

Institute for Perception Research



Organization

university and

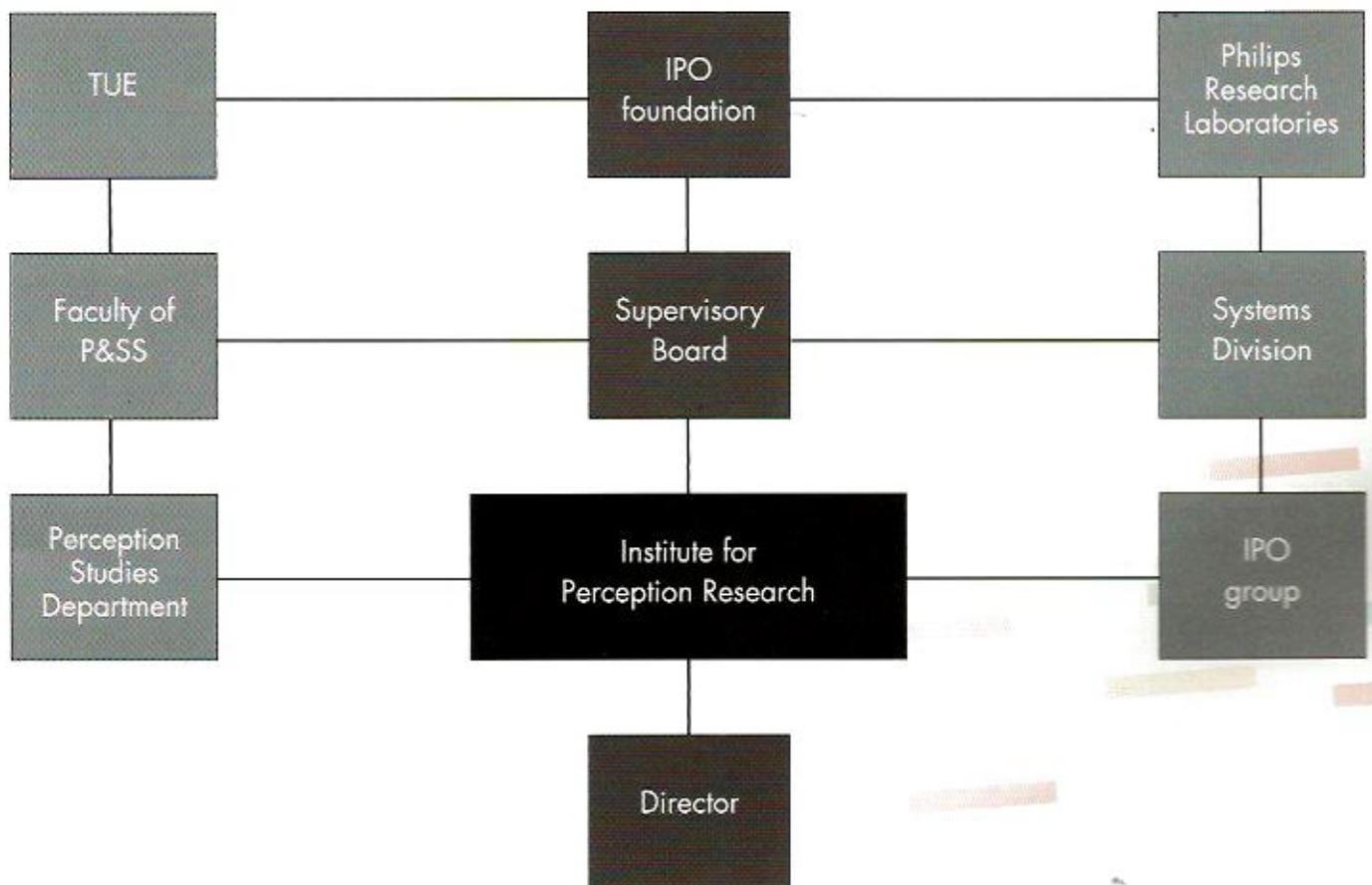
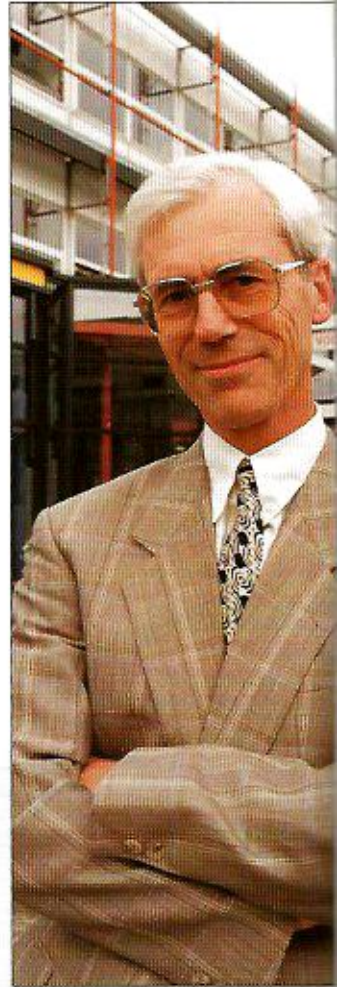
industry
unique partnership

