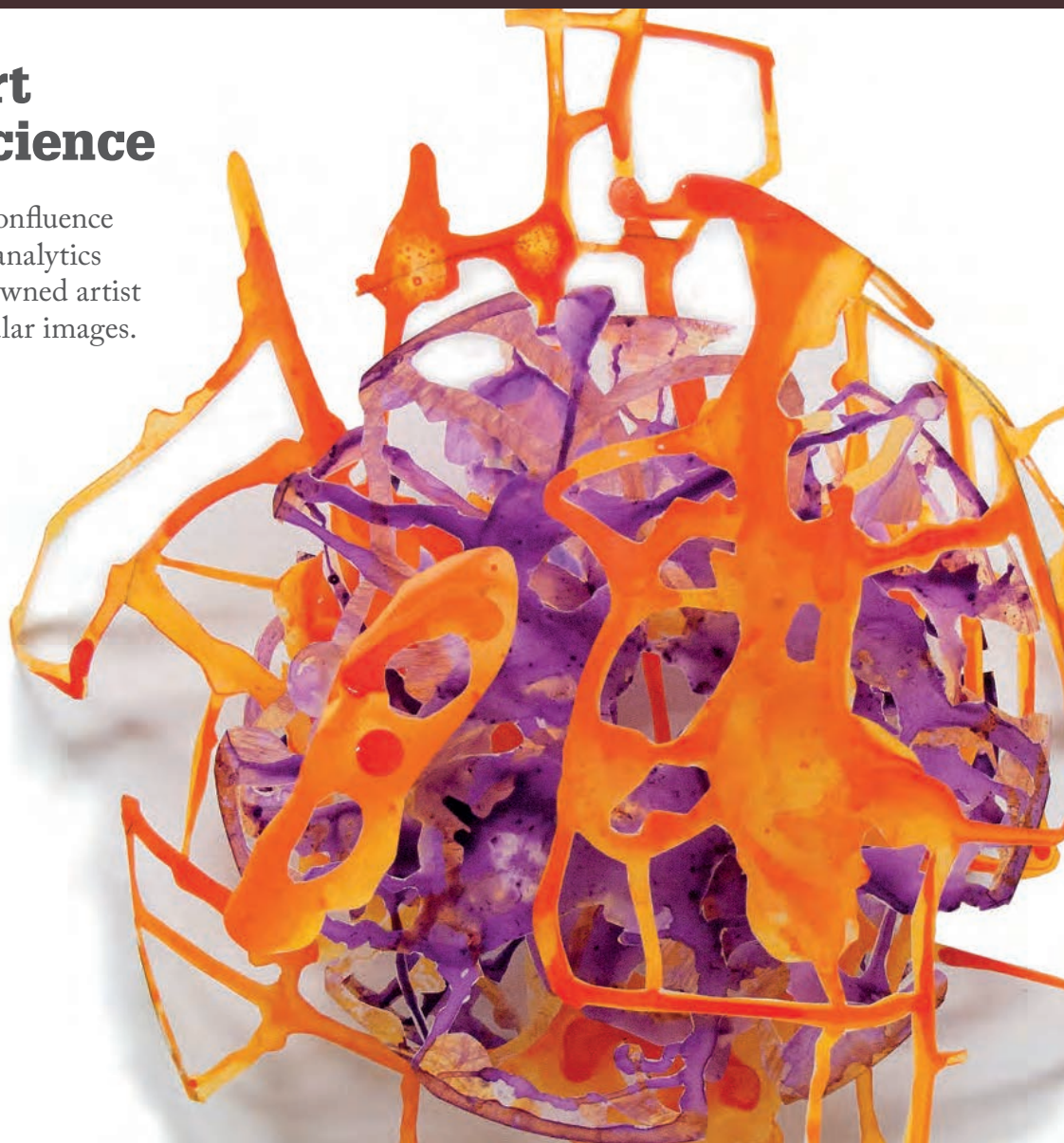
Multidimensional champion Jean-Marie (John) Dimandja

