The Parkinson project (1965-1970)

The first biomedical Engineering project of the University of Twente, at that time the THT.

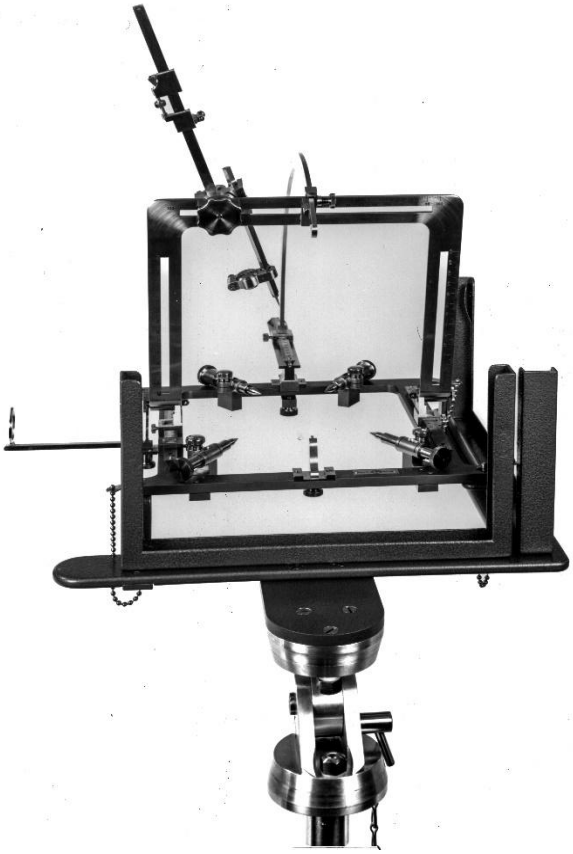
Dr.G.J.van Hoytema

Dr. G.J. van Hoytema settled as the first neurosurgeon in both hospitals of Enschede in 1953. He founded a neurosurgical center after some years, focusing on the development of depth measurements and stimulations of deep brain nuclei. As such, he started the stereotactic treatments of extrapyramidal movement disorders of Parkinson patients in the early 1960s, together with Dr. J. van Manen, a neurologist of the academic hospital in Groningen. They developed their own stereotactic frame for deep brain surgery, in collaboration with the technical workshop of the company Holland Signaal in Hengelo.

In 1964, the third Technical University of the Netherlands was opened in Enschede, called the “Technische Hogeschool Twente (THT), later on called the University of Twente (UT).

Dr. van Hoytema realized that he could probably as one of the first medical doctors in Enschede profit from the opportunity to cooperate with the newly founded university. He wrote a letter to the board of the university, asking for help with his stereotactic surgery project. His idea was that a specific measurement in the brains of a patient could help him to locate in more detail the place where afterwards the surgery should take place. His request was picked up by the chair Medical Electronics, headed by

Prof.Ir. M.P. Breedveld, in practice by the staff members Drs. Jan Holsheimer for the development of a suitable measurement electrode, Ir. Piet Bergveld for the actual measurements of brain activity and hand tremor and Ir. Peter Löhnberg for the information processing **[1]**

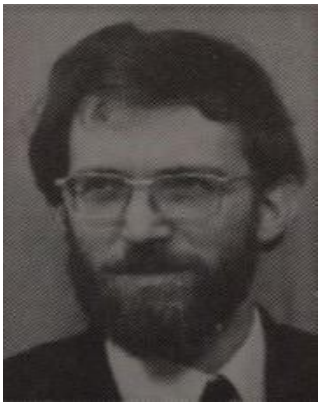


The van Hoytema-van Manen frame for stereotactic surgery

The electrode consisted of a glass tube, containing a shielded wire with a Platinum tip of 50 µm. **[2]** Because field-effect transistors with a high input resistance were not yet commercially available at that time, Piet decided to make use of a nuvistor **[3]** for the input stage of an amplifier **[4]**, because of its extremely high input resistance. For the tremor sensor he used a silicon strain gauge as base for an acceleration sensor **[5]**. An 8-channel Ampex tape recorder was used for the registration of the brain activity, the tremor and the EEG leads for later data analysis.

Jan Holsheimer

Piet Bergveld



Peter Löhnberg

Unfortunately, Dr. van Hoytema passed away in March 1966. His place in the Parkinson project was taken over by Dr. J. Oostrom, the neurosurgeon who had already been the assistant of Dr. van Hoytema since 1959 and had become his associate since 1965.

