

# FisMatEcol Boletín

Oct 2022

Dr. Oliver López Corona  
Dra. Elvia Ramírez Carrillo



Eventos

# Complejidad



Brain Criticality Hybrid Meeting  
November 7-9 2022

@NIH - BETHESDA, MD AND ON ZOOM!

Transmisión en streaming:

<https://www.facebook.com/profile.php?id=100081093056496&sk=videos>

# Edafologia

Speaker: [Professor Megan Povey](#), School of Food Science and Nutrition

Date and time: Wednesday 16 November, 12:00-12:40

Chair: [Professor Steven Banwart](#), School of Earth and Environment

The [Global Food and Environment Institute](#) invites you to join us for this free webinar.

## Overview:

Intensification of agriculture is destroying the soil, either through the incorporation of plastic encapsulants for herbicides and insecticides, or through continual ploughing and reseeded with monocultured crops and the abandonment of crop rotation. Some estimate that globally, only 50 cycles of harvest are left in the soil whilst current agricultural practice continues. Healthy soils are a complex combination of mineral particles, bacteria, fungi, organic matter, air, and water.

An ultrasound sensor for testing soils has been integrated with an agricultural robot as part of the Food Supply Chain Tracing and the MARS (Multi-sensor Agricultural Robot for Soils) project. Preliminary results suggest that the sensor will measure bulk modulus, porosity, mobile water content, and the depth of cracks in the soil. The ultrasound sensors are not too expensive, are very robust, and do not necessarily require a robot to carry them as they are very portable. They also have the potential to be used in locations throughout the world, and so could contribute to soil health in developing countries, essential to the development of sustainable agriculture worldwide.

This 20-minute presentation will be followed by 10-minutes for Q&A.

Please find more information and **the link to registration on [Eventbrite](#)**

Oportunidades



# School of Biological Sciences

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07/11/2022



Marie  
Sklodowska-Curie  
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Where to apply

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Contact Details

**Where to send your application.**

**COMPANY**

Polymer Competence Center Leoben GmbH

**WEBSITE**

<https://mirelai.eu/open-positions/>

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Hiring/Funding Organisation/Institute

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Conceptos



iimas

# Fisher Information as unifying concept for Criticality and Antifragility, a primer hypothesis

Oliver López-Corona<sup>1</sup> and Pablo Padilla<sup>3</sup>

<sup>1</sup> Cátedras CONACyT Fellow at IIMAS, UNAM

<sup>3</sup> IIMAS, UNAM



CONACYT

One of the classic problems in complex systems is the existence and ubiquity of criticality, characterized by scale-invariance in frequency space and a balance between emergence (randomness) and self-organization (order). Another universal characteristic of complex systems is their Antifragility or the capacity of taking advantage from environmental randomness. Inhere we propose a primer hypothesis that both concepts are related and may be understood under an Information Theory framework using Fisher Information as unifying concept. We present also novel brain health formulation in this Criticality/Antifragility terms..

## why is a living system fitter when it is critical?

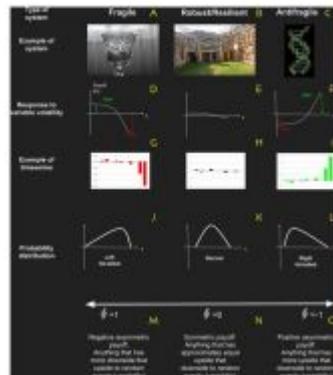
Living systems need to perceive, respond to environmental perturbations, and interact with other similar entities. Biological systems constantly try to encapsulate the essential features of the huge variety of detailed information from their surrounding complex and changing environment into manageable internal representations, and they use these as a basis for their actions and responses. The basic data to decision process implies

Acquire data -> perform computations over the data acquired-> make inferences -> construct models -> make decisions.



