

THE SAFIRE PROJECT

ELECTRIC UNIVERSE

INTERNATIONAL CONFERENCE & SYMPOSIUM

7th-11th July 2018

SOMERSET, UK

NEW VIEWS OF THE INTERSTELLAR MEDIUM

WITH

DR. MICHAEL CLARAGE

www.safireproject.com

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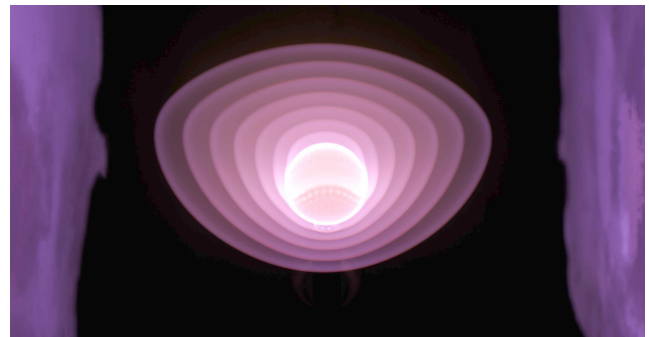
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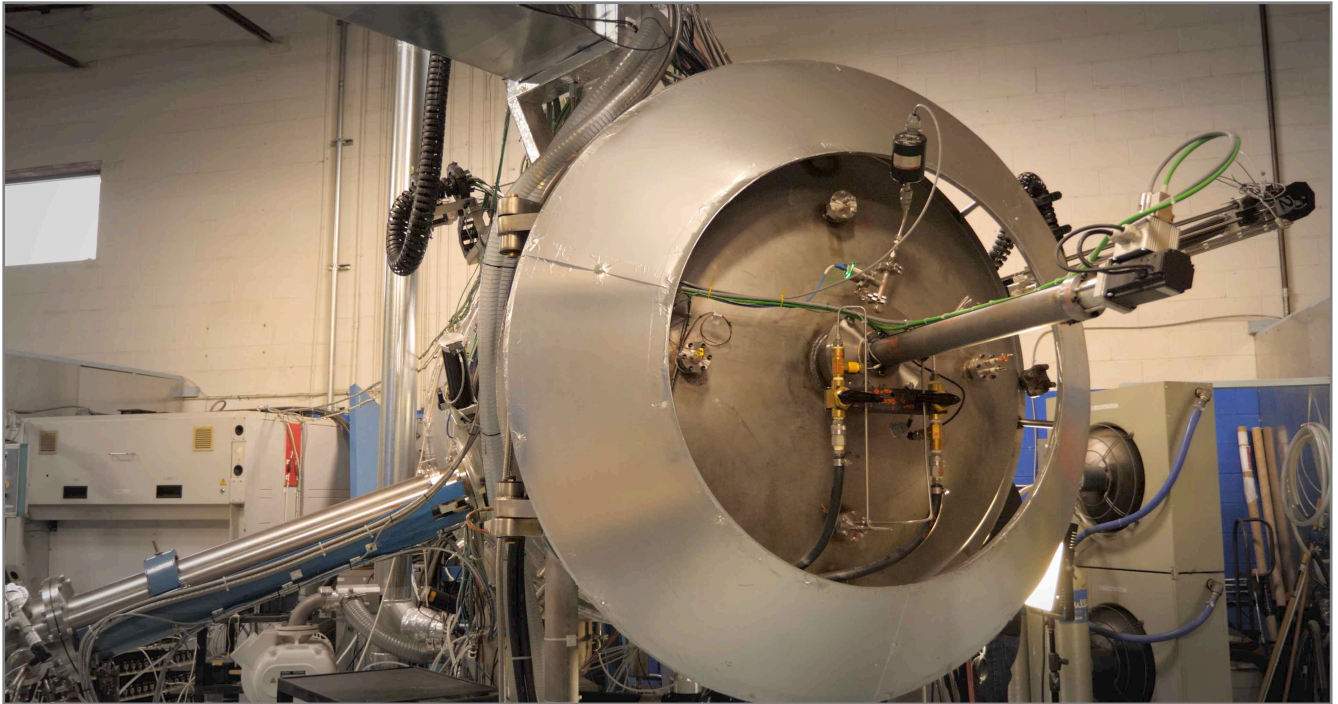
Michael Clamage
New Views of the Interstellar Medium
8th July 2018



One of my jobs on the SAFIRE team is to suggest specific experiments we can do in the lab that can be correlated with satellite and telescope data. In this second talk, I'd like to give you an idea of how I engage in that process.

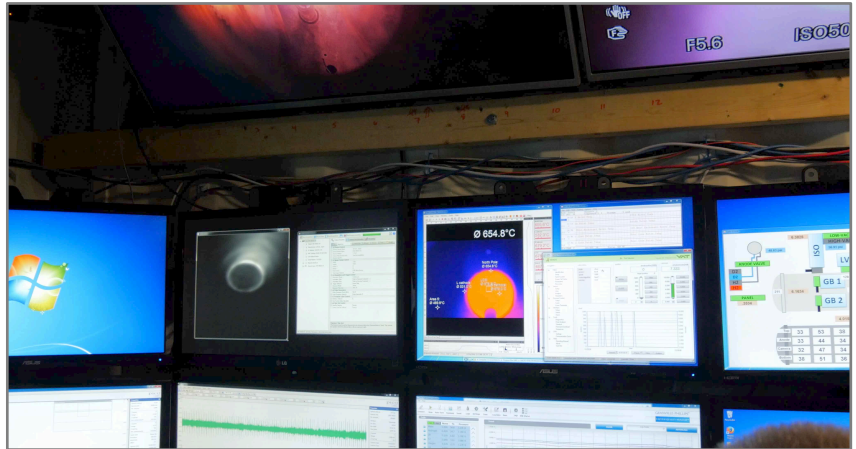


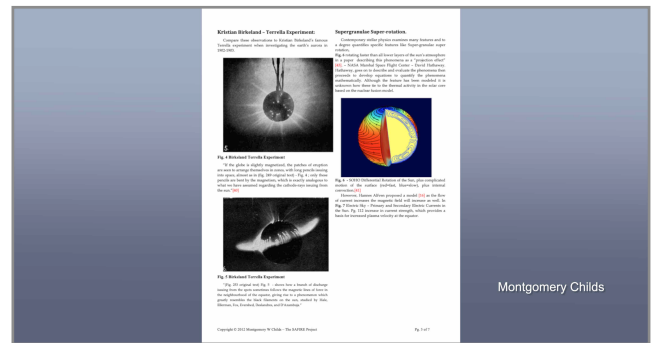
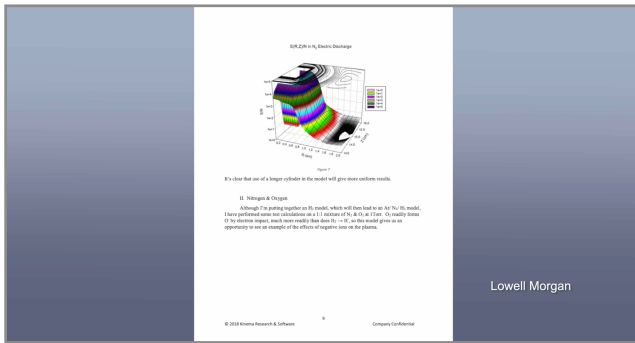
Here's Montgomery Childs introducing hydrogen into the chamber, which produces this, a plasma double layer.