The Institute for Perception Research (IPO) is the result of a unique partnership between industry and government. Philips Research Laboratories in Eindhoven and the Eindhoven University of Technology (TUE) have been working cooperatively here since 1957.

Philips
TUE
Within the Research Laboratories, the IPO forms part of the Systems Division. On the TUE side, the institute comes under the Perception Studies Department of the Faculty of Philosophy and Social Sciences. Around 80 people work at the IPO.

unity
"Not everyone who works at the IPO has the same employer. In practice, however, researchers, assistants and support staff work together closely on a cohesive research programme".

*Prof. Bouma, Director,
outside the IPO building
on the TUE campus.*



Perception

observation and

technology
more than observation

Perception research is carried out all over the world. Literally, "perception" means "observation", but it extends beyond that. In general, therefore, the researchers at the IPO are concerned with three questions:

- how do people perceive information from their surroundings? (hearing, vision)
- how do they process this to obtain useful information? (understanding, remembering, selecting)
- how do they carry out actions on the basis of all the impressions processed? (speaking, handling hardware and software)

hardware and software

IPO researchers study in particular how people perceive and process information when handling hardware and software. Hardware may be a television, but also a reading lens. Software operates a noise-dependent volume control in a car radio, but also reading exercises with a computer.

social necessity

One of the factors which determine the choice of the research programme is the technical developments taking place in society. We are receiving increasing quantities of information and we are all constantly obliged to operate increasingly complex hardware and software. This makes it all the more vital that these should be easy to use.

people and technology

The results of perception research enable us to tailor hardware and software considerably more closely to human capabilities and limitations. This is why the IPO is interested in information transfer via hardware and software, in which hearing, vision, thought and speech play an important role.

Cooperation

unity in the midst of

diversity

discipline groups

In the IPO, researchers and their assistants work together in groups. The three discipline groups are primarily concerned with strategic work, which forms the mainstay of the institute. The questions studied derive from gaps in existing knowledge, and the aim is to develop and broaden theories, often taking the form of a model. The results are significant for a wide range of possible applications. These receive considerable attention, even during the strategic research.

subject groups

In contrast, researchers in the two subject groups examine whether (possible) questions from certain practical fields can be answered on the basis of expertise already present in the discipline groups. They too consider possible applications for existing know-how.

people and technology

Due to the interest in people in a technical environment, researchers from the technical sciences cooperate closely in the IPO with researchers from the human sciences. Of course, test subjects are an essential component in perception research.

Philips and TUE

The IPO devotes considerable attention not only to cooperation within the institute, but also to cooperation with researchers elsewhere. Of course, it has contacts with various groups of Philips Research, including the Projects Centre, Geldrop,

Which differences in pitch of speech

or other sound can people hear clearly,

and why is that?

How do we measure image quality and on

which aspects of the scene does it depend?