Ultimately the stereotactic surgery has been made obsolete by the introduction of the drug L-DOPA and therefore this first common project of the hospitals in Enschede and the university was stopped. It was however the base of further research in the field of biomedical engineering in Twente with many medical projects.

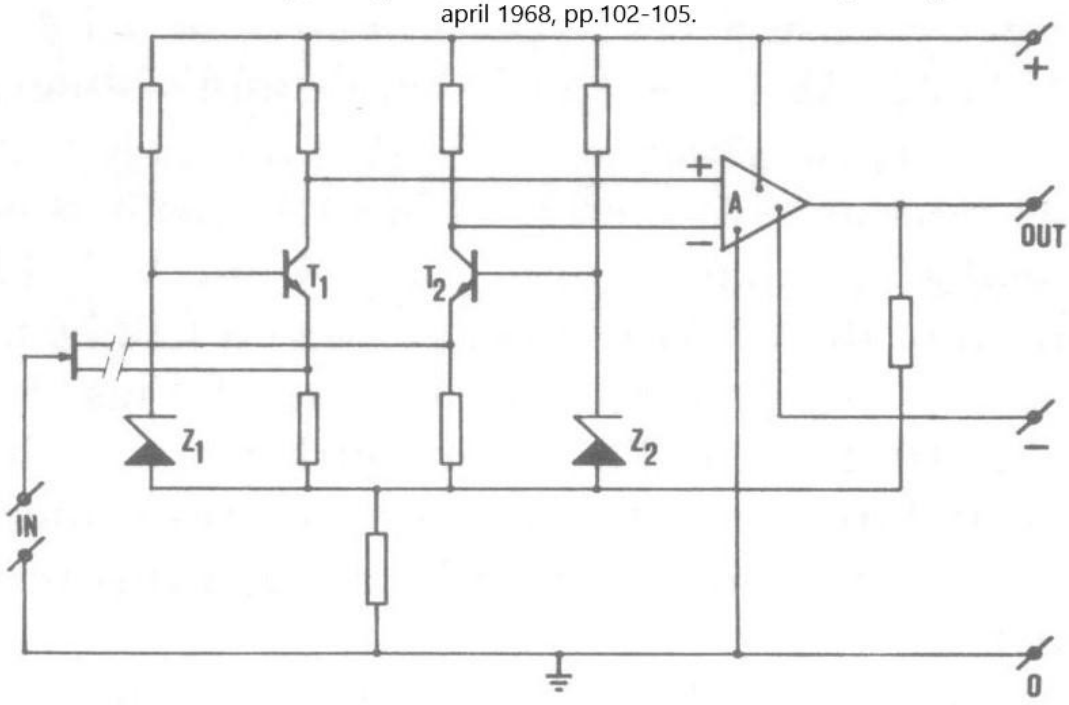
Peter Löhnberg quit the group, but Jan Holsheimer went on to specialize himself in brain stimulation as intervention in neurological disorders, for which he developed a kind of stereotactic equipment for experiments with rat brains **[6]**. The result of his brain research is described in his PhD thesis **[7].**

Piet Bergveld focused on measurement systems for electrophysiological research. Inspired by the Parkinson project he proposed a novel amplification method for depth recording as published by him in 1968 in IEEE Transactions BME **[8]**.

The key details of this method are:

1. By placing a field-effect transistor (FET) directly on or near the test object.
2. Supplying the source and drain by unshielded wires from low-ohmic points, which follow the potential of the measured signal with respect to the common lead of the system.
3. Connecting the test object with the FET to the actual amplifier, which is placed at some distance from the test object.
4. This approach is particular useful when it's not feasible to position a complete amplifier close to or in the place of measurement, like brains.
5. Prevent the application of shielded wires which may limit the bandwidth of a measurement system.

Schematic diagram of source-drain follower, published in "New Amplification Method for Depth Recording", P.Bergveld, IEEE Transactions on Biomedical Engineering, april 1968, pp.102-105.



This system is tested with the measurement system as developed for the brain research by Jan Holsheimer as mentioned above **[6].** Ultimately this approach led to the development of the Ion-Sensitive Field-Effect Transistor (ISFET) as exhibited in showcase V36 in the TechMed auditorium.