

OSPEDALE
SAN RAFFAELE

Miguel A.F. Sanjuán: a mentor for a “nonlinear career”

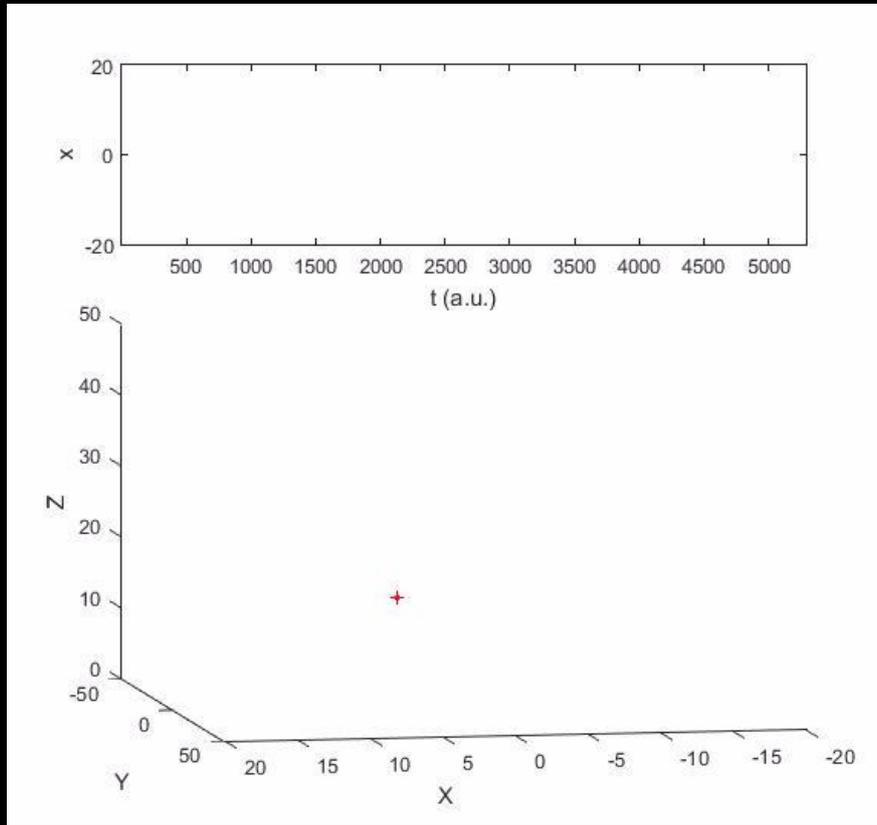
Samuel Zambrano

Vita-Salute San Raffaele University
and
San Raffaele Scientific Institute
(Milan, Italy)

How does one go..

From...

...to



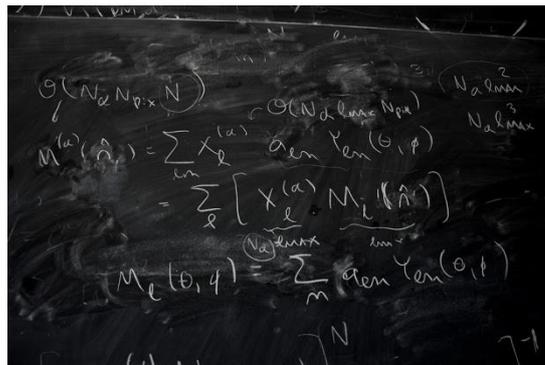
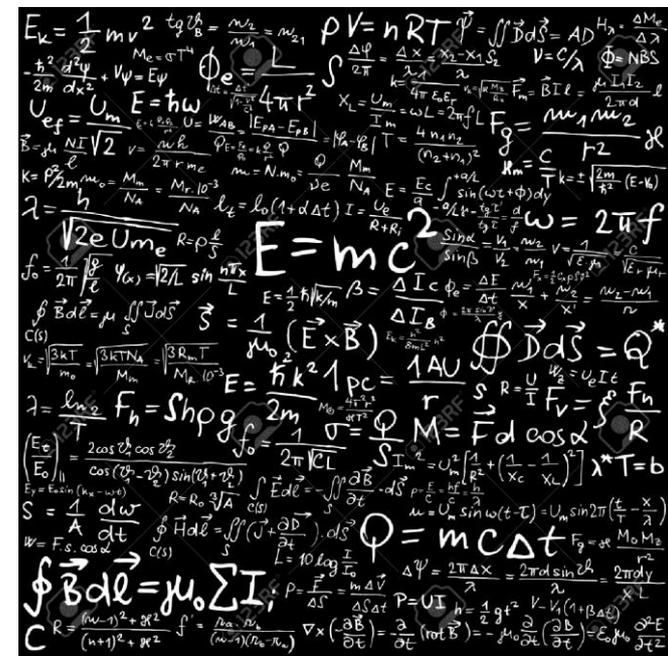
Chaotic oscillations
(in the Lorenz system)

NF- κ B oscillations

1998-2003: Physics!