So basically we have to evolutionary competition, one for better sensors

And the second on brains to achieve the best computational, inferential



Basic characteristics of systems in terms of antifragility, which is the property of a system to respond in a convex way to perturbations or variability. (A–C) are examples of fragile, robust/resilient and antifragile systems respectively; (D–F) are examples of profile responses to perturbations; (J–L) are examples of typical probability distributions; and (M–O) are the characteristic values obtained with the metric based on complexity change

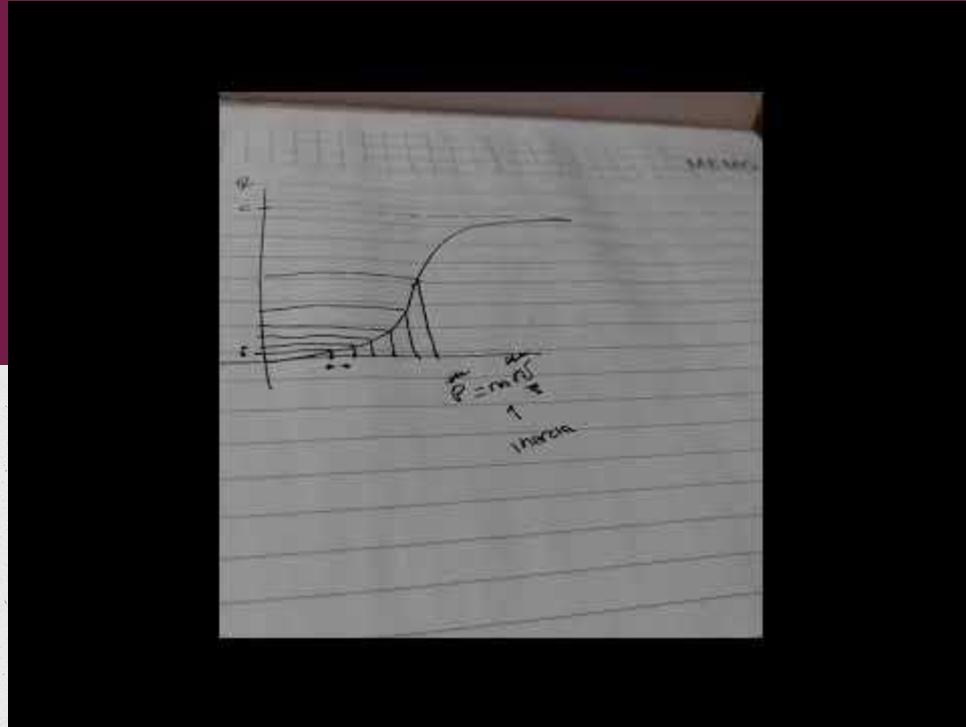
Pineda and co-workers (Pineda, Kim & Gershenson, 2018) proposed a straightforward implementation of antifragility by defining as payoff function the complexity of the system, which makes a lot of sense because complexity is maximum at criticality, and as we have said organisms are fitter at criticality. Hence any depart from criticality (diminish in complexity) should be detrimental for the organism and so, complexity may be interpreted as a universal payoff function for systems under eco-evolutionary processes.

The authors defined fragility as  $\phi = -\Delta C[\Delta x]$ , where  $\Delta C$  is the change in system complexity due to a perturbation of degree  $|\Delta x|$ . As complexity can always be normalized to, then positive values of  $\phi$  define fragile systems; when  $\phi$  is zero the system is robust/resilient; and for negative values of  $\phi$  the system is Antifragile.

Putting all the pieces of the puzzle together the main contribution of this work is to formulate the following mathematical proposition:

Let  $X$  be a random variable that defines the state of a system  $S$ , and

# Momento de una intervención



Cursos



**Stanford CS229: Machine  
Learning Full Course taught by...**

**Stanford Online**

20 videos Last updated on Jun 23, 2022

Explorar > Ciencia de Datos > Probabilidad y Estadística

# Estadística y probabilidad

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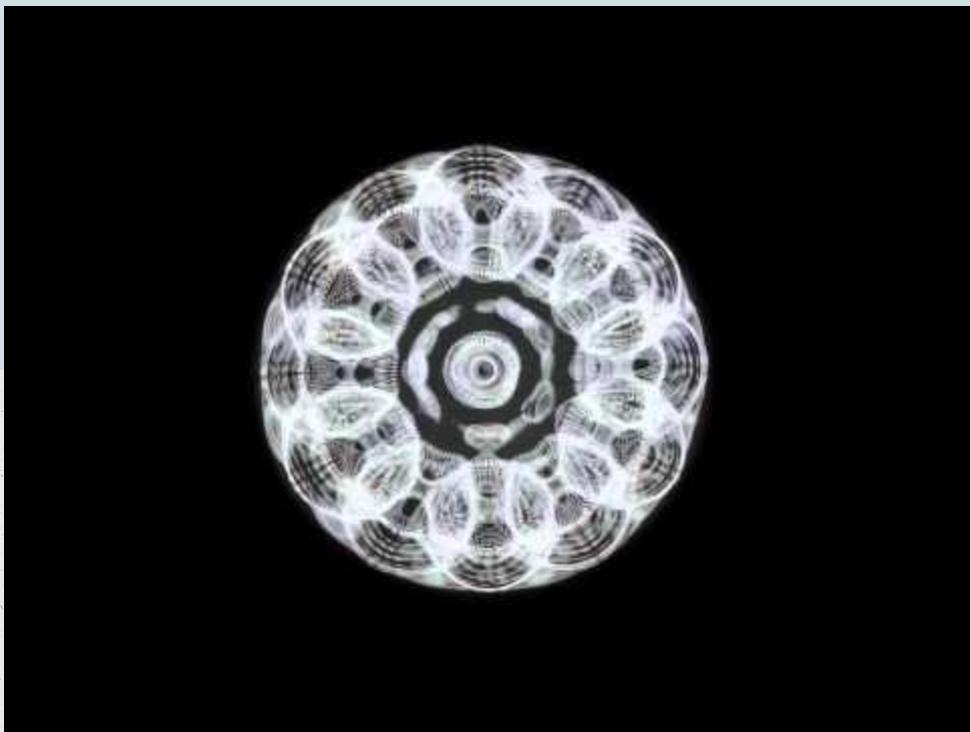
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Cultura



Artículo

# A multinational Delphi consensus to end the COVID-19 public health threat

<https://doi.org/10.1038/s41586-022-05398-2>

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Open access

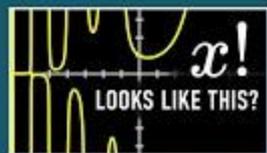
 Check for updates

Jeffrey V. Lazarus<sup>1,2,3,4</sup>, Diana Romero<sup>5</sup>, Christopher J. Kopka<sup>4</sup>, Salim Abdool Karim<sup>6,4</sup>, Laith J. Abu-Raddad<sup>7,8</sup>, Gisele Almeida<sup>9</sup>, Ricardo Baptista-Leite<sup>10,11,12</sup>, Joshua A. Barocas<sup>13</sup>, Mauricio L. Barreto<sup>14,15</sup>, Yaneer Bar-Yam<sup>16</sup>, Quique Bassat<sup>1,17,18,19,20</sup>, Carolina Batista<sup>21,22</sup>, Morgan Bazilian<sup>23</sup>, Shu-Ti Chiou<sup>24</sup>, Carlos del Rio<sup>25</sup>, Gregory J. Dore<sup>26</sup>, George F. Gao<sup>27</sup>, Lawrence O. Gostin<sup>28</sup>, Margaret Hellard<sup>29</sup>, Jose L. Jimenez<sup>30,31</sup>, Gagandeep Kang<sup>32</sup>, Nancy Lee<sup>33</sup>, Mojca Matičič<sup>34,35</sup>, Martin McKee<sup>36</sup>, Sabin Nsanangimana<sup>37</sup>, Miquel Oliu-Barton<sup>38</sup>, Bary Pradelski<sup>39</sup>, Oksana Pyzik<sup>40</sup>, Kenneth Rabin<sup>41</sup>, Sunil Raina<sup>42</sup>, Sabina Faiz Rashid<sup>43</sup>, Magdalena Rathe<sup>44</sup>, Rocio Saenz<sup>44</sup>, Sudhvir Singh<sup>45</sup>, Malene Trock-Hempler<sup>46</sup>, Sonia Villapol<sup>47</sup>, Peiling Yap<sup>48</sup>, Agnes Binagwaho<sup>49</sup>, Adeeba Kamarulzaman<sup>50</sup>, Ayman El-Mohandes<sup>5</sup> & The COVID-19 Consensus Statement Panel\*

