of Qβ or R17 phage RNA. What is more, they have found that when the mammalian cell free system is programmed with RNA from the R17 amber mutant *amB2*, which carries an amber mutation at position 6 in the coat protein cistron, no coat protein is made. In other words, this amber mutation terminates faithful translation of the coat protein cistron in the mammalian cell free system just as it does in *E. coli* cell free systems. Obviously *amB2* R17 RNA can now be used to test cell free systems prepared from various animal cells by Schreier and Staehelin's methods to see if any contain an amber suppressor tRNA.

Virologists and others would also clearly like to have a cell free system which faithfully translates single stranded DNA from virus particles and cells because it is far easier to isolate and purify viral DNA than viral RNA. Since the mid-nineteen-sixties various groups have tackled this problem only to meet with disappointment. Bretscher (1969), for example, found than an *E. coli* cell free system programmed with phage fd DNA made a set of fMet dipeptides many of which were not related to known N termini of the phage proteins. Ihler and Nakada (1970, 1971), on the other hand, obtained more encouraging results: in their hands ribosomes appeared to bind to authentic initiation sites in T7 and T4 single stranded DNA. But according to Cardit, Goldberg and Steitz (*J. Mol. Biol.*, **75**, 449; 1973) ribosomes in conditions which allow optimal RNA-directed chain initiation in an *E. coli* cell free system, bind to single stranded DNAs from eight unrelated viruses or cells to yield predominantly three dipeptides fMet-Thr, fMet-Val and fMet $\frac{\text{Leu}}{\text{Ileu}}$. As they say, "although dipeptide synthesis primed by natural DNA templates may yet prove useful in deciphering the molecular basis of protein synthesis, it is probably of little value as a tool for decoding genetic information *in vitro*".

INERT GASES

Elastic Constants

from a Correspondent

THE adiabatic elastic constants of single crystals of neon at 24.3 K and of argon at 82.0 K have been determined by Stoicheff and his colleagues at the University of Toronto, using the Brillouin light scattering technique (*Phys. Rev. Lett.*, **29**, 1454 ; 1972). The results represent what is probably the most accurate set of elastic constant data currently available for the solidified inert gases, and they are important because they provide a sensitive test of recent theories of lattice dynamics. The measurements are particularly useful because they are made near the triple points, a region about which there are unresolved questions concerning the influence of anharmonicity and many-body forces.

The inert gases crystallize in face-centred cubic lattices in which the atoms are bound by the cohesive van der Waals interatomic forces. These forces are central and may be represented to a good approximation by simple radial potentials. Thus the solidified inert gases correspond to elementary models for the solid state and are therefore ideal for developing the lattice dynamics of simple solids. These theories have to be tested against experimental data for the bulk properties of the crystals. Most experiments so far on the solidified inert gases have, however, been carried out on polycrystalline samples and only recently has it been possible to prepare large single crystals. Some data for single crystals are now available for the lattice parameter, isothermal compressibility, thermal expansion and other thermodynamic properties; but to investigate properly the dynamical properties of the lattices, and hence the interatomic forces, accurate measurements of the elastic constants are also required.

Because of its small atomic mass and the consequently large amplitude of its lattice vibrations, neon provides a very stringent test of theory. Before the work of Stoicheff *et al.*, however, only one other determination of its elastic constant had been reported, based on neutron scattering on two crystals at 4.7 K. Argon, on the other hand, is the most thoroughly investigated of the solidified inert gases, both theoretically and experimentally. Even in the case of argon, however. there is considerable disagreement between the various experimental values for the elastic constants and a similar disagreement between experimental and theoretical data.

In spite of the improved techniques now available for preparing single crystals, accurate measurement of the elastic constants is difficult. Determinations of acoustic velocities in specific crystal directions have been made using neutron scattering and ultrasonic techniques. But so far these methods have yielded results which not only are mutually inconsistent but also imply a much lower elastic anisotropy for the crystals than can be accounted for theoretically. The principal difficulty with both neutron scattering and ultrasonic techniques seems to be that large single crystals (~1 cm^3) are required; these are hard to produce and maintain under the appropriate experimental conditions.

Recent advances in high resolution Brillouin spectroscopy now allow values of adiabatic elastic constants for crystals to be determined with high precision by this technique. The application of the method to the solidified inert gases has two important advantages over the alternative techniques: first, because it only requires small samples (~1 mm^3); and, second, because light scattering studies do not require a transducer or other device to be physically bonded to a crystal sample.

Stoicheff *et al.* have grown crystalline samples of argon and neon in the tail sections of suitable dewars and have checked orientation and quality of the crystals by means of Laue X-ray transmission photographs. Brillouin spectra were recorded for the crystals at several different orientations, using a single frequency argon ion laser and a piezoelectric scanning interferometer. The observed Brillouin spectra were found to contain the longitudinal component and one "slow" transverse component. The reason for the non-appearance of the expected "fast" component is that it is generally of extremely low intensity in the solidified inert gases, except for a limited range of orientations not included in the present arrangement. Each of the frequency shifts, ν_i, was subsequently analysed using the usual Brillouin equation

$$\Delta\nu_i = \pm 2\ \nu_i\ (V_i/c)\ n\ \sin(\theta/2)$$

to determine the velocities V_i of the thermal waves.

Three independent adiabatic elastic constants C_{11}, C_{12} and C_{44} describe the elastic properties of a cubic crystal. Values of these constants accurate to about ±4% were deduced from the velocities, together with values for the adiabatic bulk modulus and the Grüneisen parameter.

The results for neon at 24.3 K are all 25–40% lower than the only other set of data available for neon, at 4.7 K. This suggests that anharmonicity is very important in neon. The results for argon differ quite considerably from earlier investigations reported, particularly from measurements based on ultrasonic techniques. The reason for this is presumed to be because earlier measurements have been carried out chiefly on polycrystalline specimens. The great value of the present method lies in the knowledge that the samples were single crystals of well defined quality and orientation.

It is somewhat surprising to find that the experimental values of C_{11} and C_{12} still differ from the calculated values by about 1.5 times the estimated uncertainties. This is, however, much better agreement than has generally been found in the past. At this stage, it would be very useful to have further measurements on argon and neon, particularly at different temperatures.