

L'ÉLECTRONIQUE POUR LES SCIENCES DU VIVANT

Contextes

Equipements
biomédical

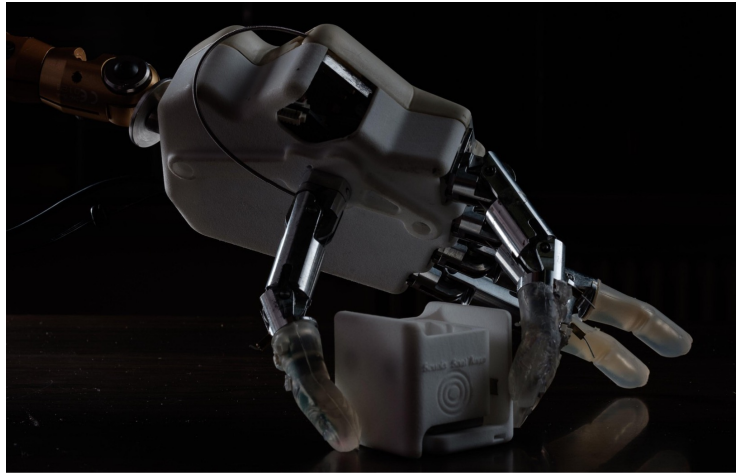
Appareils
implantés

Dispositifs
ingérables

Diagnostique
in vitro

Interfaces
neuronaux et
neuroprotheses

Neuroprothèses avancées



Une prothèse de main robotique nouvelle génération permet de recréer la sensation de proprioception chez le patient amputé (soit la capacité de notre cerveau à connaître instantanément et de manière précise la position dans l'espace de la main et des doigts, pendant et après leur utilisation (même dans le noir ou avec les yeux fermés)).

La prothèse stimule les nerfs résiduels de la partie restante du membre, ce qui permet de donner un feedback sensoriel aux patients en temps réel - d'une manière comparable à ceux d'une main naturelle.

Micera lab Science Robotics, 2019

Dispositifs portables miniaturisés pour la surveillance de paramètres de santé

ECG



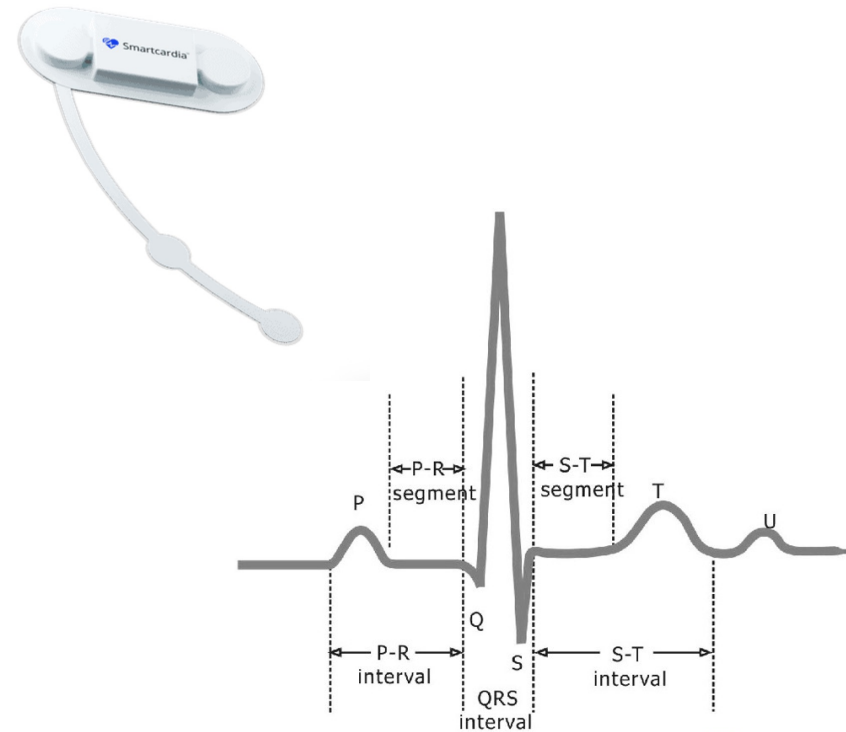
SmartCardia

Prioritise Cardiovascular Health
Smartcardia's
7 Lead ECG Patch

This wearable heart monitor patch reduces Events like Stroke, by detecting atrial fibrillation much earlier through its Live remote patient monitoring.