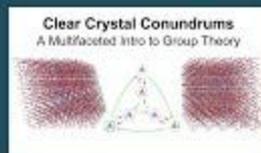
Despite notable scientific and medical advances, broader political, socioeconomic and behavioural factors continue to undercut the response to the COVID-19 pandemic<sup>1,2</sup>. Here we convened, as part of this Delphi study, a diverse, multidisciplinary panel of 386 academic, health, non-governmental organization, government and other experts in COVID-19 response from 112 countries and territories to recommend specific actions to end this persistent global threat to public health. The panel developed a set of 41 consensus statements and 57 recommendations to governments, health systems, industry and other key stakeholders across six domains: communication; health systems; vaccination; prevention; treatment and care; and inequities. In the wake of nearly three years of fragmented global and national responses, it is instructive to note that three of the highest-ranked recommendations call for the adoption of whole-of-society and whole-of-government approaches<sup>1</sup>, while maintaining proven prevention measures using a vaccines-plus approach<sup>2</sup> that employs a range of public health and financial support measures to complement vaccination. Other recommendations with at least 99% combined agreement advise governments and other stakeholders to improve communication, rebuild public trust and engage communities<sup>1</sup> in the management of pandemic responses. The findings of the study, which have been further endorsed by 184 organizations globally, include points of unanimous agreement, as well as six recommendations with >5% disagreement, that provide health and social policy actions to address inadequacies in the pandemic response and help to bring this public health threat to an end.

Videos

Motivation



Clarity



Novelty



Memorability



Libros

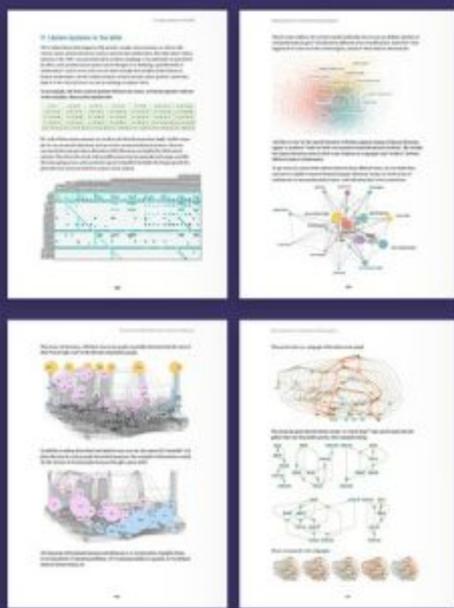
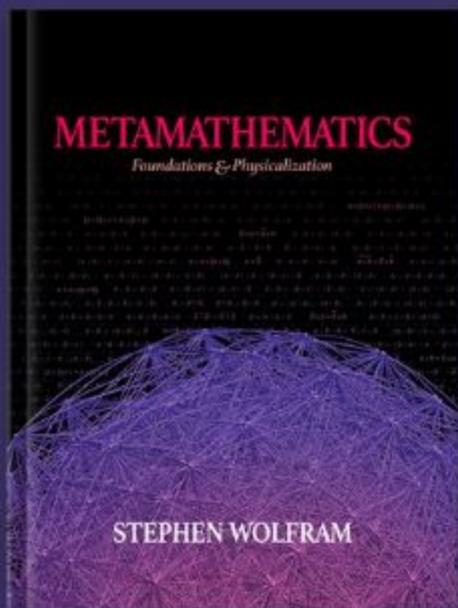


**Stephen Wolfram** ✓ @stephen\_wolfram · 3 nov.



My work on the foundations of metamathematics is now a book—that's ready for preorder. All those pictures of metamathematical space (AKA slices of the ruliad) look pretty great in print!