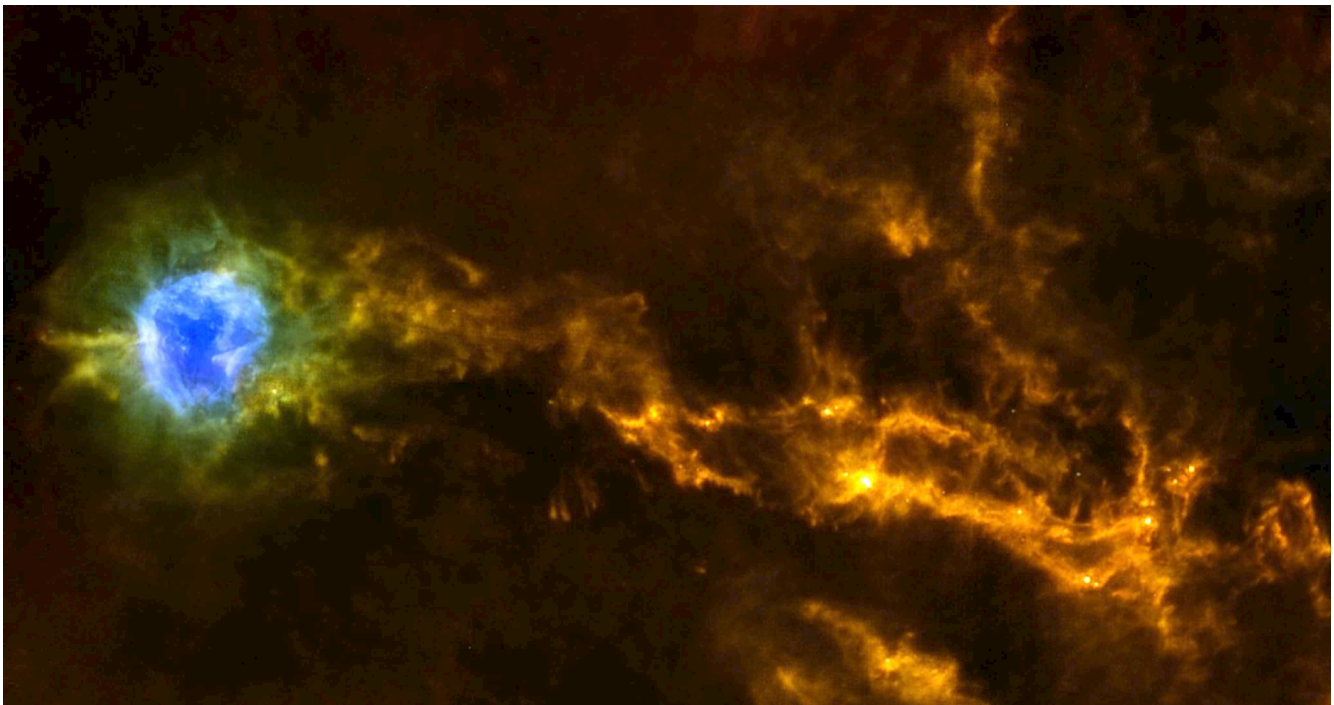
A score of instruments take readings in and around the SAFIRE plasma engine.

The data is fed to computers in our control room, where it is collected, synchronized and catalogued, to be later analyzed and used in writing papers.

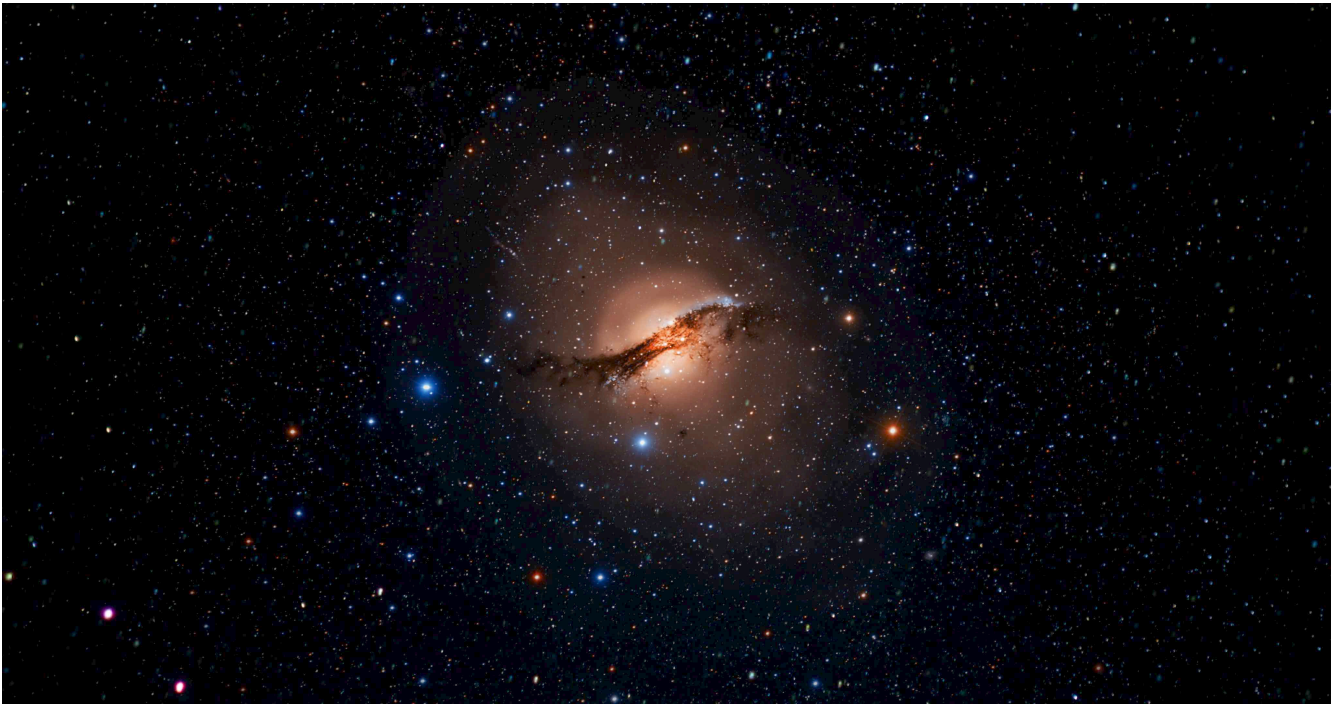




These are pages from one of Lowell Morgan’s papers and pages from one of Montgomery Childs’ papers. At the moment, the team has four additional papers in the works, describing and explaining results of our experiments with the SAFIRE plasma engine. SAFIRE’s mandate is to generate and record events and to collect, analyze, and disseminate data. To this end, SAFIRE has a core team, a review board, and special consultants. Everyone is constantly on watch to maintain a clear demarcation between the theoretical and the empirical and to make sure SAFIRE adheres to the strictest discipline and experimentation and data recording. I believe any lasting contribution of the SAFIRE project is going to be in its raw data and hard empirical evidence.



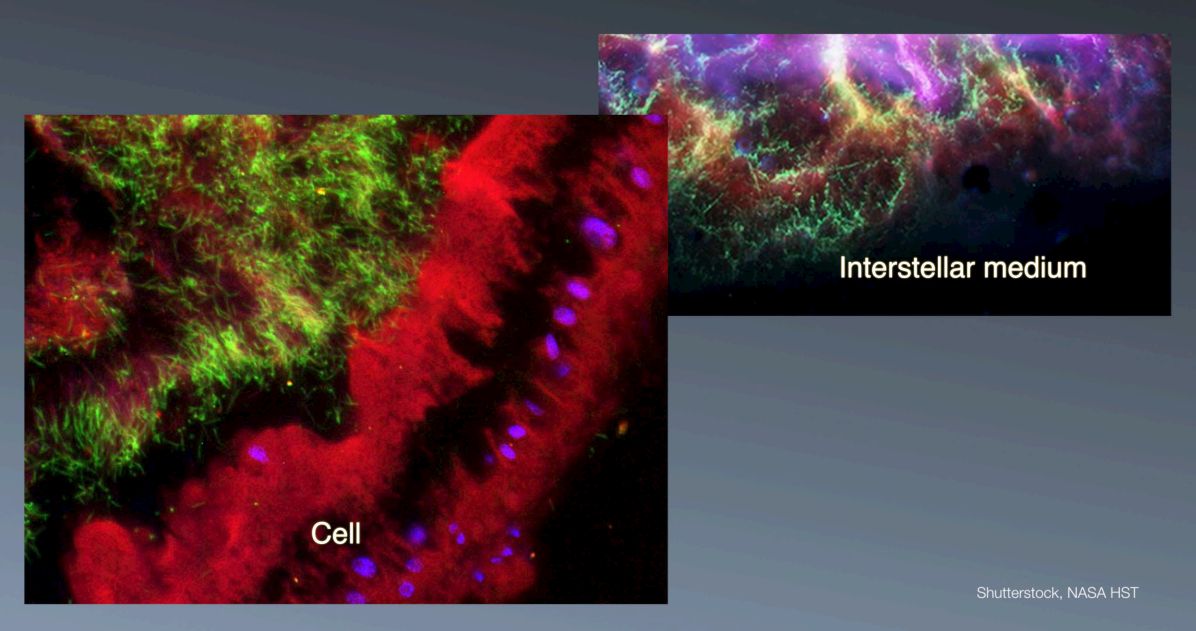
Correlating the data from SAFIRE with the latest data from deep space is not as straightforward as it might sound. The Herschel and Planck millimeter telescopes have sent back new images of our galaxy’s interstellar medium that have many in the astronomical community reeling. It is as if you’re riding along and someone pulls a wheel off your bicycle.