Sensor is re-usable and never needs charging*

- ✓ Mobile cardiac telemetry system
- ✓ Remote Patient Monitoring
- ✓ Extended Holter
- ✓ Event Monitoring



[*] Enlarge Image

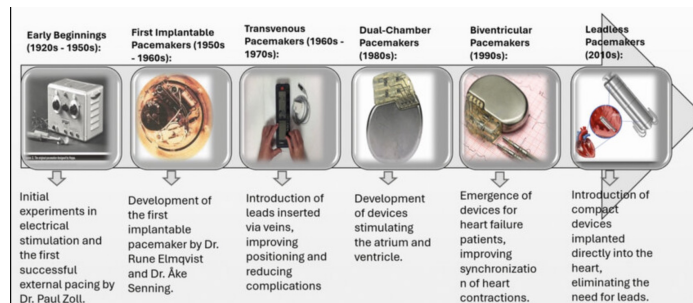
figure 1

Dispositifs implantables

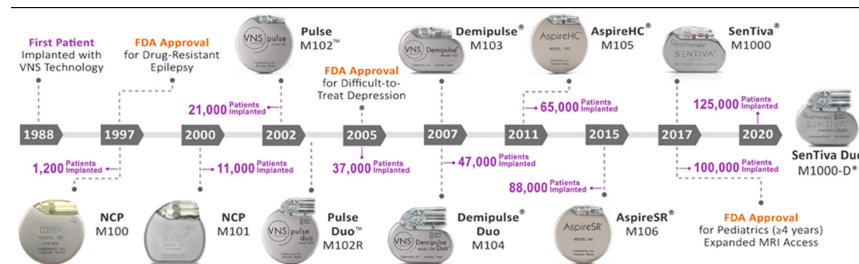


Pacemaker

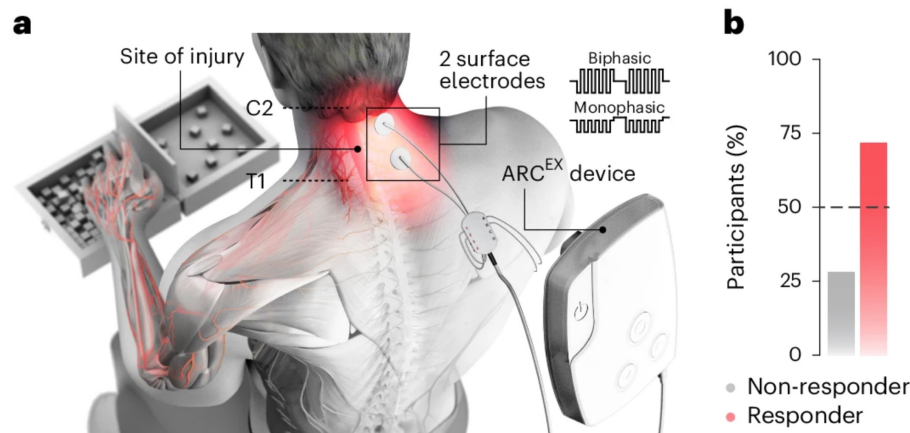
Stimulation électrique directe des muscles du coeur.



VNS Vagus Nerve Stimulation



Non-invasive **spinal cord electrical stimulation** for arm and hand function in chronic tetraplegia

