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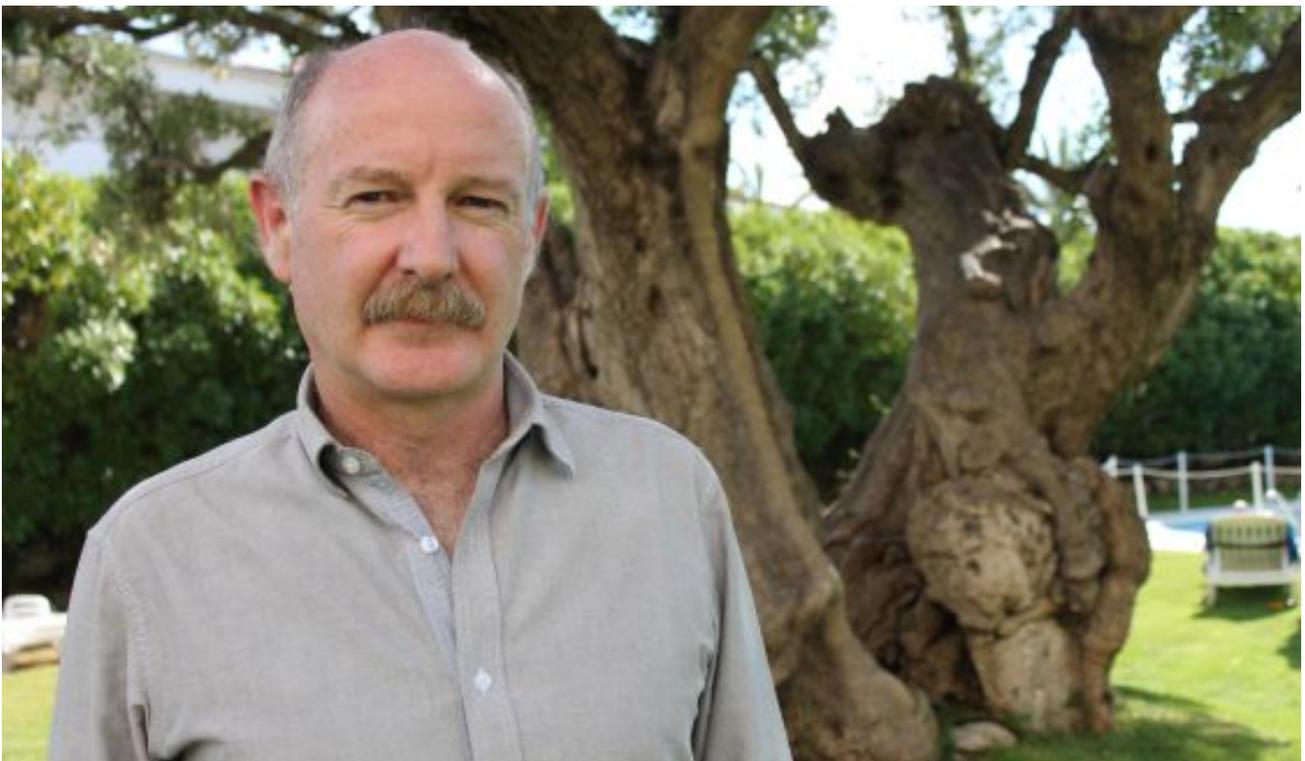
[RAFAEL YUSTE | CATHEDRAL OF NEUROBIOLOGY AT THE UNIVERSITY OF COLUMBIA](#) ›

"When we understand the brain, humanity will understand itself"

The Spanish neurobiologist devised BRAIN, the initiative of the Obama Administration to map the brain. He believes there are coordination problems, and he demands "courage"

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Rafael Yuste, in Barcelona. NJ

Neurobiologist Rafael Yuste (Madrid, 1963) lives in New York City since the eighties. There, as a professor at Columbia University (USA), he investigates all the secrets of the brain; In fact, Yuste is, according to the journal *Nature*, one of the most influential scientists in the world. His ideas have seduced the Obama Administration, which plans to invest about 2 billion dollars in the BRAIN initiative that he designed, to map the human brain. In 2013 the president of the United States [compared BRAIN with the space race](#) in the [State of the Union Address](#)but,

in this time, Yuste himself has criticized the lack of ambition and the problems of coordination of the project. Yuste has participated in the [2015 ELMI annual microscopy conference](#), organized by the Center for Genomic Regulation and the Biomedical Research Institute of Barcelona, which was held in Sitges.

A little over a year ago, you warned of the possible fragmentation of the BRAIN initiative in individual and disconnected laboratories, in [an article](#) that he published in *Scientific American* together with your colleague George M. Church, of Harvard University. When is the BRAIN project today?

Discoordination remains, and we are trying to correct it. Our idea is to structure the BRAIN project in a cerebral observatory, in an analogy with an astronomical observatory, where many universities and countries agree to manufacture an instrument in the perfect place, and then share it. We want to do something similar with the brain and concentrate very expensive microscopy techniques in a specific place in the United States, where researchers would use these instruments. Now I am behind this, writing the draft of a concrete proposal to establish a national laboratory, which would be the mother of BRAIN.