School of Physics
Universidad Complutense
Madrid



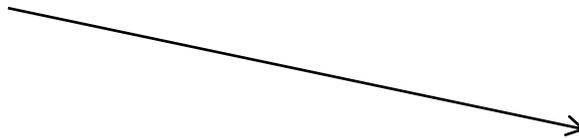
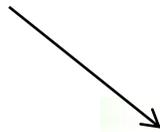
I like his job!!!!

A decisive moment: enters Miguel!



Miguel A.F. Sanjuán
URJC, Madrid (Spain)
Chaos and nonlinear dynamics

Interested in neuron dynamics,
genetic circuits, dynamics of cancer
therapy...



Prof. James A. Yorke
University of Maryland (USA)
Coined the term “chaos”

**Partial control of
chaotic systems**

Sequences genomes
Studies population
dynamics of HIV epidemics



Prof. Riccardo Meucci.
INO, Florence (Italy)
Pioneer in chaos in lasers

**Synchronization and
phase control of
chaos**

Exploring analogies
between lasers and
excitable neuron dynamics



Prof. José M. Amigó
UMH, Alicante (Spain)
Applied mathematics

**Time series analysis using
ordinal patterns**

Ordinal patterns are
currently used for and
biomedical signals.

A mentor in life sciences and interdisciplinarity: “background formation”

Modelización de sistemas complejos en Aranjuez

Publicado por **Miguel A. F. Sanjuán** el 17 septiembre, 2006 [Comentarios \(0\)](#)

Dentro de las actividades científicas que vienen realizándose en torno a la Física de los Sistemas Complejos, tendrá lugar durante los próximos días 21 y 22 de Septiembre de 2006 el **Encuentro sobre Modelización de Sistemas Complejos en Aranjuez**.

Dicho encuentro, que organiza la Universidad Rey Juan Carlos de Madrid, constituye una apuesta de futuro por un campo de desarrollo innovador y cuyos frutos se verán sin duda reflejados en el desarrollo de la ciencia de los próximos años. Entre los diferentes temas que se tratarán se encuentran la dinámica de la regulación genética, el comportamiento de las redes de neuronas, la sincronización de poblaciones de unidades elementales,



“different topics, among which gene regulation, behaviours of neural networks...”

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Grupo de Dinámica No Lineal, Teoría del Caos y
Sistemas Complejos, Departamento de Física, URJC