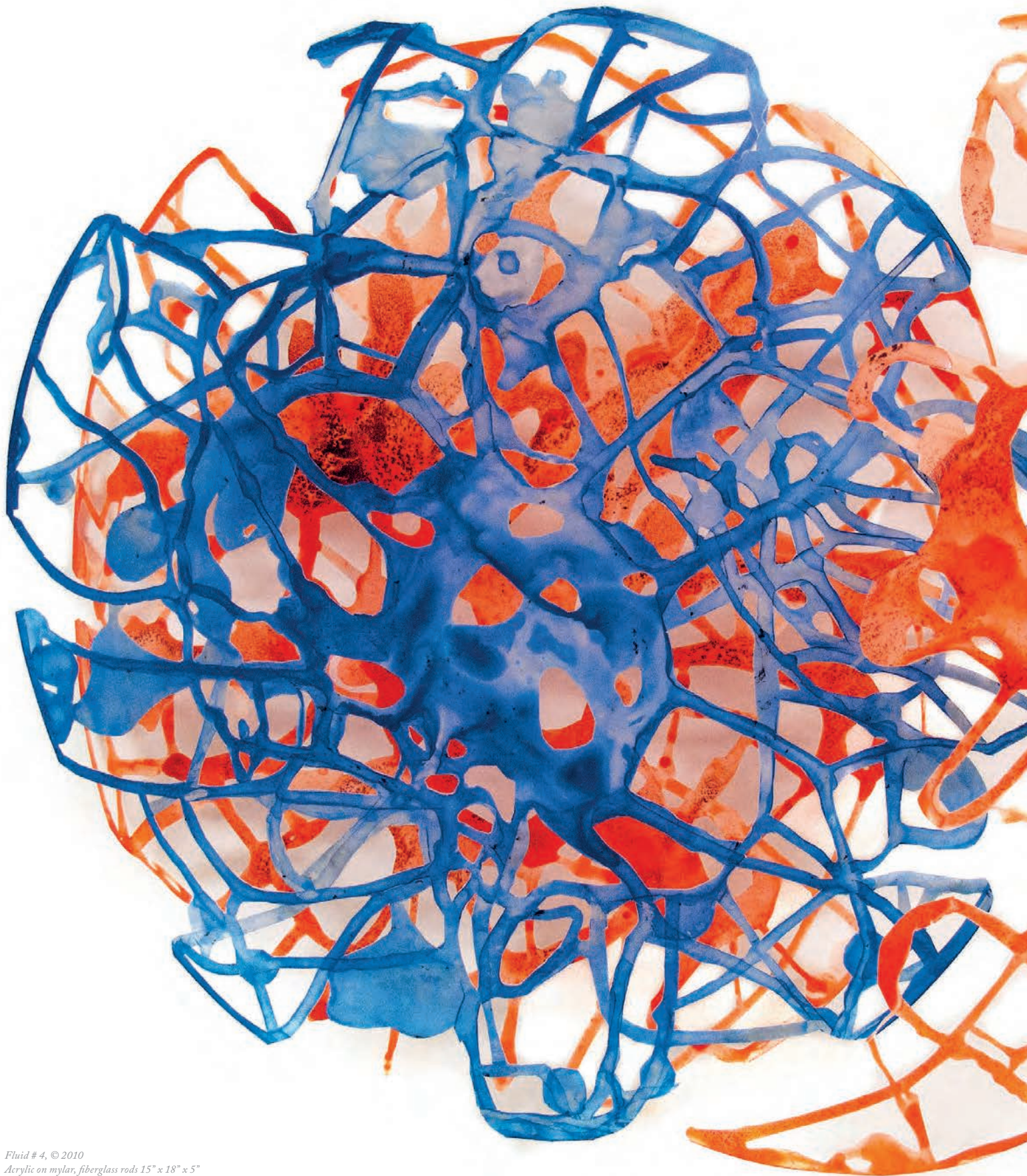
50 – 51

When Art Meets Science

Celebrating the confluence of aesthetics and analytics with a world-renowned artist and your spectacular images.

20 – 45





*Fluid # 4, © 2010
Acrylic on mylar, fiberglass rods 15" x 18" x 5"*



When Art Meets Science

Welcome to our second foray into the fascinating confluence of aesthetics and analytics, where we celebrate the wonderful and diverse world of analytical science by sharing your spectacular images.

22-25

The Invisible Becomes Visible

We interview Rebecca Kamen – the world-renowned artist who re-imagines and visualizes complex scientific knowledge and the process of discovery.



27-31

In Our Environment

From Mount Etna to biodiversity hotspots in Brazil to the bottom of the ocean floor, analytical scientists have an insatiable need to explore our big, wide world – and our impact on it.



33-37

In Our Bodies

Despite the fact that scientists have been investigating the human body for centuries, many mysteries remain – as does our desire to truly understand, diagnose and treat disease.



39-41

In Our Food

The last few decades have seen an explosion of public interest in food safety. Analytical science is at the very heart of securing our increasingly complex – and corrupt – supply chain.



43-45

Out of this World

We go on both literal and figurative journeys “out of this world” – with photographs beamed many million miles from Mars and Pluto, and to the lab that time forgot with urban exploration.

The Invisible Becomes Visible

World-renowned artist Rebecca Kamen re-imagines and visualizes complex knowledge and the process of discovery – an approach that explores the nexus of art and science in a unique and beautiful way.

Scientific analysis factors greatly in the creation of Rebecca Kamen's work. Through her research into various fields of science and by working closely with scientists, Kamen analyzes what she understands and communicates her observations and discoveries through exciting forms of art.

