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Digest of the address delivered by Mr. *W. Klein*, Director Research and Development, on 1 February 1973 at a press conference marking the inauguration of the Division's new headquarters.

The Research and Development Division had its beginnings in 1944, when the then Testing Section was detached from the Telephone Department and, under the new designation of Research and Testing Division, placed under the control of the Director General of PTT. At that time, telephone automation in Switzerland was already in full swing, while HF wire broadcasting and carrier telephony were making their first tentative steps. Owing to the wide range of activities arising from the rapid development and expansion of services as well as the planning and design of new communication facilities, the Division has been faced with staffing and accommodation problems from the beginning.

Today the Division numbers 240 staff of various branches of science and technology. About half of them have graduated from polytechnic institutes, or they hold similar qualifications.

The new headquarters, which has been designed to the Division's specific needs, for the first time enables the entire staff to be accommodated in one building, so that work can be performed more efficiently.

The major objective of the Research and Development Division, according to the PTT statement of policy, is to make the best possible use of new knowledge obtained from

science, research and development in all fields associated with PTT work. The PTT therefore encourages the coordination of telecommunication research by universities and industry, whose efforts it may support through suitable contracts. Rather than go in for basic research, the PTT relies on the results of university and industrial efforts in this domain, concentrating its own effort on applied research. In practice, however, operational problems may sometimes crop up whose solution calls for basic research on a small scale. It can be said that, for the Research and Development Division, applied research means being motivated mainly by the present and future requirements of services and customers.

The Research and Development Division also attends to business directly associated with the operation of services. As it is PTT policy to keep procurement and evaluation of telecommunication plant strictly apart, the Division has been put in charge of the acceptance of all equipment and material coming in from the suppliers. An average of 15 tons of material worth 1 million francs is processed daily by Material Control. Working out testing requirements and technical specifications, which are issued prior to placing any orders, is another responsibility of the Research and Development Division. Closely related to this is its cooperation, at the national and international levels, in all questions of equipment and system standardization. Sophisticated measuring techniques, which are mainly developed by the Division, are indispensable for effective control of the quality of telecommunication plant and for delicate laboratory measurements. Moreover, the Division's duty catalogue includes the counseling of operational units in the event of damage or problems requiring special attention.

The range of duties, which embraces practically all telecommunication services as well as some postal services, can be detailed as follows:

- Wire communication systems, switching and transmission
- Information coding and data transmission systems
- Computers and processors (technology and programming)
- Technical rationalization
- Wireless transmission systems (fixed, mobile, satellite systems)
- Radio and television broadcasting systems
- Materials technology, integrated circuits, laser technology
- Testing methods, measuring techniques, automation
- Transmission media (cables, waveguides, optical waveguides, wave propagation in the atmosphere)
- Disturbing and destructive influences on information transmission and communication media.

The Research and Development Division has frequently achieved notable success in its work, both from the techni-