I understand that it is a more complex problem than Obama's will "

Where have you thought about placing this observatory?

A logical location would be to transform one of the great national laboratories of the Department of Energy of the United States, which were originally accelerators of particles and which are now outdated by the disinterest in nuclear technology after the Cold War and the competition with CERN in Europe, which is the best particle accelerator in the world. A good site would be the [Argonne National Laboratory](#) in Chicago, which has the advantage of having specialists in data processing. BRAIN will generate a river of data of Amazonian size. If we could create a brain observatory in Argonne, it could be the place where all the BRAIN data would accumulate and serve the world, just as it happened with the Human

Genome Project, which incidentally had an initial push from the Department of Energy with the creation of national centers.

BRAIN was born from the BAM project [*Brain Activity Map*], an initiative that emerged from the ideas of neurobiologists and physicists in England in September 2011. Had not they raised a brain observatory from the start?

Yes, from the beginning. We always thought that there had to be a balance between the central facilities of a national laboratory, combined with grants and projects to individual laboratories, as if they were the spokes of a wheel connected to the center. Today there are 140 individual laboratories involved, which is very good, but the central and fundamental piece is missing.

Has the Obama Administration blunted [the original idea](#) projected by the scientific community?

Either things are done or they are not done. I do not think Kennedy sent the man to the moon like that. You have to be a little braver "

I admire what they have done with the BRAIN project because they have been clean, open, without corruption and have involved the best scientists. In addition, [they are now being opened to European researchers](#) , a decision that was unanimously approved on my proposal. But they have started the project timidly. These two years have given money to individual laboratories and have postponed the creation of a central laboratory. I think it is dangerous to do so. If you throw yourself in the pool, you throw yourself away. Either things are done or they are not done. To start like this is the best recipe so that nothing happens. I do not think Kennedy sent the man to the moon like that. You have to be a little braver.

Do you trust Obama?

It goes beyond Obama, depends on the political situation in Washington, the two political parties, the various scientific and technological projects that are

considering, and especially the national budget. I understand that it is a more complex problem than Obama's will. He has only a few months left in the legislature, he is half way out, and I suppose his scientific policy team will be disbanded after seven and a half years with him.

Beyond Obama, revalidate the democrats or go back to govern the republicans, do you trust the government of the United States?

Yes, I am optimistic. Traditionally in the United States these projects of national interest have been supported by the two parties: sending a man to the Moon, the human genome, the new nanotechnologies ... Even BRAIN has been supported by both parties in Congress. Republicans are very interested in understanding how the brain works because they believe that the exponential increase in Alzheimer's cases can bankrupt the country. Republican Newt Gingrich is the standard bearer of this economic argument.

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In his laboratory they investigate the connections of the visual cortex of the brain of mice in three dimensions, what have they discovered?

Our laboratory is like a BRAIN project in tiny. In the last year we have managed to measure the activity of all the neurons of a hydra, an invertebrate animal that has the most primitive nervous system of evolution, even more than the worm *C. Elegans*. It is transparent and has from 200 to 2,000 neurons. When we made the BAM proposal the number one goal was to measure the activity of all the neurons of a nervous system. Many colleagues told me it was impossible and I could not do it, which I'm very happy with now. We have not published the results yet. In a decade we will be able to do it in the cerebral cortex of a mouse or a mammal like us, but in parts. We can see the complete activity of all the neurons in a brain module of an epileptic patient, for example.

The applications in medicine are many. But why have companies such as Google, Facebook and Microsoft been interested in these investigations?

Data companies are based on *machine learning* (*machine learning*), a branch of computer science that uses algorithms inspired by neural circuits. For example, when you upload a photo to Facebook there is an automatic learning algorithm on a supercomputer based in Sweden, where the photo is sent in less than a second. There these algorithms see and recognize the faces of the people in the photo, they put a label on it and send it back. In fact, this year, for the first time in history, face detection algorithms have beaten humans. It seems that they have an error every eight million faces, a much better capacity than ours. Well, all this is based on a brain knowledge of almost 40 years ago. They are very interested in neurobiology because if we know the algorithm that is used to really compute, not only in humans also in mice or hydras,

Every dollar invested in the Human Genome Project has generated about \$ 143 in profit. What economic benefits does the brain predict?

I think BRAIN is going to bring about a change in the culture and history of humanity. "

More than money, I think that BRAIN will cause a change in the culture and history of humanity, not so much for the project itself but for understanding the brain. When we understand the brain, humanity will understand itself inside for the first time. I would not be surprised if this revolutionizes the culture and changes many things like education, the legal system or the economy. It will be a new **humanism**. I hope that the fruits are the size of the Human Genome Project, or even longer and shorter, given that data companies are involved in the garlic. At the scientific level, a generation of young scientists will have public databases to continue researching.

If you do not get wet with the money compare the magnitude of BRAIN with other projects such as the space race or the Manhattan Project. In what position is BRAIN?

Buf ... I have the Manhattan project very close because I work in the adjacent building where it was created, in the Pupin room at Columbia University. Every day I pass in front of what is now a national monument. Seeing what previous generations have done to open the fields to science for humanity is a daily stimulus.

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