The developing of an innovative technology for bio -organic interfaces is a strategic initiative for iit (CNST and NBT).

CNST in Milan and NBT in Genova are involved into a strategic initiative of iit, regarding bio organic interfaces for artificial retina. Others groups, centers and departments in iit are involved in similar research topics. Below a justification of this research effort is reported, as submitted to the CORDIS for new Future Emerging Technology calls at European level.

This topic address the interface between leaving cells and artificial devices based on organic electronics. Open question is: how organic semiconductors interact with live cells? The scope is to develop new technologies for life enhancing, diagnostic, healing and healthy aging. The main challenge is to realize bio-compatible, stable and effective systems. There is a series of recent breakthrough and demonstrations, highlighting the potential of organic electronics in such applications.

Physicists, chemists, engineers, biologists, neuroscientists and physicians are the core of this effort. Pharmaceutical companies, hospitals and chemical companies could also be involved. The high degree of innovation may however better fit with new start-up initiatives.

Silicon based bio-electronics has been studied for years. In spite of the obvious super power of such technology, results in terms of diagnostic performances, prosthetic device performances and medical advances are limited. Inorganic semiconductor features are far off the biological ones. Organic semiconductors, on the contrary, mimic many biological functions (molecular structure based on carbon, inherent flexibility, coexisting ionic and electronic transport, expected bio-compatibility, low or no toxicity, biodegradability). In addition to the technical limitations in performance, the microelectronic industry is not suitable for small volumes of business and customized solutions. A cheap and simple fabrication technology as for organic electronics seems favorable.

The research requires new collaborations and synergies. While a multidisciplinary team formed by specialized people can be the strongest team, a common place, like a laboratory, is needed and does not exist: A common house collecting researcher with multidisciplinary backgrounds working in close collaboration on common projects.

A FET initiative can foster development in the area and push towards collaboration research areas otherwise separated. Such an initiative will favor international partnerships and support the growth of a scientific and technological community. A scientific community is essential for development of new ideas into technology and innovation.

A starting fund allocation of 15-20 Meuro could be reasonable for 15 projects in the field. Effort should be coupled to training and dissemination with specific actions (e.g., the Marie Curie networks). On the

short time scale (3-5 years), the result will be the establishment of a scientific community and the awareness in the existing community. In 10 years first prototypes can go to the market. Time can be very long for clinical trials and approval. Results will be a new model and understanding of the bio-organic interface, including the development of *ad hoc* computational tools, the study of biological processes in vitro with new tools or concepts, improved data acquisition, data precision or functions (like selective excitation and probing, multiple probing, deep region probing, etc.). On the long run, better tools for healing, life enhancing and function restoring in human beings are expected. This field has interesting and important crosslinks to robotics and humanoid technologies.

Aging of the society is a positive outcome, due to a huge improvement in medical science, environment conditions and in general social conditions. However, it bears intrinsic new challenges, as old people suffer of reduced or impaired functions, often true diseases. These will become endemic. In order to increase the quality of the longer life now available, such pervasive decay of human functions should be contrasted and better tools identified, in order to provide as much as possible healthy aging to the people. The challenge is not only technical or clinical. It also regards the widespread of diagnostics and healing to an as-large-as possible fraction of the population, hopefully approaching 100%. This implies portable equipments to reach remote areas and chip cares to provide healing to poor people as well. The whole economy of countries would receive a benefit for the development of such technologies and their fair commercialization and distribution.

Europe could achieve a predominant position in this area, by developing a technological supremacy with the rest of the world and yet exploiting her own strong health care and welfare system.

An initiative is needed in order to compete with others undertaken in competing countries such as the Far East emerging economies and the US.

Considering a peak in population aging expected around 2050, this is the right time to start the competition with other countries. Lack of developing of an autonomous technology would result into a European dependence on abroad for services, know-how and equipment.