[amazon.com/Metamathematic...](https://amazon.com/Metamathematic...)



Notas

Miyake events, bursts of global radiation recorded in tree rings, have been detected around the world and are thought to have an extraterrestrial origin.



[sciencenews.org](https://www.sciencenews.org)

### **Catastrophic solar storms may not explain shadows of radiation in trees**

Tree rings record six known Miyake events — spikes in global radiation levels in the past. The sun, as long presumed, might not be the sole ...

ESPECIAL

# Encontrando una buena pregunta / proyecto científico



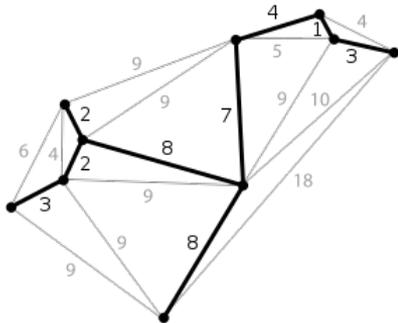
# P1: Tengo una idea?

**NO**

Entonces necesitas conocer más el campo, esta herramienta podría ser de utilidad:

<https://www.connectedpapers.com/>

La idea es tratar de descubrir el Minimum Spanning Tree de un campo o la "columna vertebral" del mismo.



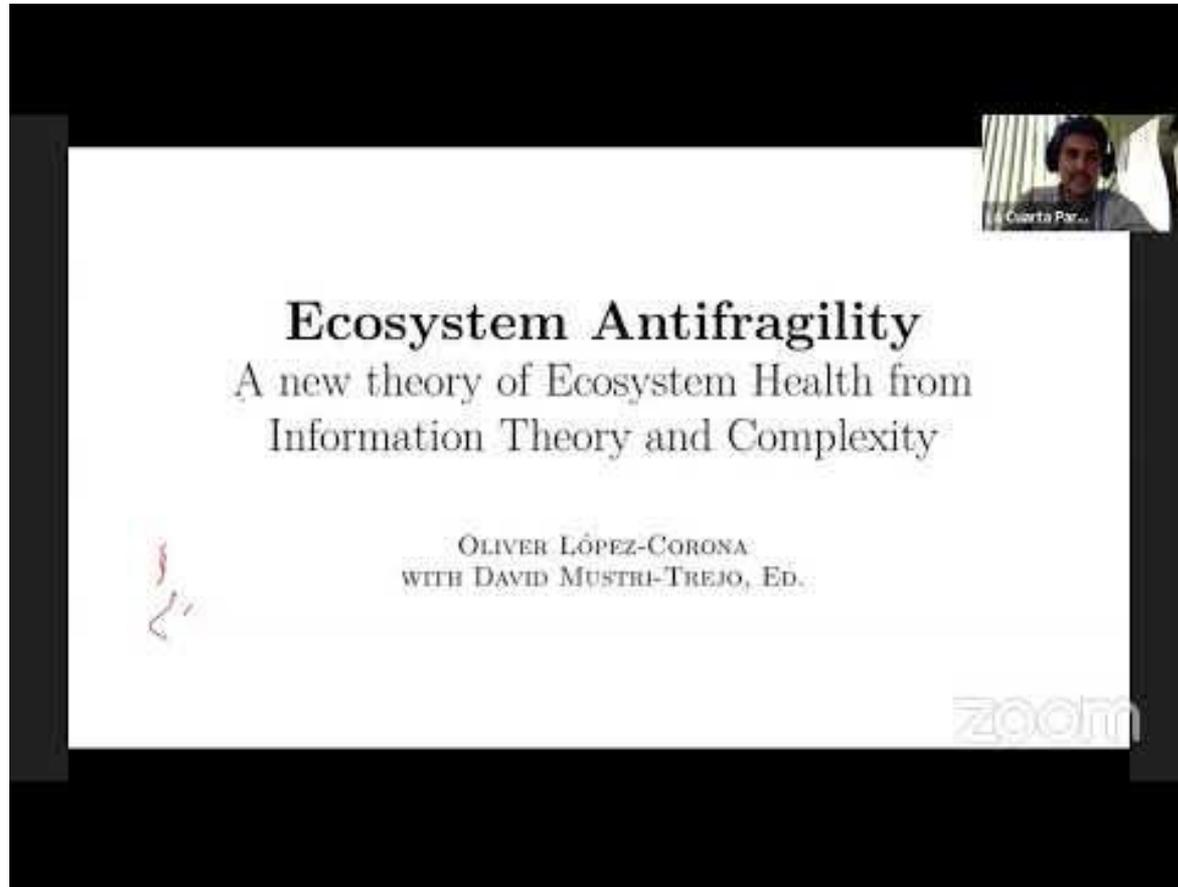
Conocer demasiado poco de un campo no te permite identificar huecos en el MST o su trayectoria futura; conocer demasiado te paraliza - Todo está hecho!

