TNO

groundwater survey

TNO Groundwater Survey Institute
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The TNO Groundwater Survey Institute forms part of the TNO Central Organization for Applied Scientific Research in the Netherlands.

The institute is housed in the TNO-research centre 'Zuidpolder' at 97 Schoemakerstraat, Delft.

TASKS

— geohydrological mapping of the Netherlands (scale 1/50.000)

— maintenance of a piezometer network and compilation of groundwater-level observations

— advising water companies, governmental services and engineering consultants

— rendering technical assistance to developing countries

— research and development

— transfer of knowledge

SCOPE OF ACTIVITIES

Geohydrological studies	inventory of resources investigation of aquifer characteristics study of hydrochemistry
Geophysical prospection	resistivity investigation seismic refraction survey magnetic method
Geophysical well logging	in open holes in pumping wells in observation wells
Laboratory investigations	petrophysical research testing samples development of equipment
Methodological research	on investigation methods on interpretation techniques on statistical evaluation of observations
Technical assistance	training personnel participation in surveys supplying equipment

Geohydrological studies

Subjects covered are, inter alia:

— collecting and evaluating geohydrological data

— well tests to determine the hydraulic properties of aquifers

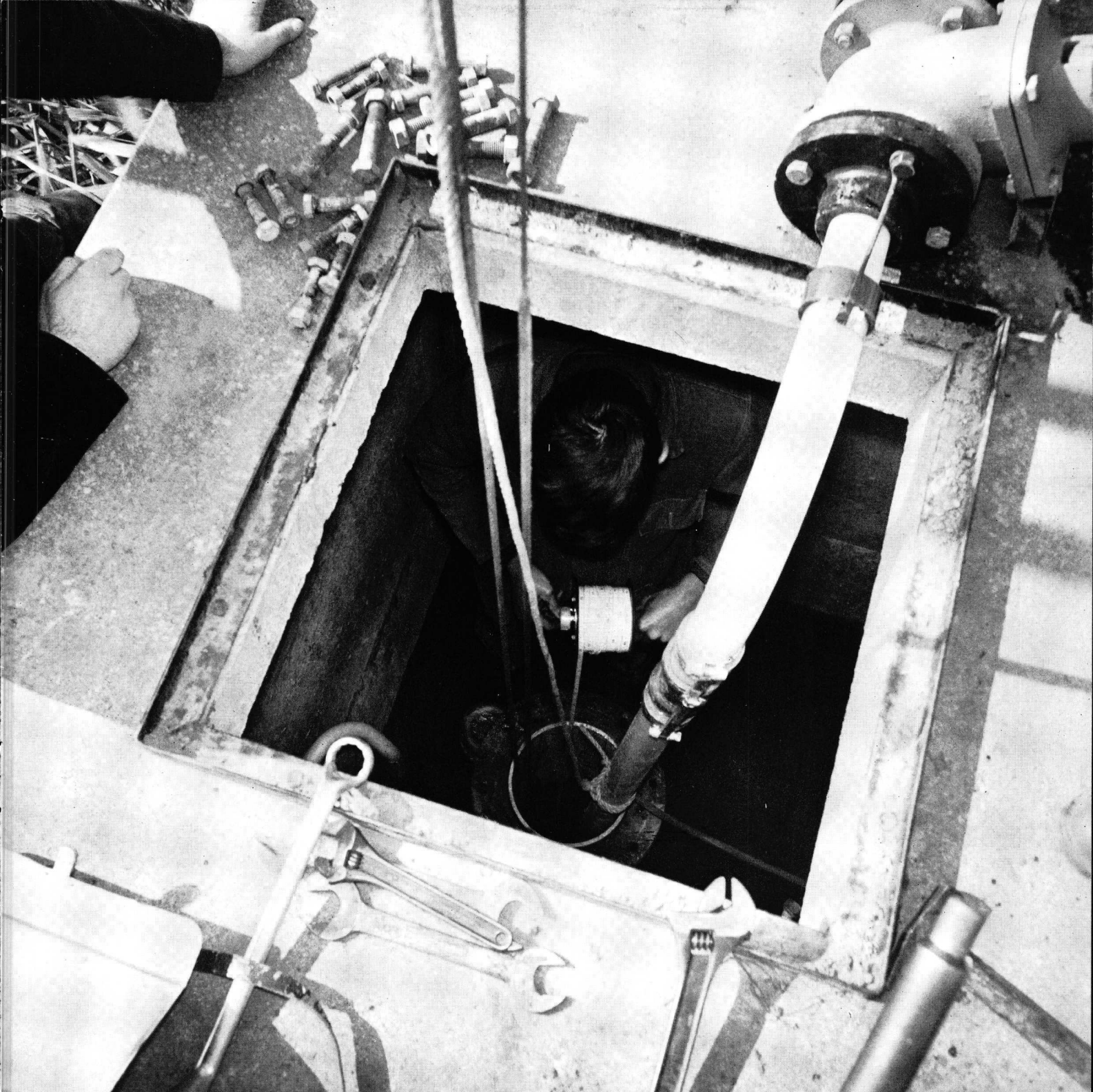
— installation of piezometers for the observation of groundwater-level data