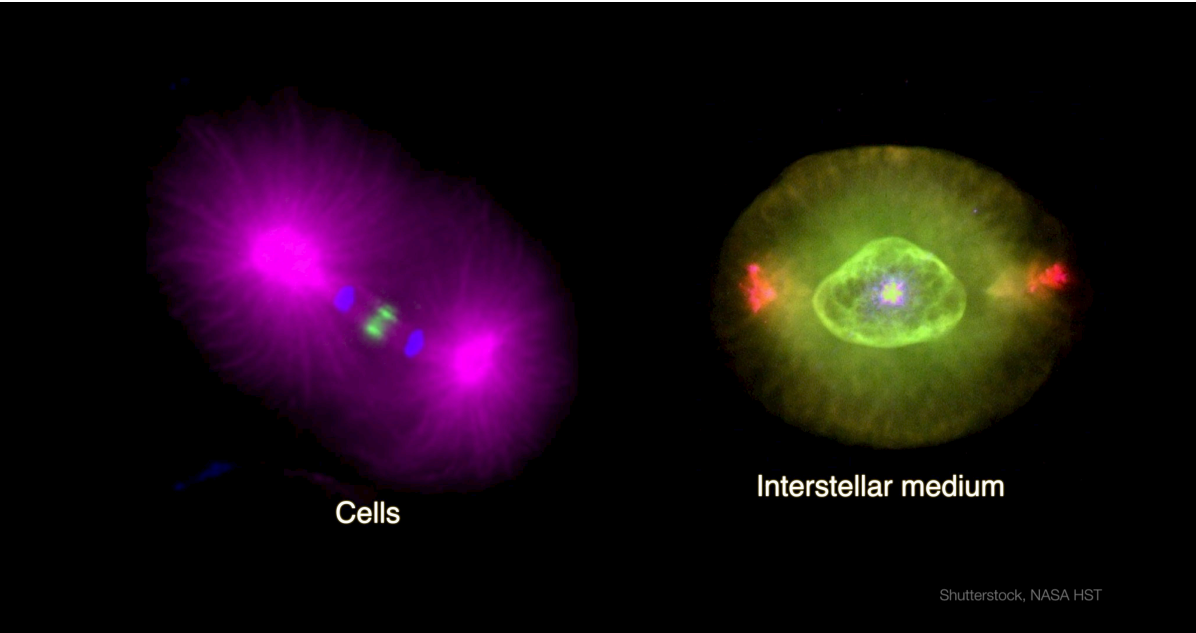
We are struggling to make sense of this data. It simply does not fit with our previous theories. The previous theories need to be abandoned or severely modified. I think we might need new models. Empirical science requires rigorous adherence to strict rules of process and discovery. Developing new models requires a certain freedom of thought, imagination, even speculation, or going deeply into other disciplines to help spark some new insight. This second talk is to offer you a few examples of ways I have sought to understand new astronomical data and to explore the possibility of new models.



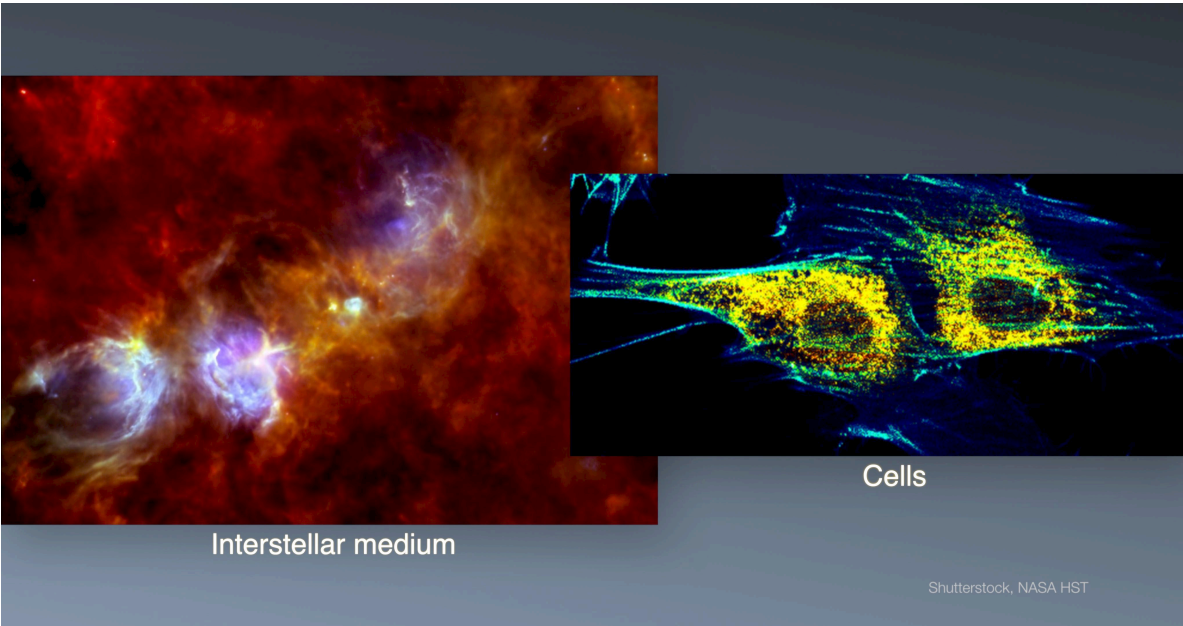
We are at a very exciting time in astronomy. If all goes well, our children's children will say things like, ah, I wish I was there at the beginning of the 21st century when astronomy was being re-written, what was that like? Many of astronomers' pet theories like dark matter, and black holes are headed for the dustbins. And this is partly because of new data coming back from the interstellar medium, from the Herschel and Planck telescopes. As we collect more and more data from evermore awesome telescopes, there's a notable confusion if we are looking at biological images or astronomical images.