**SI**

Puede sonar trivial, pero hay una gran diferencia entre una noción confusa de una dirección de investigación y una idea bien desarrollada. Pero llegar a eso puede tomar su tiempo. Necesitas tener un laboratorio de ideas, un grupo cercano de colaboradores / amigos de tu confianza dispuestos a escuchar y discutir tus ideas. De esta forma puedes poner proto-ideas a prueba y desechar las que no tienen potencial rápidamente. En principio los seminarios de laboratorio deberían servir para esto, pero es mejor que tenga TU propio laboratorio de ideas.

**Avanza**

# Para reflexionar: ciencia en estilo alpino



Cuarta Par...

## Ecosystem Antifragility

A new theory of Ecosystem Health from  
Information Theory and Complexity

OLIVER LÓPEZ-CORONA  
WITH DAVID MUSTRI-TREJO, Ed.



## P2: me parece interesante esta idea?

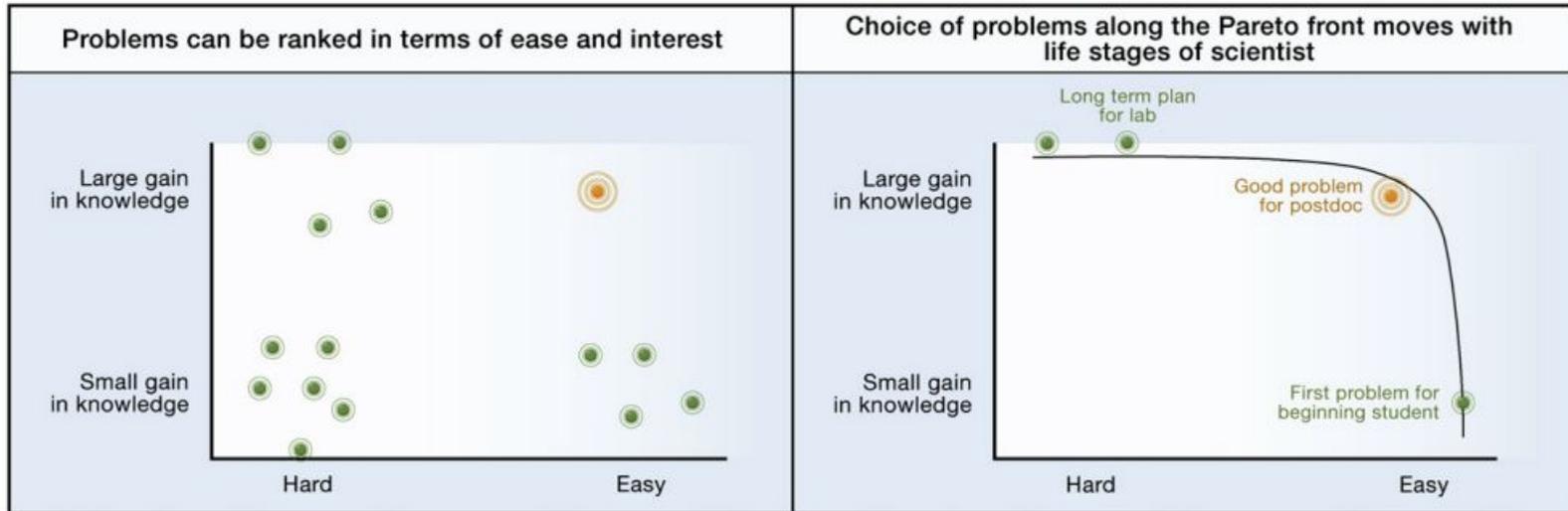
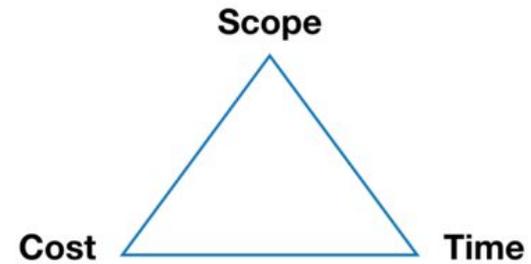
### **NO**

