to measure the total energy released in the beta decay of ^{55}Co, that is the high energy limit of its electron spectrum (see Fischbeck *et al., Phys. Rev.*, **150**, 941; 1966). Achieving high accuracy in such measurements is notoriously difficult. It may well be that there is merely a conflict between two individual experiments rather than a fundamental flaw in the chain of atomic masses.

SOLID STATE PHYSICS

Dense Optical Memory

from a Correspondent

OPTICAL circuits and optical memories may, in the future, play a major part in data transmission, data processing and other electronic equipment (see, for example, *Nature*, **244**, 135; 1973). The various elements necessary for opto-electronic data handling machines are appearing one by one as the research laboratories concerned with computer development compete to make their products faster and smaller. An author from IBM (Wieder, *Appl. Phys. Lett.*, **22**, 487; 1973) now reports further improvements in dense information storage by optical means. Of all the feasible techniques of data storage, optical data storage already has the best potential for high-density use; Wieder's new concept, termed "superresolution", further improves the position of optical storage relative to other forms such as those using magnetic bubbles and semiconductor circuits.

An important method of optical data storage is the local alteration of the order in an amorphous thin film or, alternatively, the local "amorphization" of a crystalline film (see, for example, von Gutfeld and Chaudhari, *J. Appl. Phys.*, **43**, 4688; 1973). The best way of heating the film locally is with a laser beam, and a junction laser is a particularly convenient type to use. Compared with other light sources, a laser can "write" a very small spot on a recording medium. It would, however, be advantageous to work with even small spots, in order to make optical memories even more compact. A junction laser gives a dark spot on a photographic film which is more than 4 μm in diameter, but it would be desirable to reduce that by half so that the grid of spots could have a spacing of, say, 3 μm. The intensity of the laser spot is not uniform from edge to middle, but is, in fact, a gaussian profile, with a width at half maximum of 2.5 μm. The use of a threshold process, such as melting of a thin film, is a way of reducing the size of "spot" recorded. The power level of the beam can be adjusted so that only a small area, of diameter considerably less than the half width of 2.5 μm, is melted. In this way, spots less than 2.0 μm across have been obtained, leading to a correspondingly dense packing of information.

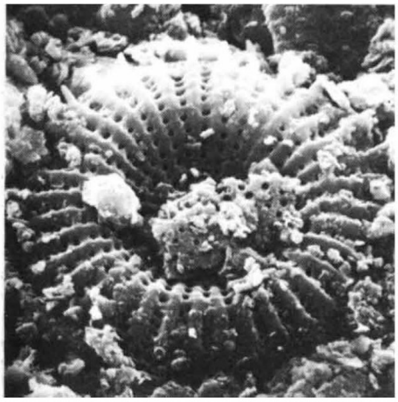
Now, however, comes the problem of reading out this densely packed information. The "read" beam is again gaussian, and will also generate diffraction patterns when interacting with the spot. Thus, if the "read" beam from the laser is again 4 μm in diameter, it cannot separate the information in two adjacent spots that are of 2 μm. Again, a threshold effect has to be found for the reading technique.

Wieder has come up with a very convenient one using the potentiality for threshold effects present in the reading laser itself. The laser is run at a level at which it is luminescing but slightly below the threshold current for lasing. When the beam sweeps over a more reflective area, such as the melted and recrystallized regions representing the "spots" of information, the increased light reflexion provides feedback into the laser resonant cavity and lasing commences. The edge of the spot can thus be detected either by sensing the altered light output of the laser or changes in the current drawn by the laser. The gaussian waveform of the read beam is thus effectively "clipped" by a large and adjustable factor.

In the system described by Wieder, a mixed chalcogenide film was used, containing tellurium, germanium and arsenic, with a preponderance of tellurium. It was evaporated to form a crystalline film, but a film of this composition is easily converted into the amorphous form by melting and rapid cooling. With the laser running continously above threshold, that is without the use of the "clipping" technique, the system could not read dots written on 3 μm centres. But when the laser was run just below threshold, so that the clipping action could operate, the same array of dots was clearly resolved. Extrapolating these trends, by plotting bit separation against modulation depth (essentially the resolving power of the system), it would seem that the threshold method should allow bit separations as low as 2.5 μm, whereas the non-threshold scan should not achieve a separation of less than 5 μm.

The development of the optical memory for computers has clearly come a long way from the form that is so familiar, namely the "IBM card". Bit separation was in the millimetre range for these, whereas it is in the micrometre range for the system now described by Wieder.

Diatomites in Saharan Dust



THE Harmattan is a dust-laden wind which moves south from the Sahara across West Africa during the dry period from December to February. The small dust particles, which mostly range in size from 0.1 to 1 μ, are deposited as the wind meets humid air from Guinea Bay.

The fact that these particles can very effectively penetrate and damage delicate electronic equipment led to a sample being collected from an air filter of a piece of standard ARN-2 equipment at the Ahmadu Bello University at Zaria, Northern Nigeria, and being sent for examination to Dr J. Buczkowski of Warsaw Technical University. Dr Buczkowski found that the dust included very distinct shapes, some of which are typical of warm sea diatomites with dimensions of about 10 μ. Debris particles were less than 1 μ. The figures here show two of the photographs which he obtained with a JSM-U3 scanning electron microscope with a 25 kV electron beam. The magnification was between 3,000 and 10,000.

Other workers have recorded diatomites in the Lake Chad area and Dr Buczkowski considers that study of dust particles originating from the Sahara might provide valuable information on the geological history of the region, as well as help to identify the origin of the Harmattan winds themselves.