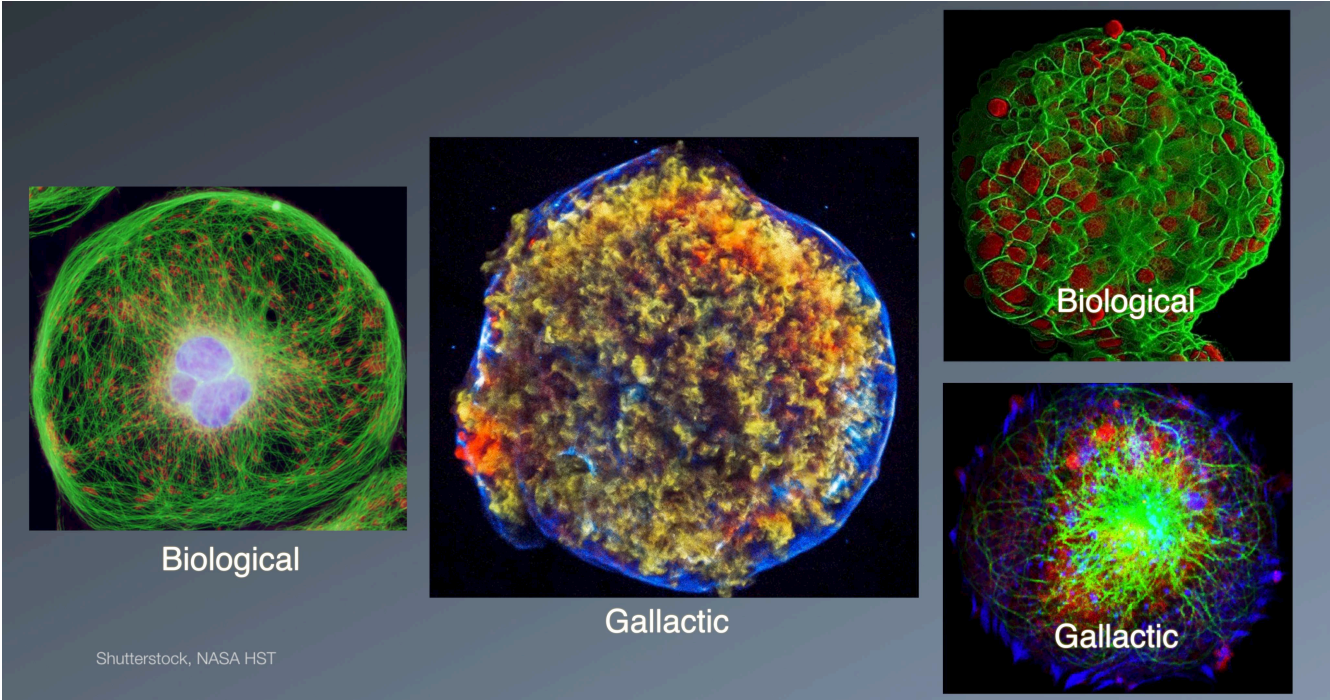
One of these is a micrograph of a cell. One of these is new data from the interstellar medium.



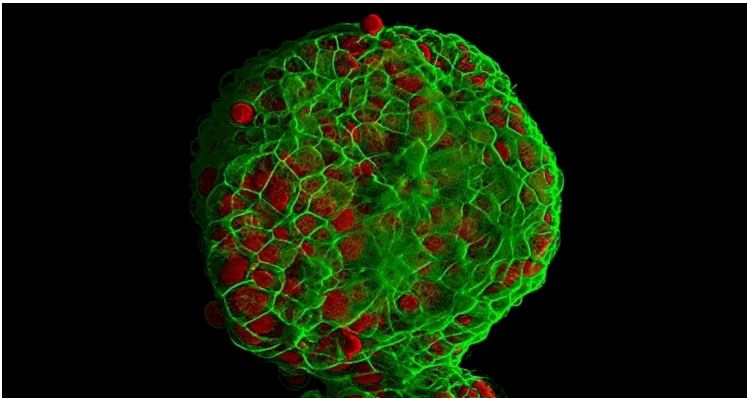
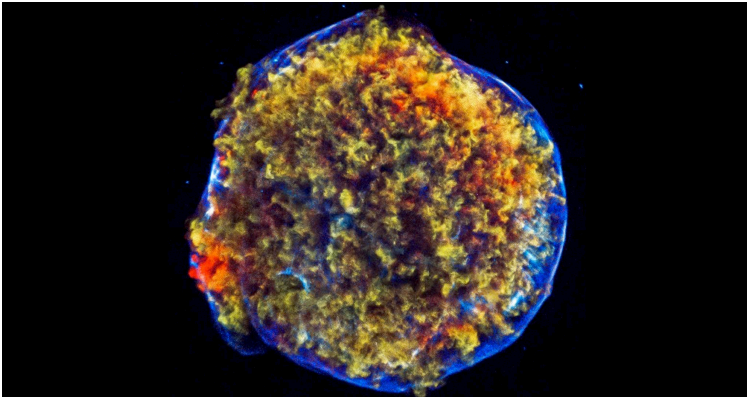
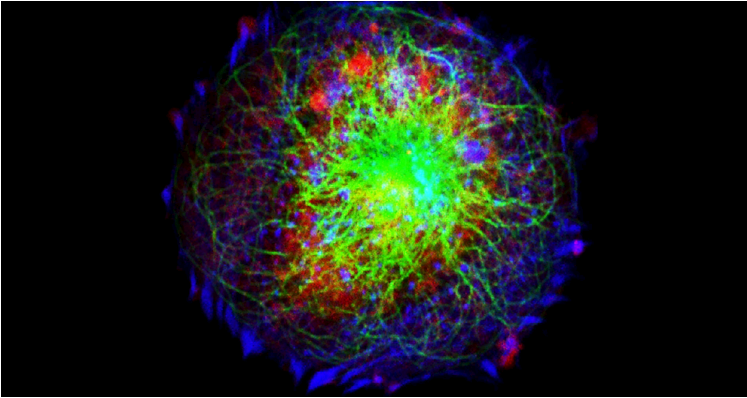
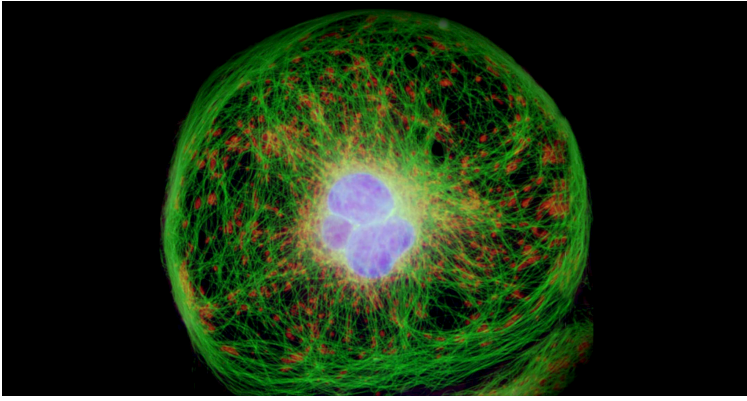
Same, one from interstellar medium, one from the world of cells.



Same thing, interstellar medium, world of cells.