En ese caso no tiene sentido seguir. La investigación científica es una actividad demandante y emocionalmente costosa, que requiere de un enorme reservorio de auto-motivación y autodisciplina. Las ideas y preguntas que vuelven una y otra vez a tu mente durante meses o años, son una mejor base de buenos proyectos, que ideas que se te han ocurrido en los últimos días

### **SI**

Es notable que escuchar nuestra propia voz idiosincrásica conduce a una mejor ciencia. Hace que la investigación sea automotivada y que la rutina de la investigación sea más gratificante. En ciencia, cuanto más te intereses, mayor será la probabilidad de que interese a tu audiencia. Cuando uno puede lograr la autoexpresión en la ciencia, el trabajo se vuelve revitalizante, impulsado por uno mismo y cargado de significado personal. También puede tener una mejor oportunidad de descubrir algo profundo.

# Para reflexionar: Existe un trade off entre facilidad, ganancia y esfuerzo



**Figure 1. The Feasibility-Interest Diagram for Choosing a Project**

Two axes for choosing scientific problems: feasibility and interest.

# P3: Otros encuentran interesante la idea?

**NO**

Uno de los aspectos fundamentales de la ciencia es que el interés de un problema es subjetivo y personal. Esta subjetividad, sin embargo, hace las cosas confusas. La confusión se debe a la mezcla de dos voces: una es una voz fuerte de los intereses de quienes nos rodean, en conferencias, en nuestro departamento, etc. La otra es una voz débil en nuestro pecho, que dice: "Esto es interesante para mí."

En general las ideas que no tienen el interés de los demás pueden ser difíciles de publicar, en ese sentido son un riesgo. Quizá necesitas vender tu idea

**SI**

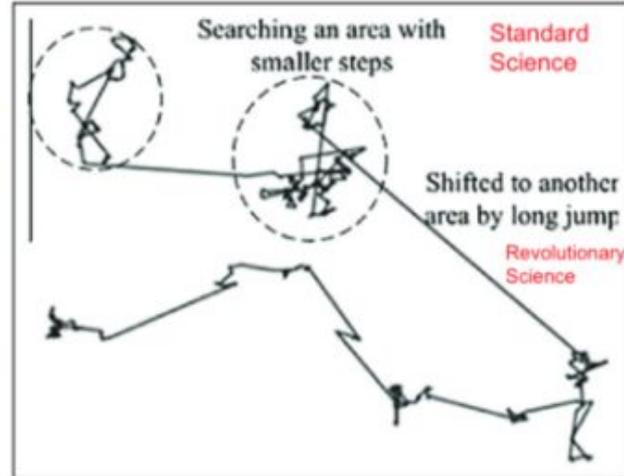
Cuando una idea tiene mucho interés por parte de la comunidad del campo, será mucho más fácil de financiar y publicar, pero también podría significar que es menos innovadora. El arte es montar la ola. Como en el surf, si te lanzas muy temprano la ola no te jalará, si te lanzas muy tarde la ola te pasó, si logras montarla...