— compilation of results in geohydrological maps (for instance, groundwater contour, transmissivity and hydrochemical maps)

— planning and management of test-drilling programmes

— installation of permanent electrode systems for groundwater-salinity inspection in observation wells

— determination of seepage by means of near-surface temperature measurements



The Archives for Groundwater Levels, a department of the TNO Groundwater Survey Institute, maintain a network of over 13,000 observation wells in the Netherlands.
Water-level observations are made every two weeks in 54% of the wells; the remaining part is gauged four times a year. The total number of collected observations exceeds 3,500,000. The automatic processing of these observations on a CDC 3200 computer at the TNO Institute for Mathematics, Information Processing and Statistics started in 1970. About 20,000 tables or graphs are issued each year to interested parties in the fields of agriculture, forestry, construction, groundwater recovery and water management.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Geophysical prospection

The resistivity method is applied by means of several types of measuring equipment, developed by the TNO Groundwater Survey Institute.
The interpretation of the resistivity soundings can be carried out by means of the direct and indirect interpretation methods.
A desk computer with XY-plotter provides facilities for solutions of up to eight layers.

The seismic refraction method is applied when exploring:

— depth to bedrock

— weathered zone

— sequence of layers in hard rock

— depth of phreatic water-table in loose sediments

Geophysical well logging

The TNO Groundwater Survey Institute is responsible for all the geophysical well logging for geohydrological purposes in the Netherlands.

The following logs are run through open holes:

— spontaneous potential

— normal resistivities (20 cm/100 cm or 16″/64″)

— dry hole resistance

— natural gamma radiation

— caliper (diameter)

For survey in pumping and observation wells, tools are available to record the following properties:

— temperature

— differential temperature

— fluid resistivity

— vertical flow


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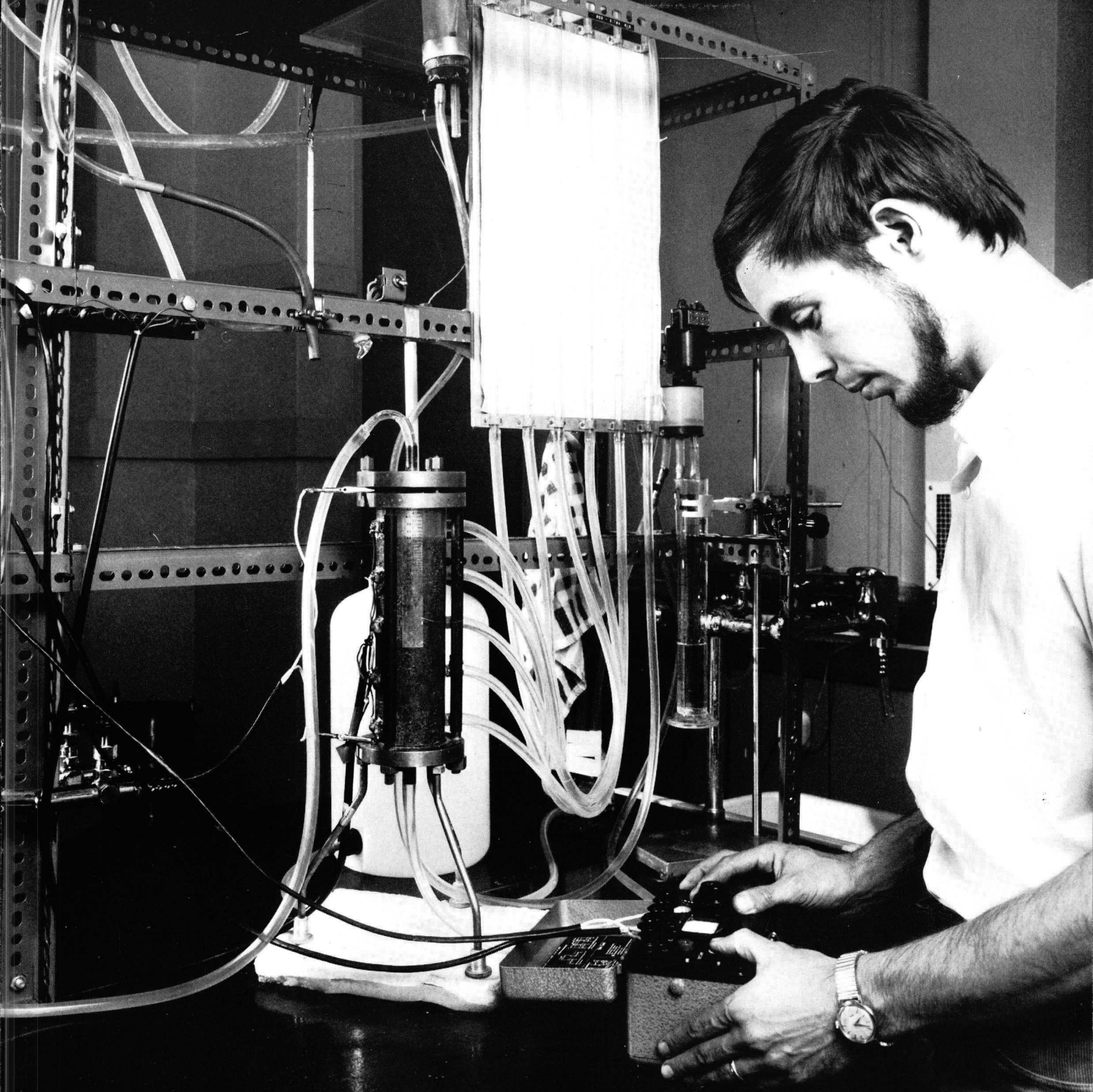
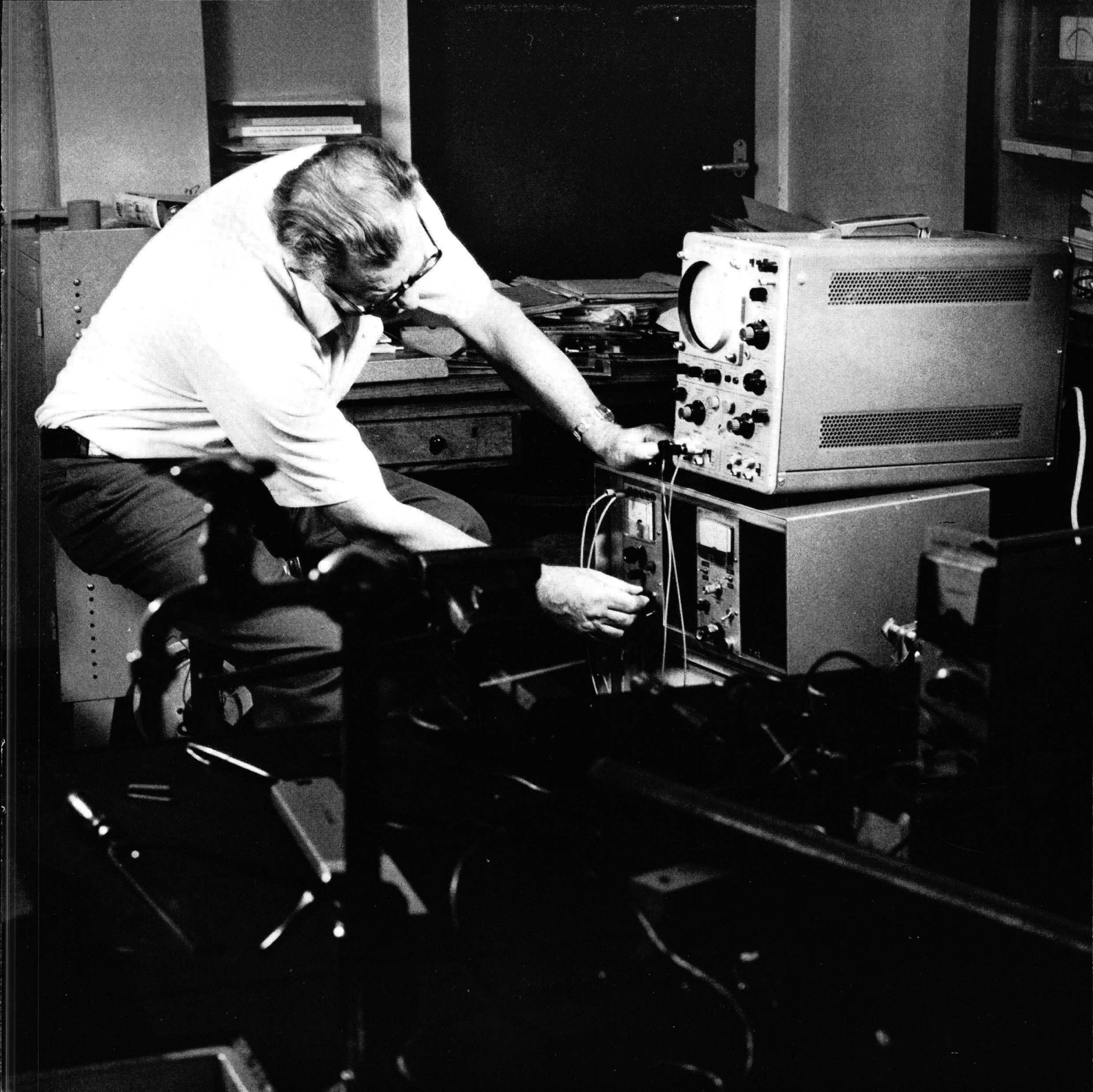
Laboratory investigations