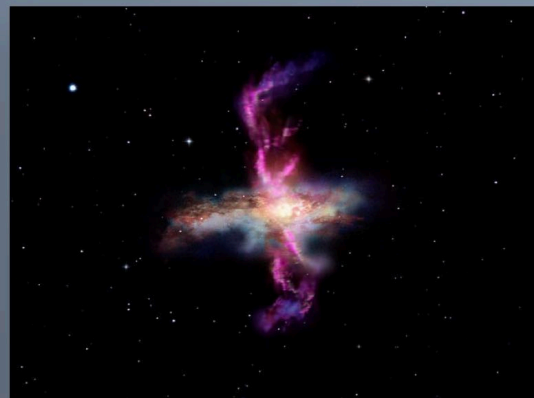
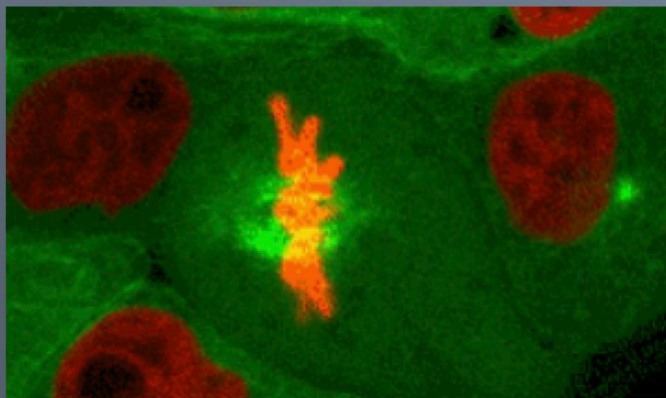
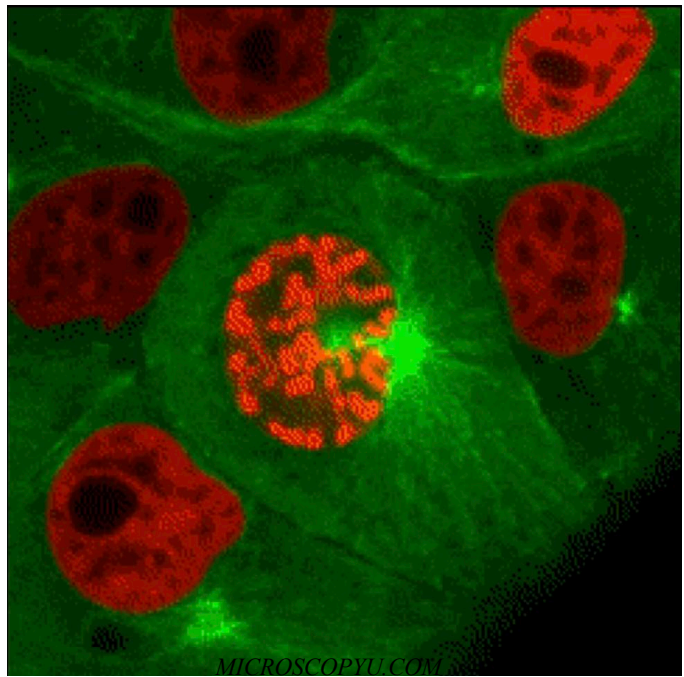
This is my favourite. Two of those are from the world of biology, two our views of something going on in our galaxy.



This is not an accident that they look the same and it's not an artifact of our instruments. The reason these two worlds look so similar is because many ways they are similar. We live in a living universe. The cosmology that we grew up with is dead and I don't mean dead as in "over with", I mean it only talks about dead things. Stars are supposedly dead, galaxies are supposedly dead, the whole universe is supposedly dead and only you and I are alive, only you and I. The profoundness of this absurdity needs to be reexamined.

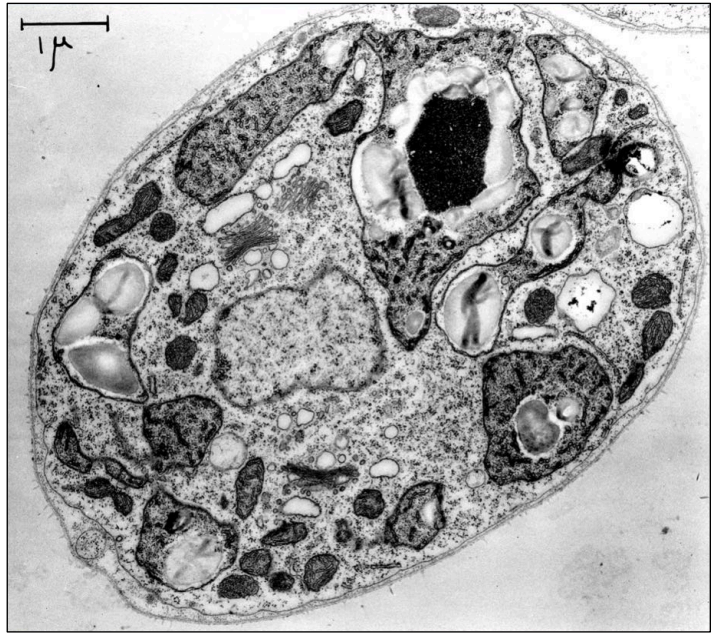
Astrophysics will be stuck until it can acknowledge that the objects it studies are alive just like you and me and our little cells. I knew my cells were alive before anybody showed me a movie of it. I also know that stars and galaxies are alive before anybody shows me a movie of it.

That's mitosis, cellular division.

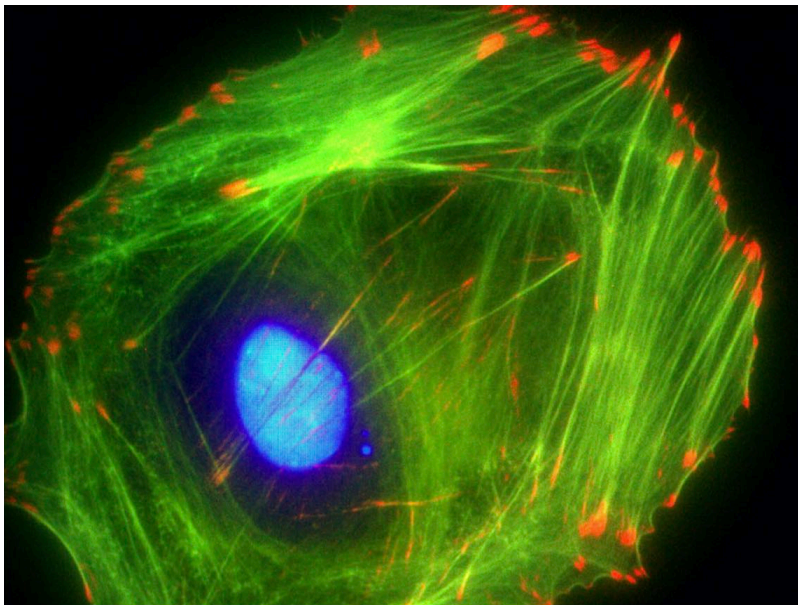


When I was looking at the left hand one, I just happened to see the right hand one in somebody's astronomical catalog; I am like, "Where have I seen that before?"

This is an image of an animal cell. It is what you would see with your eyes with a visible light. When I was young, I was told that all those little functional pieces, mitochondria and the Golgi apparatus and the lysosomes and all those functional pieces, I was told that they float around randomly in an unorganized sack of water and it was assumed that random purposeless motions were somehow accomplishing all the required millions of complex biochemical reactions for cellular life. For example, if new amino acids came in from the right hand side of the cell, but they were needed on the left hand side to do something that somehow they would just meander over to where they are needed. It was actually known that random diffusion was about a million times too slow to account for the speed of biochemical reactions, but it was forbidden to propose any model where the cell actually knew what it was doing and why it was doing it.