How do people know what the words "he"

and "it" refer to in a sentence such as: "Did

he take part in it?" in a given context?

What are the functions performed by office

workers, which can be automated and what

are the possible interfaces between person

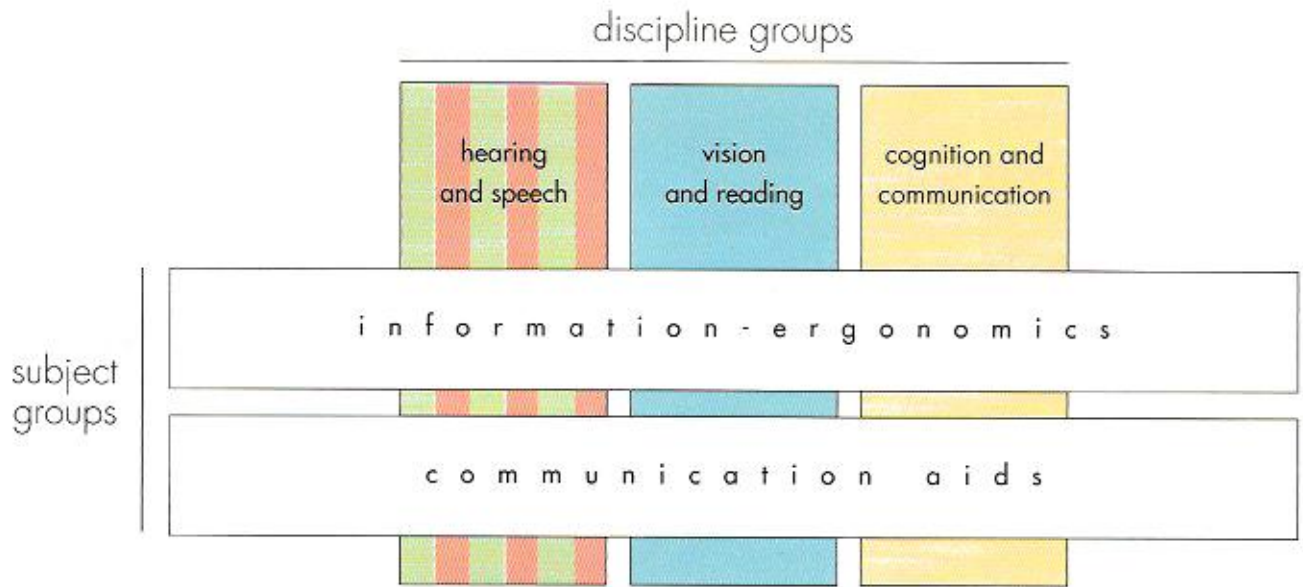
and computer? Does speech offer new

prospects in this connection?

How can we tailor aids for people with

speech disabilities as closely as possible to

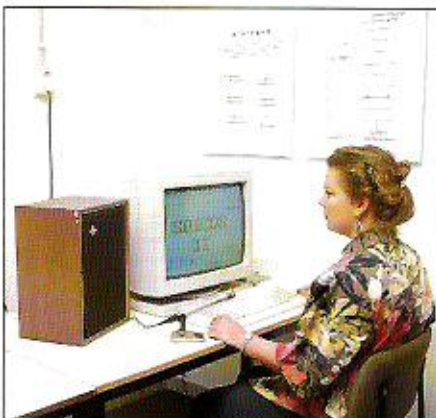
the practical situation?



and a number of TUE faculties, such as Philosophy and Social Sciences, Electrical Engineering and Physics. In the TUE, the IPO is represented in the Joint Committee on Biomedical and Health Technology.

(inter)national The IPO also works with various universities, (para) academic and industrial research laboratories in the Netherlands and in other countries. An example of this is SPICOS, a Siemens-Philips-IPO joint project in the field of dialogue systems between human beings and computers in spoken, natural language. European projects in which the IPO is involved include the ESPRIT project Polyglot, concerning speech recognition and synthesis, and the EUREKA project for HDTV (high-definition television). In addition, researchers from other countries come to the IPO regularly as visiting members of staff.