When did your fascination with science and discovery begin? I fell in love with discovery as a young girl. With awe and wonder, I spent much of my childhood investigating the world of elements with a simple chemistry set, and used it to create elaborate science-fair projects. Insatiable curiosity and a deep love of learning created bridges between seemingly unrelated disciplines. As a result, I have devoted my life to an intuitive examination of properties that overlap from discipline to discipline. I remember the thrill when my first cardboard telescope magically connected me with the cosmos, and can still summon my feelings and fascination as I continue to explore its matter and meaning. These discoveries have inspired me to use my artwork to make the invisible visible, connecting common threads that flow across various scientific fields to capture and re-imagine what scientists see.


How can art help explain scientific concepts, principles and processes?

Art enables people to visualize something through different eyes. If, for example, you change a lens on a microscope or a telescope the instrument will reveal something new. A macro lens, for instance, will reveal more detail. When any discipline is able to view something through a new pair of eyes – or apply a

new way of thinking – discovery happens. That's certainly been true in my work, as I don't have any formal scientific training. I am an extremely curious person and fascinated with discovery in all fields of inquiry. I create work that is inspired by various fields of scientific research that many think aren't accessible to them. I like to tackle serious subjects, such as the periodic table of elements – something that would typically make people glaze over; when I tell them about my journey of discovery, they perk up. Essentially, I'm providing a new lens for people to look through, perhaps so they can understand something that they previously could not see.

How do you immerse yourself in a topic?

I spend a great deal of time talking to scientists and I research many rare books that record the history of science; they help me to understand the genesis of a discovery. And those historic discoveries explain what we now know in the 21st century. The history of science also provides a sense of a personal narrative; it's one of the significant ways we connect to other human beings through telling stories. For example, my research on general relativity reveals that Einstein began envisioning his theory when he was 14 years of age; wondering what it would feel like to ride on a wave of light. Einstein's "gedankenexperiment" – thought experiment – brings more meaning to his scientific discovery because people can appreciate that general relativity was something he originally thought about as a teenager. I also work with metaphor and try to make my art visually poetic, so people can see it and understand it in a way that is much more accessible to them.



“Rebecca Kamen has great passion for the science and artifacts she studies and her curiosity leads her to transcend her point of origin, producing a response that both surprises and delights. Her creative process is akin to that of the natural philosopher whose scientific investigations sought correspondence rather than differentiation, as do today’s scientists.

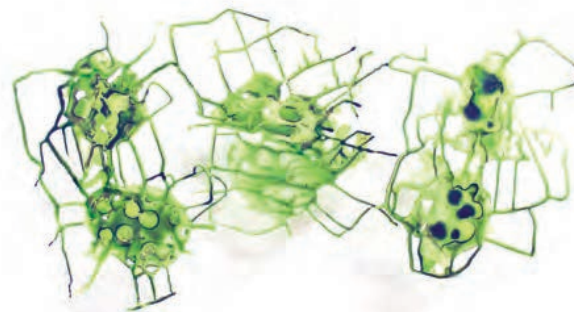
Rebecca practices imaginative participation, seeing layers of relationship that broaden rather than narrow consciousness. She has the capacity to access a wide variety of human thoughts, hopes, beliefs and yearnings embedded in complex scientific artefacts.

Rebecca has a gift for bringing out the spiritual dimension of science.”

– Marjorie Gapp,
Curator of Art and
Images, Chemical
Heritage Foundation,
Philadelphia, USA.



Fluid # 6, © 2010
Acrylic on mylar, fiberglass
rods 17" x 13" x 6"



Fluid # 1, © 2010
Acrylic mylar, fiberglass
rods 12" x 23" x 3.5"

How did you get interested in dynamics?

I've always been interested in movement and dynamics. I grew up in Philadelphia but I spent my summers in Atlantic City (New Jersey), and I think those seeds were sown while walking on the beach, watching the movement of the ocean, and wondering about how things orbited the earth in space. Another example comes from when I was an artist in residence for the US National Institutes of Health's neuroscience program, where I became very interested in the "avalanche effect" (bursts of neuronal activity) in the brain. I found it interesting how things at the micro level in the brain are really a very small-scale version of what we actually experience at the macro level. The new work I'm currently developing is a dialog between inner and outer space, and the dynamics of what happens in both of those realms.

Scientific discovery really seems to inspire you...

As an artist, one of the things that fascinates and excites me is looking at certain natural phenomena, in outer or inner space, through various instruments that enable one to view things in a different way. For example, with electron microscopes, our ability to be able to see things at a minute level is quite humbling. It's so interesting how diverse scientific instruments reveal very different information about the dynamics of a natural phenomenon. Being invited by scientists to view and see what they get excited about is also inspiring.