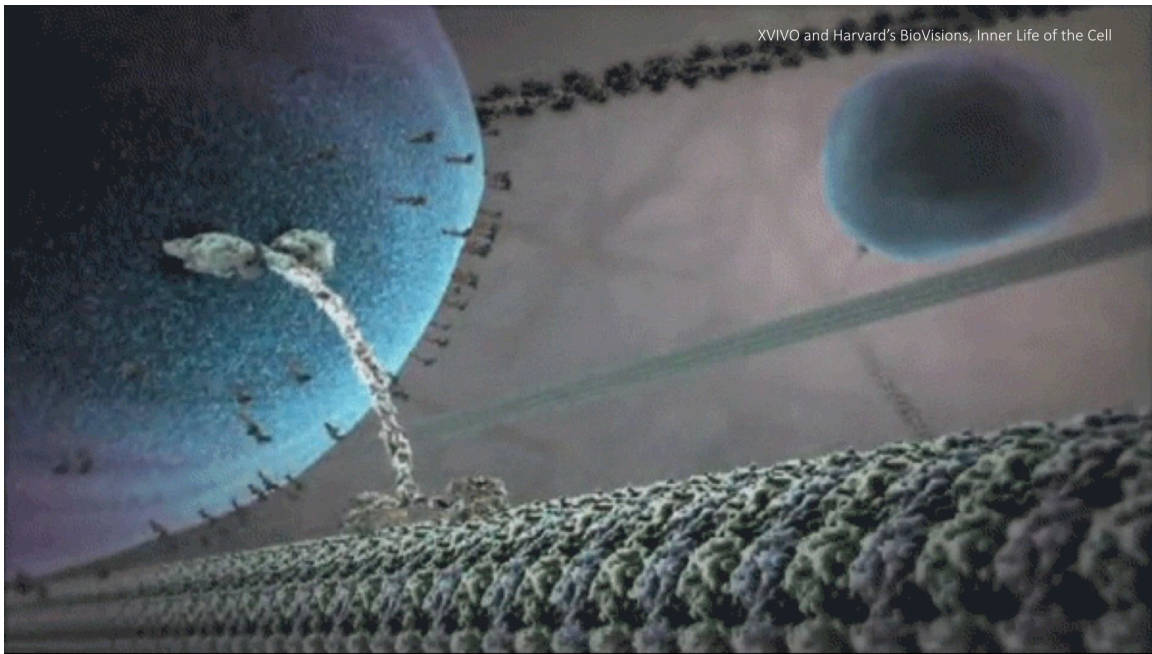


Creative Commons: Cell Image Library

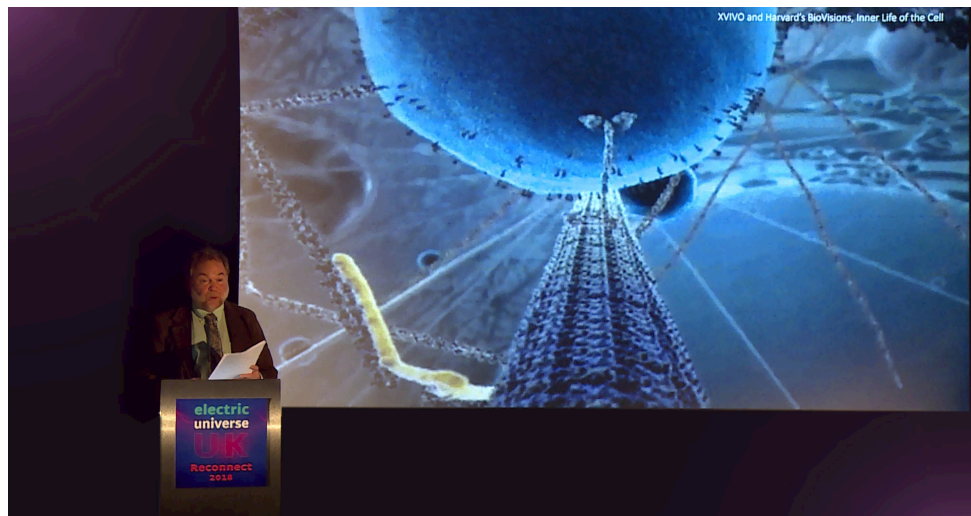


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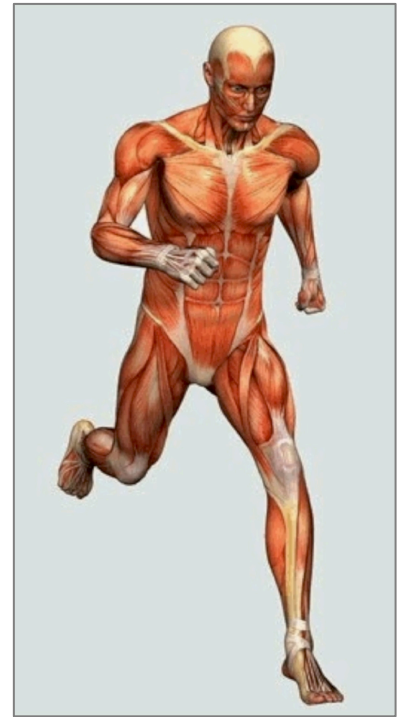
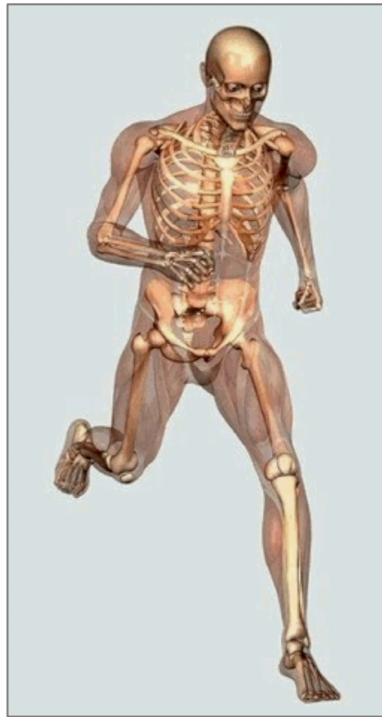
In the 1990s, we developed fluorescent dyes to attach to a different set of biological molecules than we could see before and that's what the cell looks like. I was in graduate school when this work was being done at a different place and everybody is like, what are we looking at, right? After just a few years of research, we uncovered that these different filaments are actually holding together all the pieces of the cell and moving all the pieces of the cell around, and by watching further, we could see that raw materials like amino acids or whatnot, when they're brought into the cells, they're packaged together and they are brought to where they are needed by the cell.



This is a computer animation of materials being transported in a cell. I remember vividly when we started to see the movies, the data this is based upon just changed everything about how we understand how cells work.

