



## **Biovision project-team**

Bruno Cessac, Pierre Kornprobst, Marco Benzi, Ilian Caugant, Dora Karvouniari, Evgenia Kartsaki, Selma Souihel

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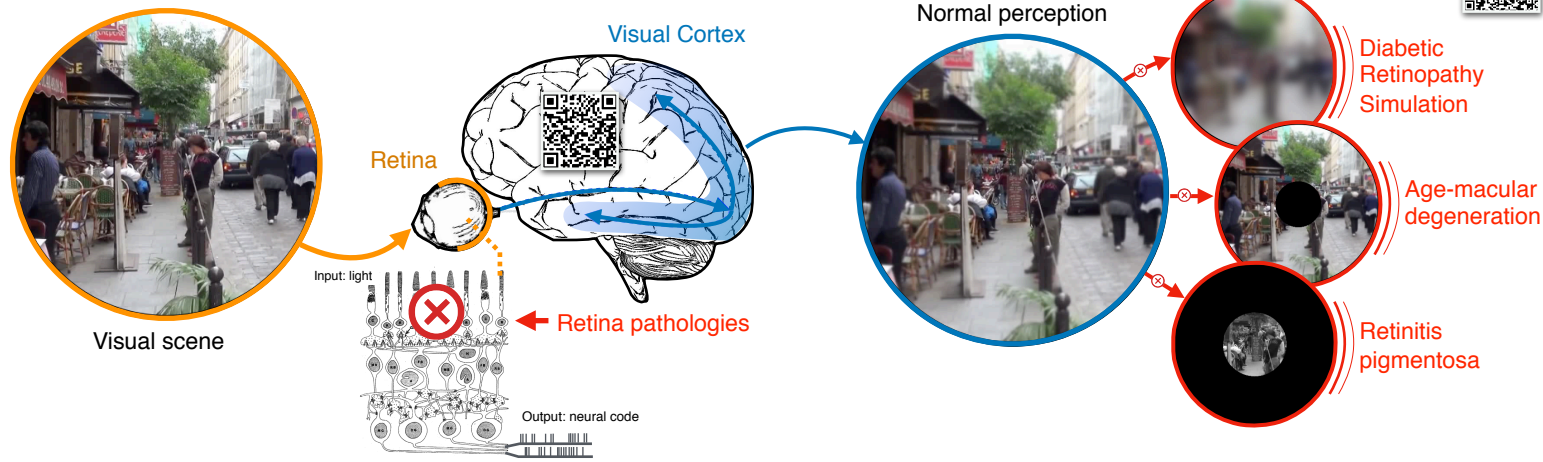
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### The visual system



### Research Axis 1 — Coord.: Bruno Cessac



#### Modelling and understanding the early visual system in normal and pathological conditions

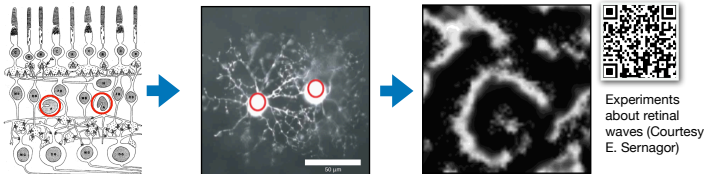
##### Main goals:

- Model and simulate normal and degenerated retinas
- Understanding how retina encodes motion (detection, anticipation)
- Contribute new therapeutic strategies

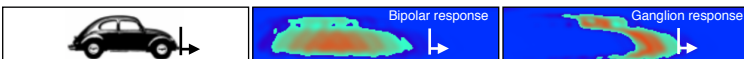
**Methodologies:** Biophysical modelling, dynamical systems theory, statistical physics, mean field, neural fields, computer simulations, ...

#### Biophysical modelling of the visual system

- Retina during development, retinal waves (Dora Karvouniari PhD)



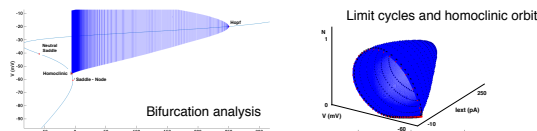
- Motion anticipation in the retina and beyond (Selma Souihel PhD)



- Impact of retinal cells silencing on vision (Jenny Kartsaki PhD)

#### Mathematical analysis

$$\frac{\partial G_A}{\partial t} = g_A D_M \left[ (\nabla G_S, \nabla G_A) D_H^2 \left( \frac{\nabla G_S}{\nabla G_A} \right) + \frac{\partial H}{\partial G_S} \Delta G_S + \frac{\partial H}{\partial G_A} \Delta G_A \right] + S(G_S, G_A).$$



### Research Axis 2 — Coord.: Pierre Kornprobst



#### Unveiling fundamental mechanisms of low vision perception to leverage cross reality

##### Main goals:

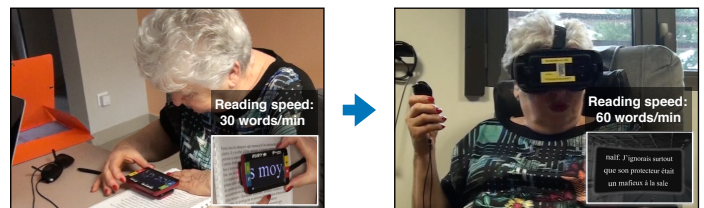
- Study low vision pathologies at behavioral level
- Design vision aid systems targeting main low vision needs
- Design patient specific low vision simulators

**Methodologies:** Computer vision, virtual and augmented reality, partial differential equations, dynamical systems, neural fields, ...

#### Modelling oculomotor strategies

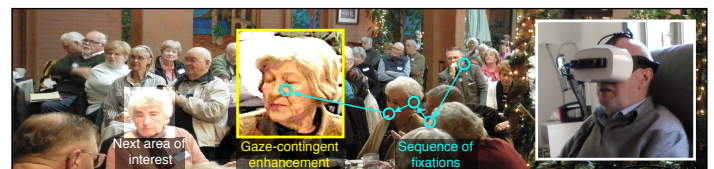


#### Reading aid system using virtual reality (Marco Benzi and Iliann Caugant)



#### Vision aid systems using augmented reality

- Face recognition and enhancement (Josselin Gautier)



### Main partners

#### Physicians

- CHU Pasteur 2, Service d'ophtalmologie, Nice
- Institut de la Vision, Paris

#### Neuroscientists

- Institut des Neurosciences de la Timone, Marseille
- Laboratoire de Psychologie Cognitive, Marseille
- University of Valparaiso, Chile
- University of Newcastle, UK

#### Theoreticians, modelers, computer scientists

- Institut de Physique de Nice
- Laboratoire J.A. Dieudonné, Nice
- CIMFAV, AC3E Valparaiso, Chile
- University of Genoa, Italy