Brief timeline

2007: PhD Seminar

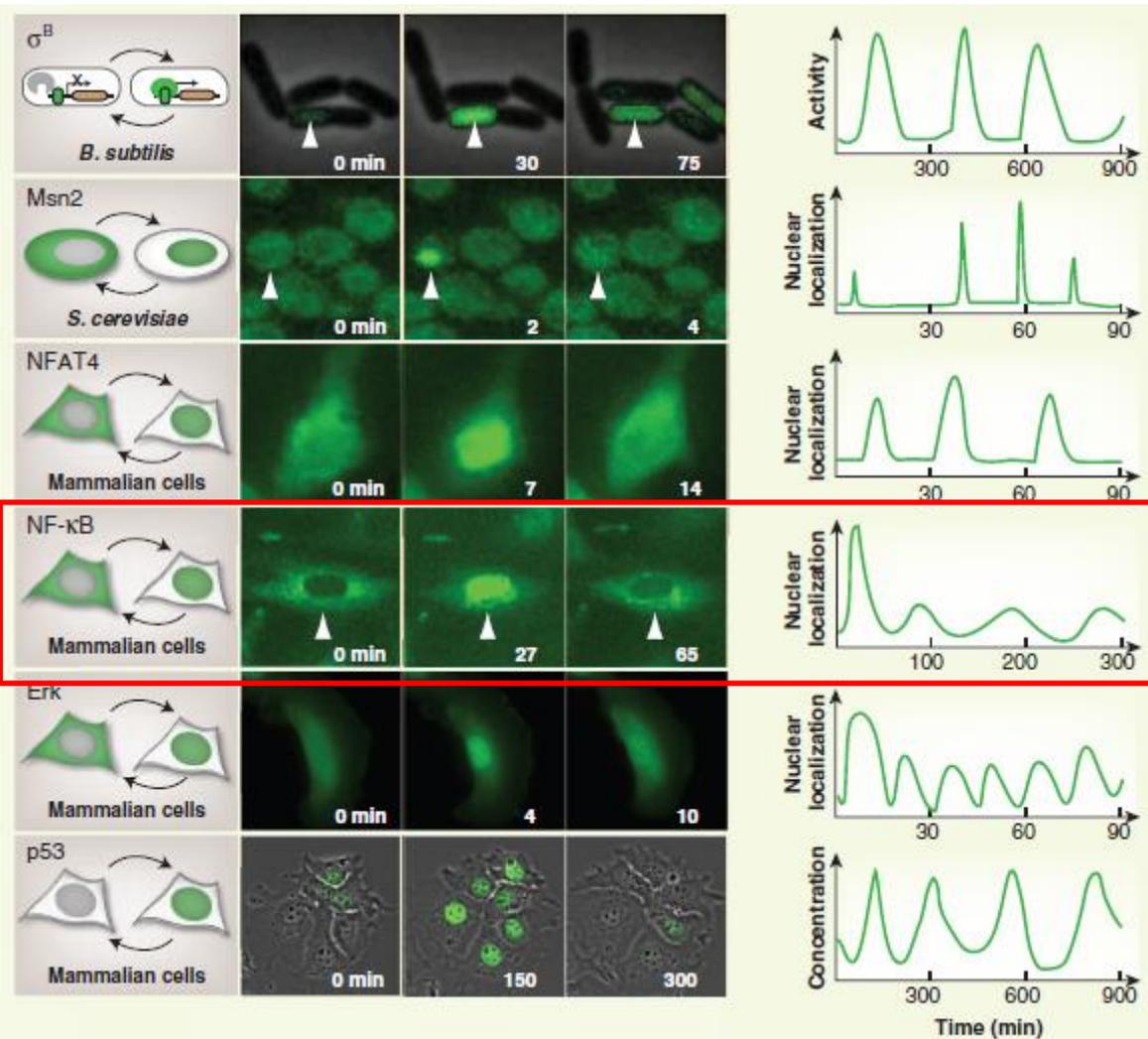


2007-2011: Assistant Professor at URJC

2011: Leaving for San Raffaele in Milan
... To follow my family

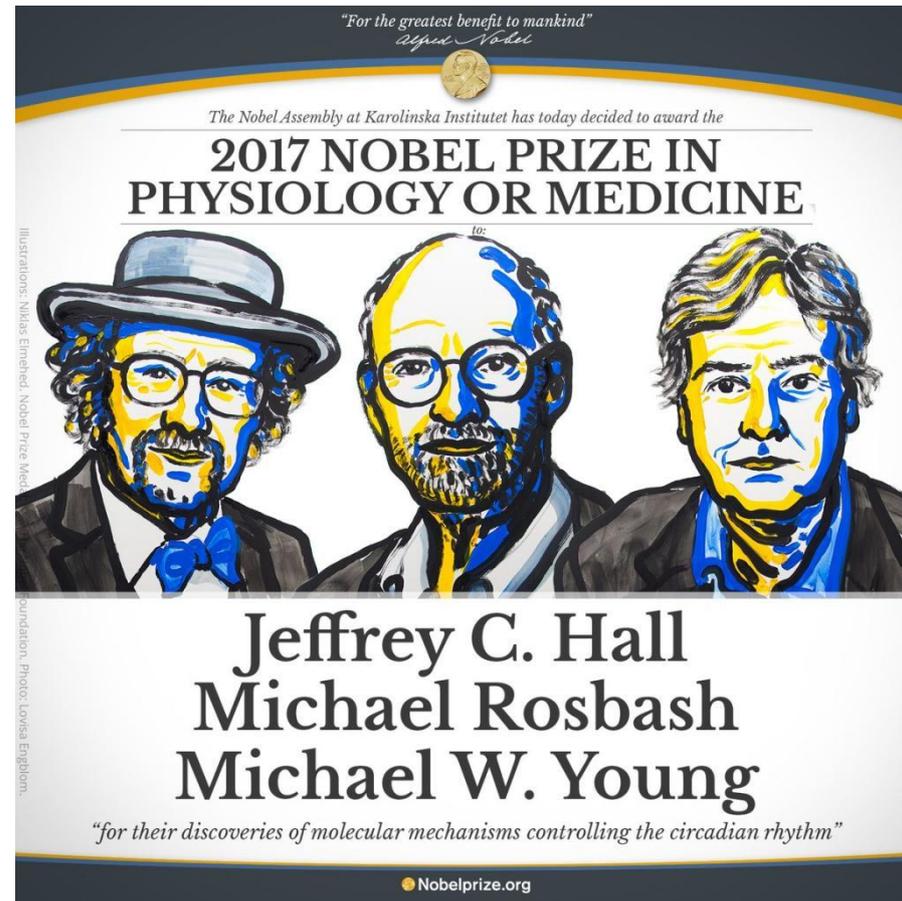


Me: now at San Raffaele : NF- κ B's role

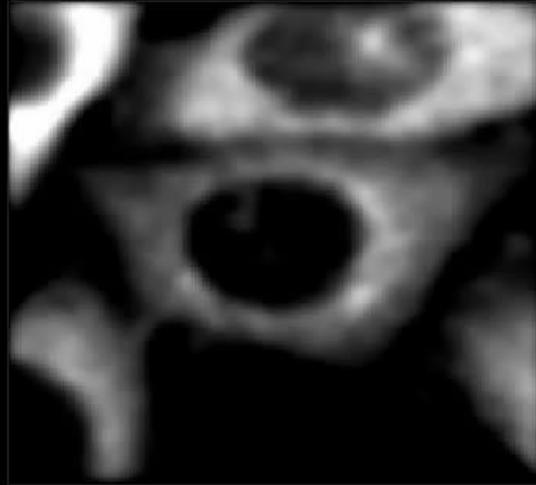


Levine *et al.*, *Science* (2013)

NF- κ B, a “transcription factor” : protein controlling gene expression , oscillating with a period **T=1.5 h**



Me: now at San Raffaele : NF- κ B's role



How does NF- κ B control
gene expression?