A researcher communicates with SPICOS in natural language.



Gaining and exchanging expertise under the guidance of visiting member of staff Prof. W.L. Verplank.

Research in reality

hearing and speech

sound

"Every sound has a number of features which we can measure objectively. But what interests the IPO in particular is the way in which people perceive sounds. For example, how much information can we omit from sound without it being noticed by test subjects?"

*Prof. A. Houtsma:
"People hear by no means everything. So we can code sound more economically, that is, omit 90% of the information!"*



Prof. R. Collier:

"We ask test subjects to judge the naturalness of synthetic speech."

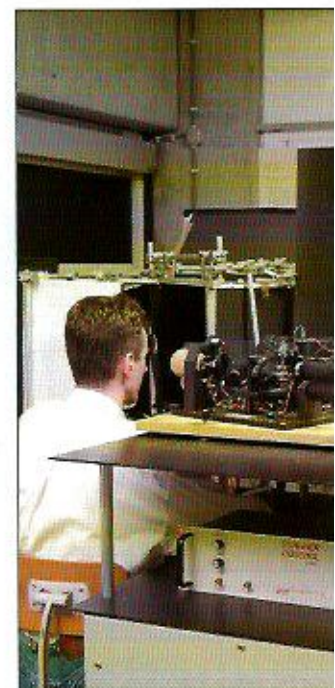
speech

"The main question in our research is: what happens in the speaker and listener when they communicate with each other by means of

language? How are the speech sounds produced? How do they differ from other types of sound? And which sound aspects of speech are important for understanding the message? An ideal way to evaluate our knowledge of this is to try to imitate the human voice as accurately as possible by synthetic means. We can now do this reasonably well for Dutch, English and German."

Prof. J. Routs:

"When features of pictures change, does their readability also change? Eye movements tell us something about that."



vision and reading

perception of brightness

"Some features of television pictures and other images can be measured easily, such as luminance (a measure of the amount of light which an object emits and is received by the eye). However, we would also like to know how people experience them. So we use other, subjective, terms such as "brightness". In the IPO we are working on a brightness model which indicates in mathematical formulae how people perceive brightness.

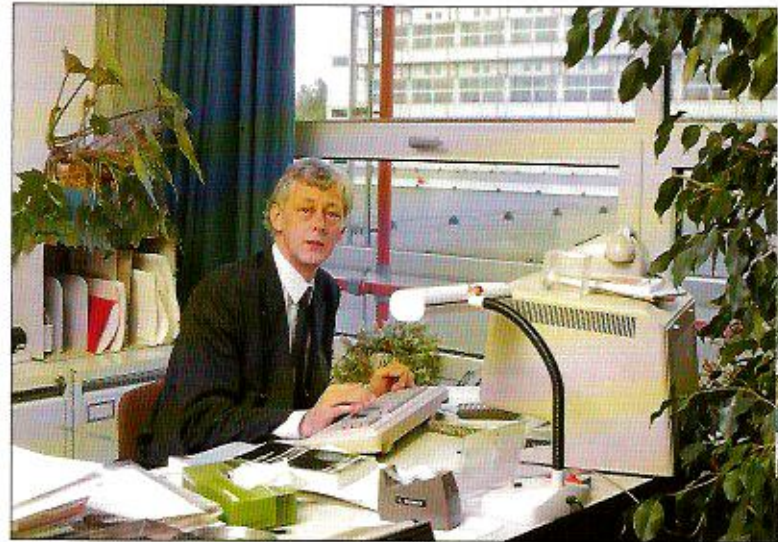


subjective image quality

Using this and other information, we can compose such images as television scenes so that they are tailored to the way we see. This also means as little excess information as possible in a picture!

reading

This is a method of information processing via the eye which is more important now than ever before. Do features of the picture or the paper bearing text influence the way we read and the ease and speed with which we read? Researchers in my group are investigating eye movements in particular."