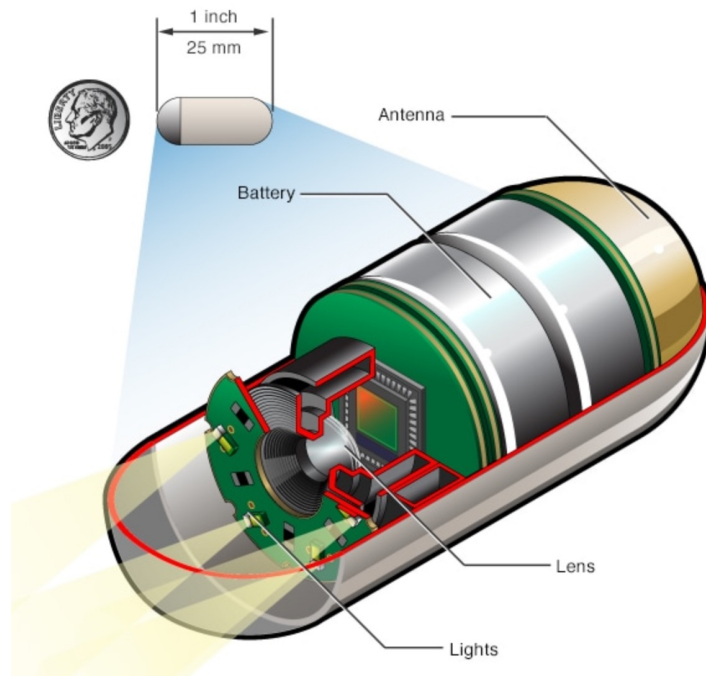


Nature Medicine volume 30, pages1276–1283 (2024)

Dispositifs ingérables

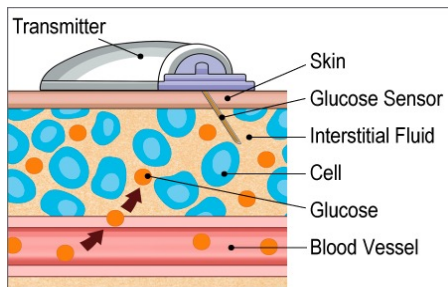
Caméra endoscopique

Doit être avalée, enregistre des images.

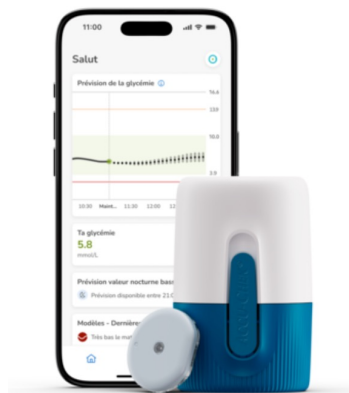


In vitro/in vivo diagnostics. instruments pour la recherche

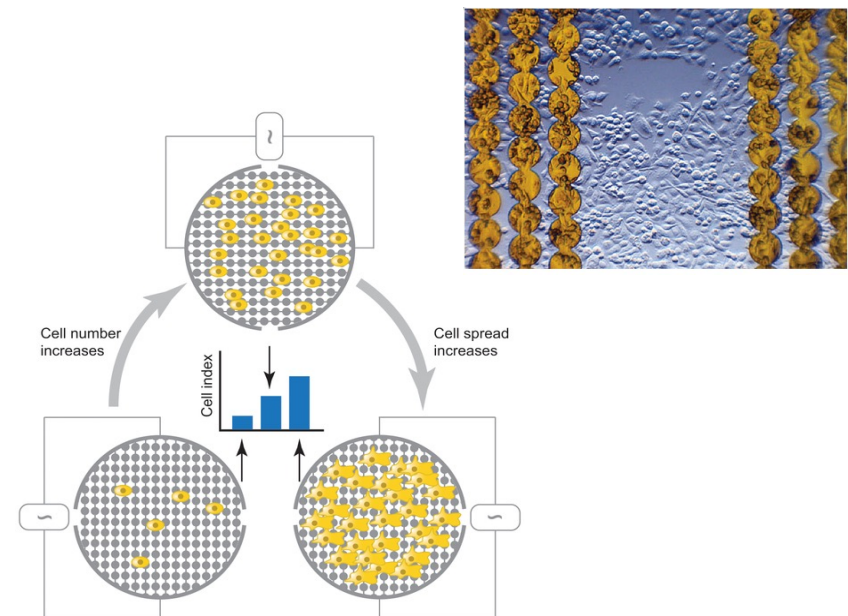
Glucomètre et surveillance continue du taux de glucose



ACCU-CHEK® Roche

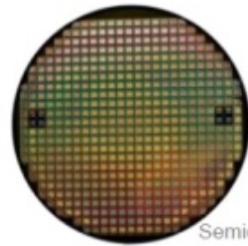


Tests sur des cellules vivantes basés sur la spectroscopie d'impédance Viabilité et motilité des cellules