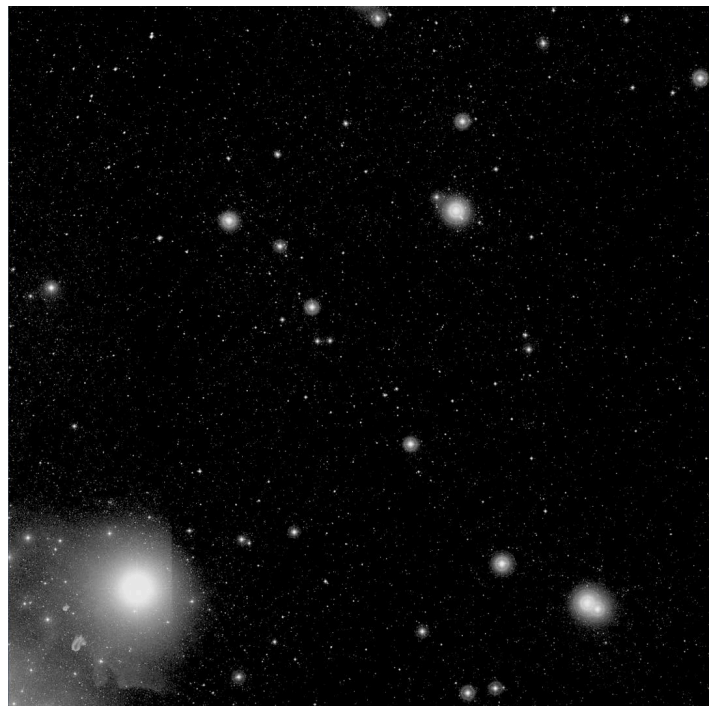


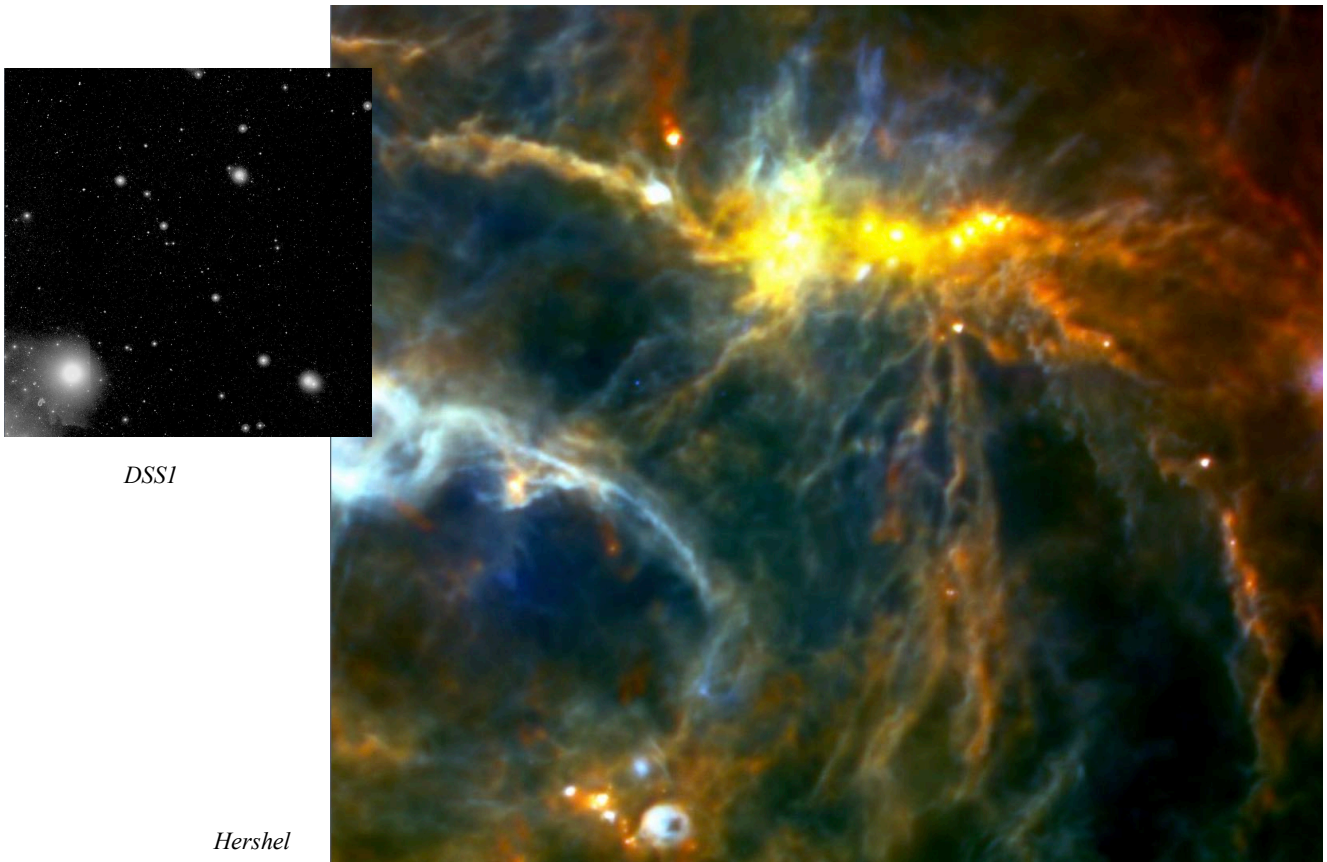
In other words, the entire description of life at the cellular level was turned on its head and what was assumed to be random and purposeless, we could now see was a carefully orchestrated and purposeful activity. And just to be clear, the old view that cells could function through random motions of molecules, that theory was never proven. In fact, all the evidence we had said that it couldn't actually work. But the random model was vigorously defended for years since, well, it's assumed we live in a random purposeless universe. It took the invention of new microscopic techniques for the diffusion model to be proven false. In other words, we had to see it with our own eyes. We can only build models from what we see.



For example, if we could only see our bones and we couldn't see our viscera or muscles, then we would say things like, "Oh, there's a lot of empty space in the human body!" And we would say that the bones move around because of random air currents and crashing into other bones. But if we can see muscles, then we can develop models where we say that the bones are being moved by the muscles for the purpose of moving the body about.

Coming back to the stars – this is an image that we're all familiar with. It's what we see with our eyes when we point a telescope at the night sky, we see one point of light then a lot of empty space and then another point of light and a lot more empty space, and since this is all that we saw, modern astronomy built its models upon this picture. I recall one assignment in school where we had to take the known distances between stars and the known sizes of stars and we had to prove that it was impossible that two stars could ever come close enough to touch each other. I used to hate those assignments where you had to prove we live in a disconnected universe. Yet we still hear this way of talking. Recently I was listening to a radio interview of a prominent astronomer and she was using phrases like 'out there in the darkness' and 'the unimaginable expanses of empty space'.

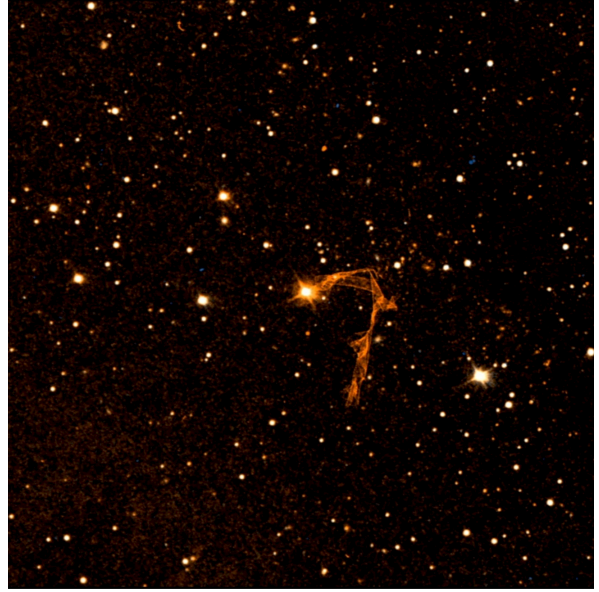




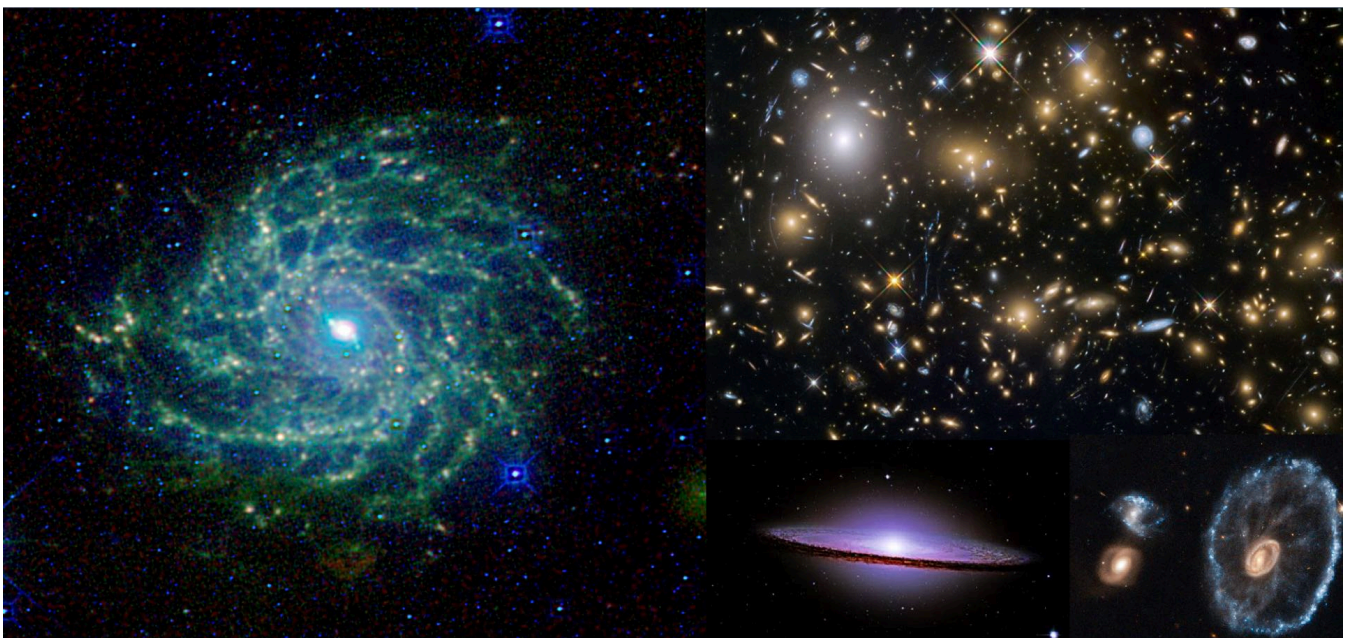
Let's look at similar region of the sky, but with the new data that we're getting back from the telescopes. It seems like we have a complete reversal. The new data is showing us that most, if not all, stars are connected to other stars and the lonely disconnected star must be more of the exception than the rule. All of modern astronomy was built upon the left-hand image of disconnection, and we can only create models from what we can see; and now our current model needs to be amended and the re-writing is taking place right now, which is very exciting.