*Prof. D. Bouwhuis:
"Basic research is also very important in developing interactive educational tools."*

cognition (knowledge) and communication word recognition

"How do people process the "first impression" at higher, more central, levels in their brains? In our research into reading we are concerned with theories on how people recognize words.



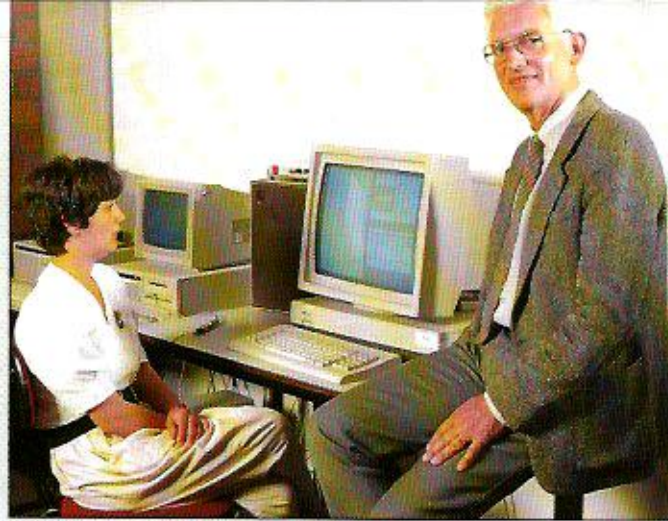
interactive learning

Another question is how we can develop an effective, interactive educational tool for teaching children to read or for teaching a foreign language. This requires research, but it also requires evaluation in practice.

communicating

Further questions relate to how people (should) communicate with computers or information machines. If we want to tailor hardware and software as closely as possible to the human being in this area too, we must first have sufficient knowledge of how people communicate between themselves."

Prof. F. van Nes: "We investigated the possibilities of speech in an office environment in the context of a European project."



information ergonomics

screen
operation

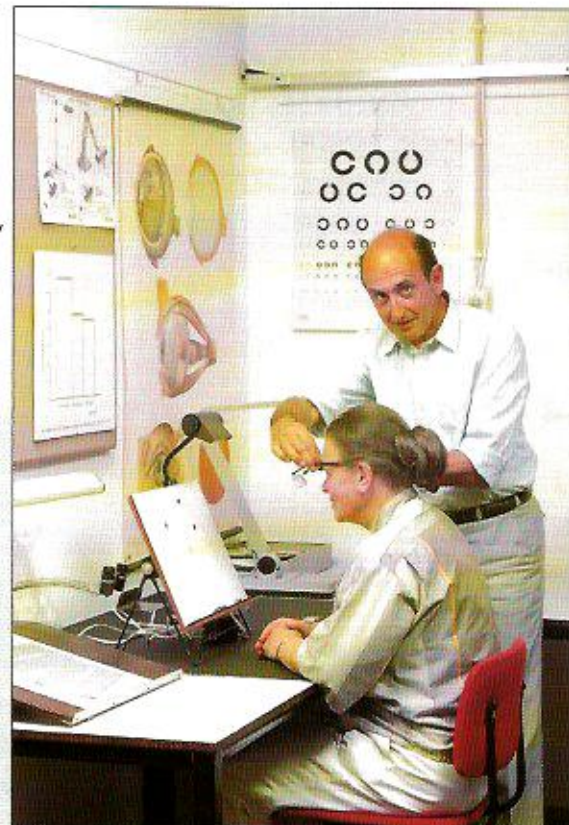
"Producing hardware and software which behave in exactly the same way as a human being is still far beyond our capabilities. What we can do is design hardware in such a way that people know much more clearly how to handle it, or rather: how to perform certain functions with it. To do this, we have to ask ourselves: what information has to be displayed on a screen, in which position and in which form (of lettering)? Is a keyboard, a mouse or a touch-sensitive screen preferred by a given target group? We also study whether people actually do use all the options offered by, for example, a videorecorder or a car radio, and if not, why not."