# Para reflexionar: quiero hacer ciencia estándar o revolucionaria?

Science as Levy flights

When they say to me, don't do THAT



# P4: Puedo hacer una contribución al campo?

**NO**

Es poco probable que una idea se publique en una revista respetable si no hace una contribución sólida al campo.

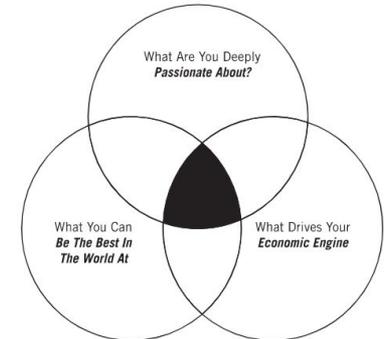
Esto tiene un doble significado: primero, su idea debe hacer una contribución por sí sola. En segundo lugar, debe ser realista que usted también tenga la capacidad de cumplir y cumplir con esa contribución.

Si ni usted ni la idea pueden hacer una contribución al campo, debe trabajar en refinar la idea y su ejecución para asegurar su impacto.

**SI**

Mis recursos personales son limitados y, por lo tanto, debo hacer concesiones todos los días. Si no tomo esas decisiones difíciles, corro el riesgo de quemarme y poner en peligro la calidad de mi trabajo

Three Circles of the Hedgehog Concept



# Para reflexionar: cómo generar más habilidades como científico?

## **So You Think You Have Skills**

21 SEP 2012 · BY [JENNIFER A. HOBIN](#), [CYNTHIA N. FUHRMANN](#), [BILL LINDSTAEDT](#), [PHILIP S. CLIFFORD](#)



# P5: Tengo el tiempo y la energía para ello?

## NO

Si tiene tiempo y energía, debe seguir adelante y continuar con el proyecto. Si no tiene la capacidad en este momento, puede considerar buscar colaboradores que puedan ayudarlo con el proyecto.

Proponer ideas es relativamente fácil para la mayoría de los investigadores curiosos: elegir las adecuadas para seguir es a menudo el punto de conflicto.

## SI

Una colaboración exitosa puede lograr hallazgos de alto impacto y brindarle acceso a nuevas fuentes de financiamiento y experiencia. También puede ser una gran oportunidad para pensar en las herramientas y los resultados que pueden hacer que su investigación sea más accesible para sus pares y el público

NEWS · 28 JANUARY 2020

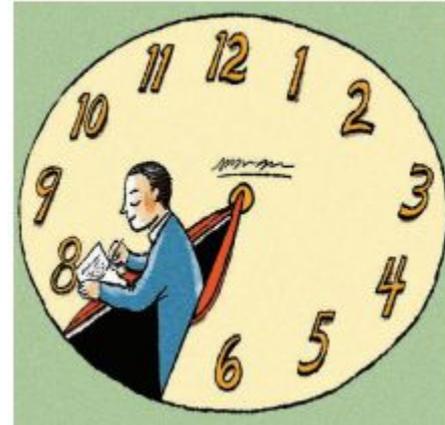
## How to collaborate more effectively: 5 tips for researchers

Participating in a collaborative effort can be extremely challenging. To get most out of it, you need a strategic approach.

# Gestión del tiempo: Aprovecha el momento



I call it the 1-hour workday, referring to the short, sacrosanct period when I do what I see as the “real” work of academia: writing papers.



# Ejercicio práctico

Utilizando la técnica de AHP presentada aquí y como criterios de comparación las preguntas descritas en las láminas anteriores, encontrar la jerarquía de preferencia entre al menos tres ideas proyectos que te interesen.

## Comparaciones pareadas



The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	Definition	Explanation
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment moderately favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation

Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities of 1/1, 1/2, 1/3, etc. can be used for elements that are very close in importance.