I'm trying to understand more about my own creative process, now that I've had a little foray into neuroscience, and to discover what's occurring in my brain that enables me to make unique connections. About 15 years ago, I learned that I am dyslexic, which explains a lot about the challenges I had as

a young student. Dyslexia also prevented me from becoming a scientist because I had a difficult time with school tests. But that particular cognitive obstacle turned into an extraordinary opportunity, enabling me to understand the world through making connections. And that contributes to my understanding of how everything in the universe works; I look at one thing and understand how it connects to something else.

You appear to learn intuitively. Does that help with your creativity?

Dyslexic people are often highly creative; we process information in a different way. And we are usually visual people. We learn by creating relationships between forms so that we can understand how things relate to each other. My own ability to see different kinds of relationships – because of the way my brain is wired – enables me to make connections between different scientific fields. When I deliver a lecture to senior scientists, I inevitably get the same response: "You have no formal training in science, so how do you know this stuff?" So, yes – I guess it's intuitive!

I also find it interesting that scientists work on such small parts of a much larger puzzle. It fascinates me that sometimes a scientist in one office will not communicate with another scientist next door because he's doing different research. I am also intrigued that when scientists leave their offices to present research and findings, they do so to other scientists who are doing similar types of work, but no one seems to put all these pieces together. With my work, I embed myself in a diverse range of scientific communities to understand what types of connections exist between areas I've researched already, which creates wonderful bridges between different scientific fields.

Do you believe your creative approach encompasses scientific thinking?

Absolutely! Creativity is about problem solving – and those scientists who I've really connected with are those who are creative thinkers. They tend to be universal investigators; they don't limit themselves to one small area, instead they tend to look at what they are doing in relationship to bigger pictures. Creativity in art and science is really about discovery. I can spend hours in my studio trying to solve a problem conceptually before I physically manifest it. It's like chemistry; the notion of transforming materials.

Before the advent of the camera, scientists were natural philosophers who looked more holistically at nature and the universe, using drawing and painting as a way of capturing and recording their observations. My work re-connects scientists to this original way of seeing and experiencing natural phenomena. I have an innate understanding of science and using my art to interpret scientific discovery fascinates scientists. Several have commented on how the artwork captures the aesthetic aspect of science observed in the complexity of a visual pattern or the beauty found in a series of numbers describing a scientific truth.

Many years ago, I was lecturing to a group of chemists and one of them said, "...astrophysicists have all those beautiful Hubble photographs but as chemists we don't have those kinds of beautiful things." I told the group that they had something even more extraordinary as their field deals with transformation. As a chemist, you may investigate how when chemicals come together they transform into something totally different – and that's beautiful. A chemist emailed me after seeing some images from my "Divining Nature: An Elemental Garden" project on the periodic table of elements. She said, "Thank you. I never thought of what I did as a chemist as being beautiful." Her words struck me because many other scientists that I meet do talk about their work in relationship to beauty – a beautiful equation, for example. There is a wonderful aesthetic sense to science that appears when I'm talking to scientists; because they're conversing with an artist, perhaps it's sometimes okay for them to think about their work or explain their work as being beautiful.

Would you advocate that scientists approach work with a creative and aesthetic eye?

I think that anyone involved in a creative field – which includes all sciences – and anyone who deals with discovery can learn so much more about what they are doing by looking at it through a different lens or field. For example, when I'm creating big projects, like Divining Nature, I include other art forms because using sound or dance to interpret the periodic table provides another way of understanding – and to me that's what we do as artists and scientists; we assist others as well as ourselves on our journey of discovery.



A Portrait of Rebecca Kamen

"I never made a painting as a work of art, it's all research." – Pablo Picasso

Not formally trained as a scientist, Rebecca Kamen presents scientific observations through the eyes of an artist. Her presentations to diverse audiences showcase the unique relationships between art and science, including the importance of patterns in both fields. Kamen has exhibited at the Chemical Heritage Foundation Museum, American Center for Physics, National Academy of Sciences, Science Museum of Virginia, and National Institutes of Health. Below, Kamen shares projects inspired by science.

"Matter Series – a series of complex wire sculptures, inspired by Einstein's ground-breaking research, that explores the relationship of space and time."

rebeccakamen.com/gallery/matter

"Fluid – investigates my interest in nature as a mapping system of energy. Informed and inspired by both micro and macro views of the Universe as well as other scientific visualization models such as fluid mechanics and fluorescence microscopy, these acrylic on mylar sculptures, interpret and make visible, the fluid energy of matter, creating a bridge between art and science."

rebeccakamen.com/gallery/fluid

"Divining Nature: An Elemental Garden – inspired by the orbital patterns of the first 83 naturally occurring elements in the periodic table."

rebeccakamen.com/gallery/divining-nature

"Portal – a sculpture and sound installation informed by gravitational wave physics and black holes, created in celebration of the centennial of Einstein's discovery of general relativity."

rebeccakamen.com/gallery/portal