communication

aids
speech aids
lighting

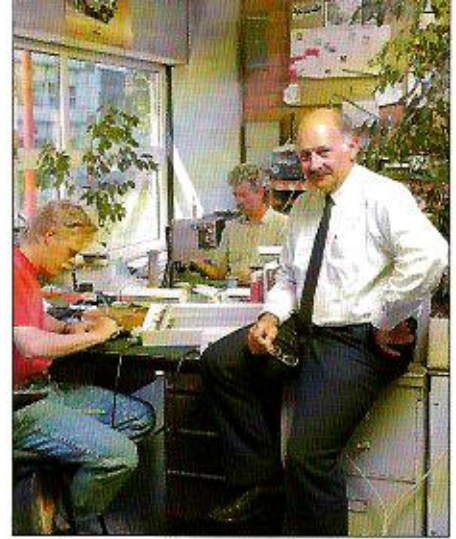
"Quite a few results of research in the discipline groups can also be used for the disabled. For example, consider the possibilities of synthetic speech for people who are unable or barely able to speak themselves. And our expertise in lighting can be important for the partially-sighted."

H. Mélotte: "A typical question arising from practice is: what are the possibilities and limitations of various types of lenses for the partially-sighted?"



support
instrumentation

"No researcher can work without hardware and software. Consider an instrument for measuring eye movements, and computer programmes for guiding experiments with test subjects and registering and processing the results. The resources are often very specific and not easily available. So the Instrumentation group develops them, working closely with the researchers of course. The Instrumentation staff also administer and maintain the instruments, for which they have their own mechanical and electronic workshop."



L. Willems: "Hardware and software are essential implements in the research."

secretariat

"The secretaries provide the director, group leaders and other members of the IPO staff with the necessary administrative support."

Mrs. P. Evers: "We are the first point of contact for people from outside."



library

"As the librarian, I am responsible for the IPO's extensive collection of books and periodicals. Together with a researcher who works as a "reader", I draw his colleagues' attention to particular periodicals or articles."

Mrs. R. Smith: "The IPO has its own extensive collection of books and periodicals."



Results

science and society scientists

IPO researchers communicate regularly with fellow scientists throughout the world. These contacts take place via theses, articles in scientific and specialist periodicals, direct meetings at scientific conferences, patents and consultations. The IPO also issues an Annual Progress Report each year. In addition, as a member of special working groups within Philips, the institute attempts to use its expertise to develop products. Product prototypes are sometimes handed over to a manufacturer, following a thorough evaluation. Past examples of this include a Teletext alphabet and, recently, the "Pocketstem", a prototype aid for people with speech disabilities. IPO researchers also give lectures and demonstrations on a regular basis.

This design of the "Pocketstem" was conceived by Philips Corporate Industrial Design.



*Years
Annual Progress Report...*



social groups

However, society too must benefit from the IPO's expertise. It is precisely because the human being is a central focus of the research that certain social groups can profit from the results. For the partially-sighted, a leaflet has been produced on types of lenses and the way they are used. A representative view of the research is given by the partly interactive exhibition in the hall of the IPO building. A leaflet on the "Reading Board", a prototype interactive reading aid for primary education, is intended to inform the teaching world, government and manufacturers about new possibilities for the initial stages of instruction in reading.



Education

thought and action
lectures
practical training and final projects
courses
doctoral degrees

IPO researchers give a course of five optional lectures each year for students of the TUE. In addition, students from the TUE and other universities and colleges can receive practical training or carry out a final project at the IPO, working within the framework of the existing research programme. The IPO is also involved in postgraduate education at the TUE and holds postacademic courses regularly. The professors of the institute supervise doctoral research.



Students regularly discuss their contributions to IPO research with their supervisor.



The exhibition in the hall of the IPO building: an appealing approach to social groups from a location close to the researcher.



The IPO's colloquium room is equipped with extensive audio-visual facilities.



Doctoral theses at the IPO sometimes receive considerable media attention.

Further information

For further information about the IPO or its research, telephone or write to:

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There are white signs for the IPO on the TUE campus.**

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