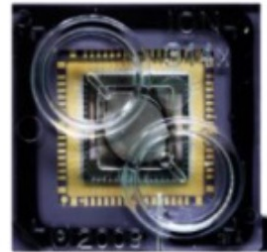
cellZscope NanoAnalytics
MaestroZ Axion

Next generation Sequencing



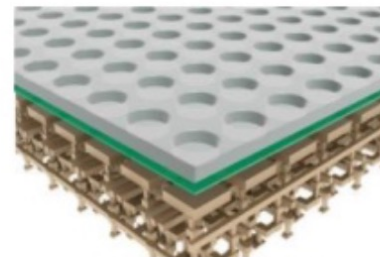
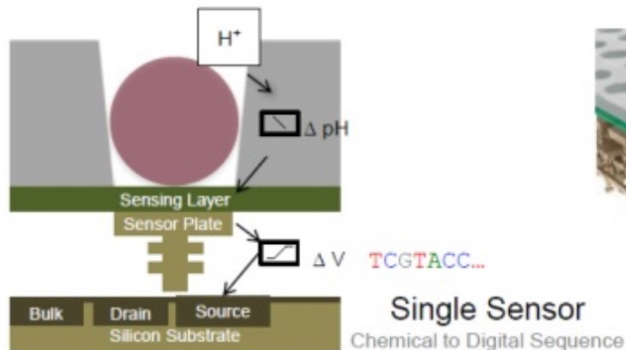
Wafer

Semiconductor Manufacturing



Chip

Semiconductor Packaging



Millions of Sensors

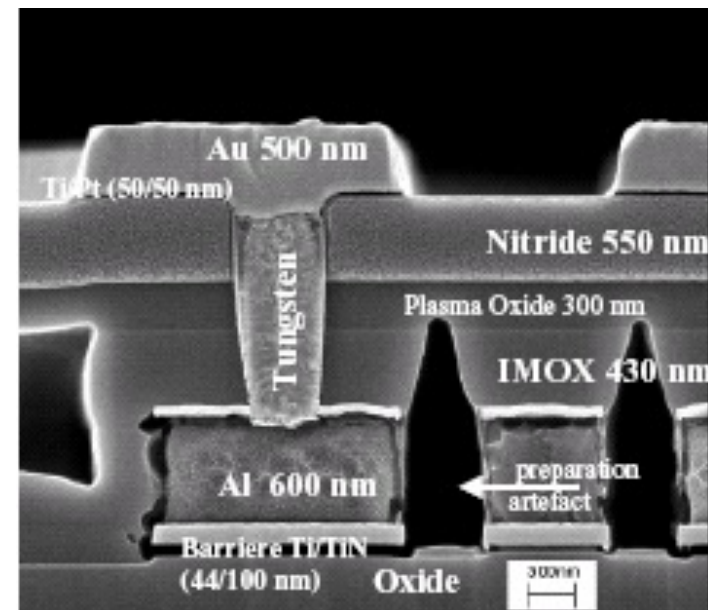
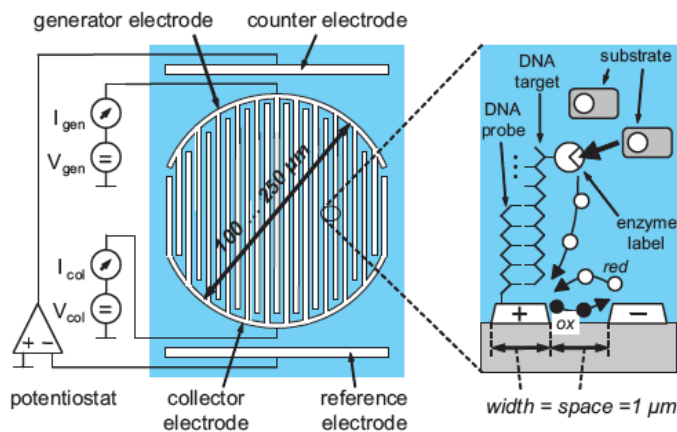
Semiconductor Design