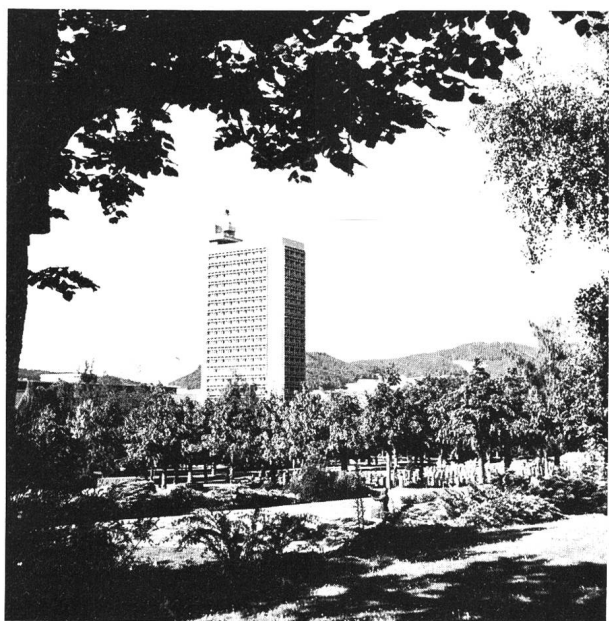


Fig. 1  
The new Research and Development building

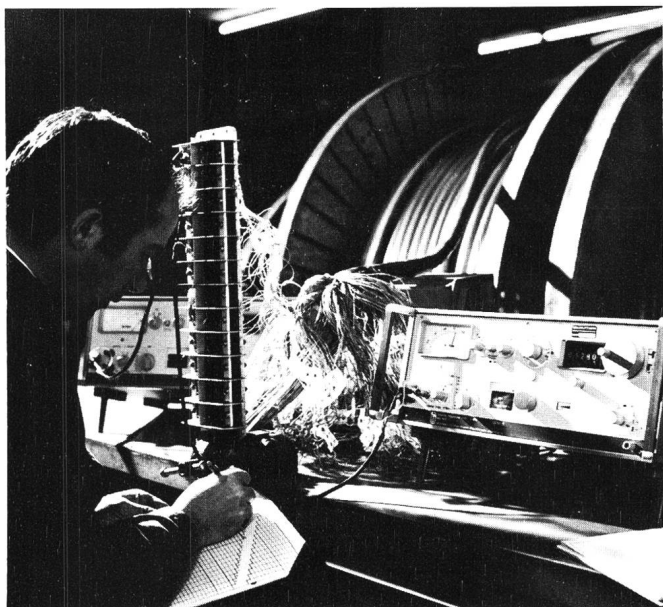


Fig. 2  
Test of a Cable with Paper Pulp insulated Conductors

cal and the economic angles (examples: lead cable corrosion, plastic cable, digital multi-channel systems, microwave systems, wave propagation, the specifically Swiss network of high-altitude stations). Also worthy of note is the national motorcar radiopaging system making use of the reflection of electromagnetic waves from the mountains as a convenient and economic transmission medium enabling the whole country to be covered by only a few transmitters.

Today main emphasis of the Division's work is on electronics and on the revolutionary changes in concepts and construction principles it makes possible. Semiconductor amplifiers, integrated circuits, new technologies, micro-miniaturization, lowest-energy converters, digital techniques, computers and processors with flexible programming – the interplay of factors such as these will shape future telecommunication techniques. Many developments are under way, and hardly anyone is able to fully gauge the wealth of new possibilities they offer. However, whether future man will attend to an appreciable part of his daily work from his

armchair via an information centre remains an open question, although this may be technically feasible one day.

Switzerland has a well-developed, efficient telecommunication industry whose production – mostly inland orders – weighs considerably in the economic scale. The PTT alone invests about one thousand million francs in telecommunication plant a year and, being the industry's principal customer, is largely responsible for the general concept of telecommunication systems. To be able to assess industrial developments, to stimulate them by expert advice and the placing of appropriate orders, and at the same time exercise some control, the PTT must itself engage in a certain amount of applied research, in close cooperation with all other organs specializing in this field. New solutions in the field of telecommunications have to be developed and introduced on the basis of long-range planning, as the useful life of systems extends over 20 to 40 years, with correspondingly high investments. It is not advisable, therefore, to rely on commercially available but rapidly changing components and technologies (as offered by the computer industry for example) in the construction of major installations. Such products should preferably be developed and made by the telecommunication industry.

A working party, headed by the Research and Development Division and including members of the three major Swiss telecommunication firms, was set up in 1970 to evolve, in longer perspective, a comprehensive network concept on a digital basis, which could one day replace the heterogeneous switching and transmission systems now in use in this country. In view of the rapid technological progress in this field, it is to be expected that such systems will become increasingly economical, although technical and operational steps required for the change-over period will need careful study. Some of these digital developments are already in practical use and are proving more economical than the former systems. Considering the importance of the entire project and the success achieved so far, the PTT are concentrating a major part of their research effort on the development of digital subsystems, with a view to a possible future integrated telecommunication system.

The Division's personnel and material expense for actual research and development – about  $\frac{3}{4}\%$  of yearly telecommunication investments – is very modest indeed, considering that at present about half of its labour force is employed on such work.