Cortical microcircuitry after traumatic brain injury: molecules to networks, (Micronet)

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Traffic accidents, accidental falls and violent attacks may result in the damage to a person's brain: the ability to move, feel, speak, form memories and judgments can be lost at once. Repairing this damage is often beyond our current therapeutic abilities. Nerve cells become disconnected following the impact and parts of the brain become unable to communicate with each other. Yet some cells manage to establish new contacts and some level of recovery can arise although it is never complete. Which nerve cells are important for recovery? What happens to those disconnected cells, and why some do some succeed and others fail at making new connections? Are memories, movements, and feelings lost beyond repair, or can we restore lost functions? We have to answer these questions to improve the condition of those patients for whom there are few treatment options.

In this project, we will use the most advanced technologies available for visualizing how and when nerve cells lose connections after trauma and regain the ability to communicate with each other. We will develop new methods, bringing together scientists from computer science, medicine and biology to understand which nerve cells need to be stimulated for recovery to happen. Then, we will look for ways to promote such recovery. We will screen for drugs that have a positive regenerative effect on damaged neural cells and can therefore be used in the treatment of traumatic brain injuries. We will also study new ways to predict how successful the recovery will be. Our long-term goal is to funnel all this information into a coherent rehabilitation program aimed at severely impaired patients and help them to regain integrity of brain and mind.