These comprise routine determinations of physical properties with respect to formation samples, water samples and drilling muds.
Experimental research in the petrophysical field concentrates particularly on unconsolidated sediments.
Facilities are available for testing and calibrating well logging equipment.
Other institutes within the TNO organization offer almost unlimited facilities for physical and chemical analyses.



The development and manufacture of specialized equipment was born of the need for instruments of higher standards than those readily available.
Equipment designed by the TNO Groundwater Survey Institute is now in use in several countries in Africa, Asia and South-America.



Methodological research

Methodological research plays an important role in the activities of the TNO Groundwater Survey Institute. It supports the automation programme of the Archives for Groundwater Levels; keeps the geophysical prospection up to date, and supports the geohydrological surveys in various ways.
The desk computer is used to evaluate laboratory and field observations.

Technical assistance

Technical assistance to developing countries is given in the following ways:

— training personnel in the TNO Groundwater Survey Institute

— participation in bilateral or multinational co-operative programmes

— supplying equipment manufactured or adapted in the institute

The effectiveness of the assistance largely depends on the experience gathered by staff members and technicians of the institute during water supply surveys and feasibility studies carried out, for instance, in India, Chile, Colombia and Tanzania.

The TNO Groundwater Survey Institute plays an active part in many national and international organizations, committees and working groups in the geohydrological and geophysical fields.
With regard to international technical assistance, the institute is represented in the Sub-committee for development co-operation, installed by the Committee of Earth Sciences of the Royal Netherlands Academy of Arts and Sciences.
Staff members of the institute participate in and contribute to national and international meetings, conferences and post-graduate courses.