What are we looking at with those filaments? It's important to say that we don't know, no one really knows, this is new data, and like any other data we get from any telescope, it's partial, it's only showing us a narrow slit of what's really out there. That being said, we are pretty confident that these filaments are made of dust silicates, finely powdered rock, but we also see large quantities of hydrocarbons, sugars and amino acids. Right – hydrocarbons, sugars, amino acids. Up until a few years ago, these substances were thought to only be found on the surface of our little disconnected earth, right. So, what are they doing up there connecting billions of stars in a galaxy. Many publications you read refer to the filaments as regions of star formation, that might be true, but that description assumes that the ultimate goal of any matter in a galaxy is the creation of what we call a star. Saying that these are stellar nurseries assumes that the filaments are there for the stars, but maybe the stars are there for the filaments or maybe they're both there for each other or for something larger.

As we get more and more data from these structures in the interstellar medium, I suggest we hold off on rushing to conclusions about what it is we're seeing and keep an open mind about the larger picture that's opening up.



Since I often look at the electrical aspects of stars and planets, I wondered if we might be able to see any electrical discharges in space, you know, lightning bolts in space. One of my colleagues, Ignacio Cisneros, has been teaching me how to do multi-wavelength astronomy overlaying different regions of the sky. This is a picture of the one region in the sky. There's about 50 years, maybe its 40 years separating the two images. What is this discharge? We don't really know, no one knows what these are. Are there a lot of these? Yes, in about an hour, he showed me a dozen such examples as this. How long does the discharge last? We don't know. How much energy is released? We don't know. They're out there. The trouble is no one's been looking for them. Even something like the Gaia telescope project, which is awesome, is only looking at changes of point sources. That is the design. So, to look at changes of diffuse discharge like this, that's going to take some new work.

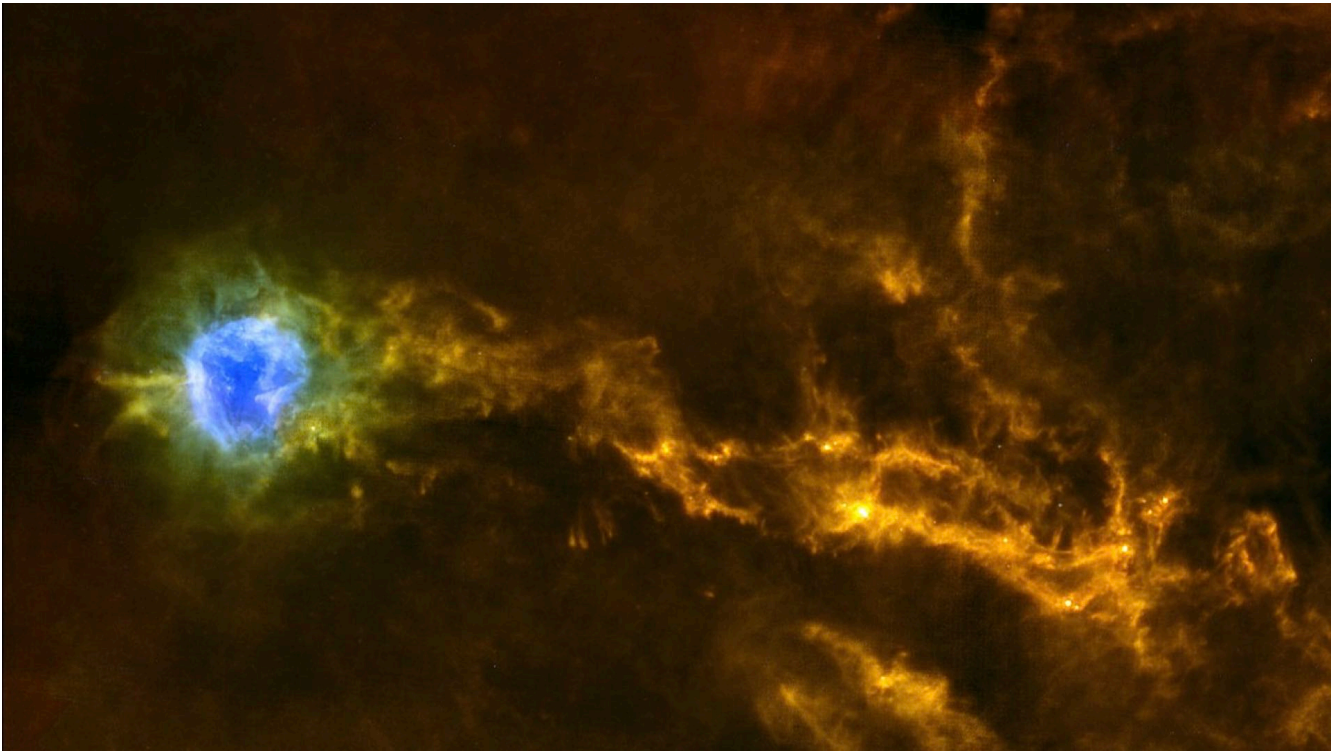


I think that most astrophysics is floundering with data overload because there's no thought that we are looking at structures that are performing useful functions. What is the function of those filaments in between the stars? What is the function of those transient discharges? More data will not necessarily help if we're not asking the right questions. I think that modern cosmology took an unfortunate turn several hundred years ago by denying or ignoring the question of function or purpose in the larger cosmos. Biologists recognize the principle that form follows function. So, why do astrophysicists not recognize this principle? Why are astrophysicists not asking this question?



The idea that life or intelligence would be attached to a planet or a star was too much for our consciousness, so we denied its possibility. There was never any evidence to substantiate that denial and I don't need to tell the people in this room that denying a star could be alive is a misuse of the scientific method. In the last two generations we've developed telescopes to show us galaxies, billions of galaxies, trillions of stars, and then we promptly declared them all dead and having no purpose to themselves or to anything else.

I would propose that this blindness of ours can in the large part be explained by the limitations of our perceptions. Each of us, each person on earth lives for about 80 years and can only directly perceive several miles of his or her surroundings. Galaxies exist for tens of billions of years and are so large that it takes light 100,000 years to go from one side to the other. So, what can we possibly directly perceive about a galaxy given this almost unfathomable difference in our duration and size? If you work through the numbers, each of us stands in relation to our galaxy as a single electron stands to your body. So, imagine that each of us is an electron within a molecule within a blood cell somewhere in a human body. And further imagine that your whole electron life comes and goes in a millionth of a millionth of a second.



Continuing the analogy, all of human history, all of known history would pass in 1000th of a millionth of a second. So, what do you think such electron astronomers as us in that scenario would be able to directly perceive about the human body? I'm not saying that the electron astronomers would get the physics wrong, I'm saying – what could they understand about what they're seeing?

We astronomers are handicapped in just such a way when we try to study stars and galaxies. We live in a world that is part of a much larger world that is itself part of an even larger world and we have within us smaller worlds made of still smaller worlds and to know these worlds as they appear to themselves requires that we change our perceptions and probably also change the quality of our emotions.



When I make an effort to directly perceive the sun or the earth, I noticed a subtle shift whether I'm in a place of gratitude towards the sun and the earth. To overcome these limitations of perception, more data alone will not necessarily lead to a deeper understanding. Another new telescope will not all by itself elevate our perceptions and feelings. We should also ask how do I elevate my perceptions, my feelings, my senses. Many of us have had at least moments of elevated perception. That's why a lot of us became scientists in the first place. If any of you would like to discuss this further, come find me.