<https://www.thermofisher.com/ch/en/home/brands/ion-torrent.html>

In vitro bioanalytics

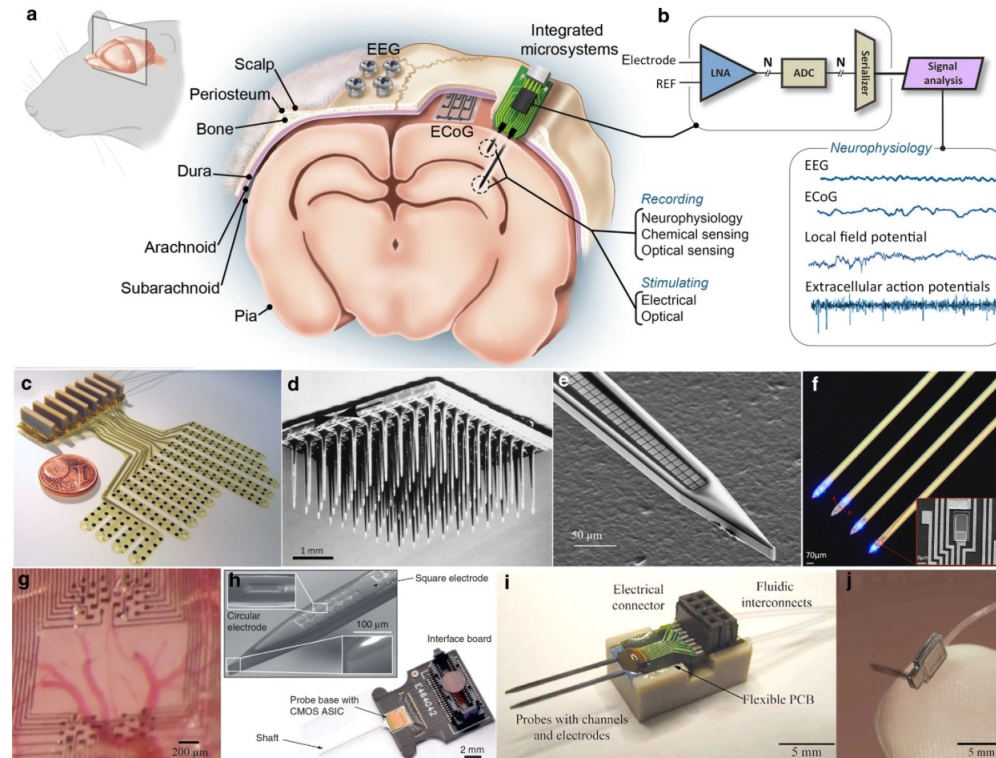
Analyse AND. Detection des réactions électrochimiques

Microélectrodes intégrées



Interfaces neuronaux

Microélectrodes intégrés



Recording and stimulating technologies vary across scale and degrees of invasiveness. (a) Illustration of the rodent brain and a variety of technologies from electroencephalogram (EEG) to intracortical microelectrodes. (b) High-density systems will increasingly require built-in active electronics to serialize large data streams and reduce the size of the connectors. Sample electrical signals show the amplitudes of various signal sources. The intracortical arrays are often microelectrodes but may also include chemical and optical sensors. (c) Polyimide electrocorticogram (ECoG) for large area mapping⁶⁷. (d) A "Utah array" with 400 μm shank spacing and 100 channels has been used in human studies⁵⁰. (e) Close-packed recording sites with 9x9 μm area and a pitch of 11 μm ¹⁷⁸. (f) MicroLED optoelectrode made from GaN on silicon¹⁷⁶. (g) Parylene ECoG with greatly improved resolution over EEG and even single-cell capabilities²³. (h) CMOS integration on probe shaft and backend⁴⁰. (i) Fluidic probe for drug delivery⁴⁵. (j) Active 3D silicon recording system with flexible parylene interconnect¹⁸².

2011: milestone avec HD-USEA (High density Utah Slanted Electrode arrays) pour stimulations et enregistrements neuronaux in vitro et in vivo.

25 électrodes/mm²

Biophysique

Observation de l'hybridation des deux brins d'acides nucléiques sans aide de marqueurs fluorescents.

Transducteur: dispositif à nano-tuyau

