(Right) Participants looking down Gaping Ghyll Pot in the Yorkshire Dales during one of the hill walks.

Yorkshire Dales. Sessions were held in the mornings and in the evenings after dinner. The afternoons were left free and most participants availed themselves of the opportunity to enjoy some hill walking in some of the most beautiful countryside in England. We would like to acknowledge financial support from Oxford Instruments, Elscint (GB) Ltd., and Schaefer Instruments.

G. R. Pickett and D. Thoulouze

SQUIDS

The International Conference on Superconducting Quantum Devices, held in Berlin from 5-8 October, 1976 was the first devoted primarily to the superconducting devices known as SQUIDs. An attendance of over 125 persons from the Western European countries, the USA, and Japan (hardly anyone, unfortunately, from eastern Europe and the USSR), plus displays of SQUID magnetometers and other instruments by representatives of three commercial firms, showed that these simple, highly sensitive devices have become part of the way of life of a large and diverse group of scientists and engineers.

The nature of the contributed papers demonstrates that SQUID technology is approaching maturity. The operation and limitations of DC and RF biased SQUIDs were analysed and presented in considerable detail. One unexpected prediction was a negative input resistance of an RF biased SQUID in the hysteretic mode. It would be useful to have a simple qualitative explanation of this, since it differs radically from the Manly-Rowe relation. Both the theory and the fabrication technology of tunnel junctions, microbridges, and point contacts seem to be maturing rapidly, although the theory of microbridges is not nearly as far along as the others. Also, much remains to be done on the very-high-frequency (above 100 GHz) operation of Josephson junctions.

The intrinsic limit of SQUID sensitivity to low-frequency magnetic fields was estimated to be of the order of 10^{-32} J/(Hz)$^{1/2}$. Practical instruments now have sensitivities in the range of 10^{-28} to 10^{-30} J/(Hz)$^{1/2}$. Roughly speaking, these figures are the amount of field energy that must be coupled into the SQUID to give an observable response. In summarizing the conference, John Clarke listed two applications in which greater sensitivity would be useful. One is in gravity-wave detection : the other is in the general area of magnetic-gradient measurement. A third is in biomagnetism, specifically magneto-encephalography, where any significant increase of sensitivity would be very gratifying.

There were several reports and an ad hoc session on computer simulation and analysis of SQUID operation. While it is clearly useful to work out in precise detail the consequences of our simple models, the real world is more complicated, and I suspect that many of us would be better served if some carefully-worded intuitive or qualitative explanations were presented along with the computer results. Our love affair with the electronic computer reminds me of the recent experience of watching a younger colleague use a pocket calculator to multiply 40 x 60, and I wondered if he would have been dubious if the result had been 480.

As a tutorial document, the conference preceedings will be deficient in certain areas, a defect for which we, the programme committee, must be assumed responsible. First, some of the potential major applications of SQUIDs, namely geomagnetism (geothermal prospecting by earth conductivity measurements, for example) and biomagnetism (measurement of magnetic signals of the heart, brain, and other organs) were not mentioned or reviewed. Second, the mechanical analogue of the Josephson junction and associated circuit elements was not used or discussed. This important intuitive aid is easily worth ten thousand words.

The exciting and potentially enormous application of SQUIDs in computers was covered in an invited and several contributed papers. Several unique and interesting applications of SQUIDs to magnetic susceptibility, RF power and attenuation, and other laboratory measurements were given in contributed papers. The papers demonstrate the almost revolutionary impact of SQUID technology on DC and low-frequency laboratory measurements. There was one paper on an important technology that usually is not even mentioned in papers on SQUIDs, namely refrigeration.

In short, this conference proceedings will be useful to specialists in the field, but will not be as useful to a broad spectrum of potential SQUID users as it might have been. If, as has been suggested, the conference is held again in three years or so, we should try to do better for the latter group.

Our German hosts earned our praise and admiration for the excellent facilities and smooth operation of both the technical and non-technical events. They set a standard that will be difficult for others to match.

J. E. Zimmerman