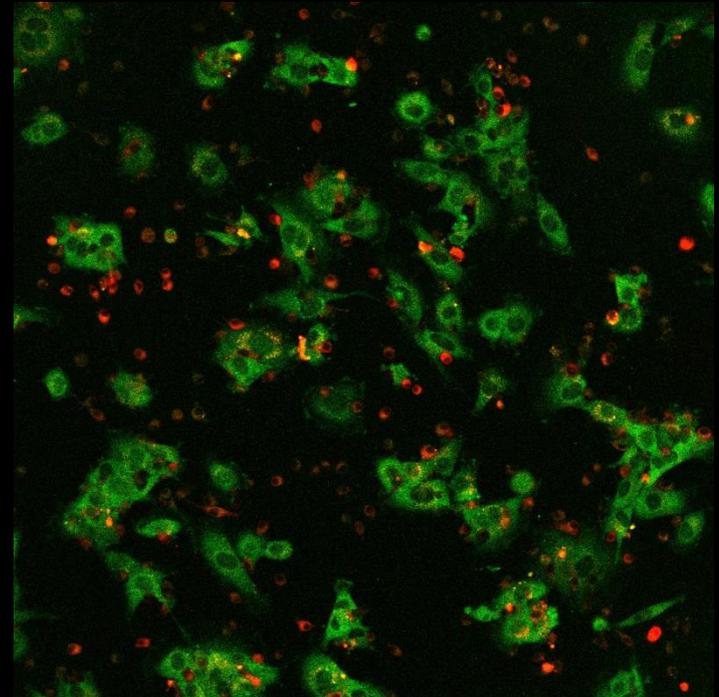
**(Tools for stochastic
processes, nonlinear
oscillators)**

Gene activity

NF- κ B

How does NF- κ B mediate
cell to cell communication
in the tissue?

**(Tools for coupled
oscillators theory)**



Conclusions

With Miguel, I learnt many things:

- A profession: researcher, professor.
- The beauty of nonlinear dynamics.
- The importance of collaborations.
- An interdisciplinary outlook applicable to a wide variety of problems.

The many facets of what “mentoring” means.

Thank you, Miguel, and for many years to come!