inherited in a more conventional manner, may behave similarly.

Telomeres apparently do not have to contain C-A repeats in all species. Minichromosome termini in the vaccinia virus²³ and in the rDNA of two slime mould species^{24,25} have more complex terminal repetitive blocks which are not based on the C-A dinucleotide. However, the evidence from ciliates and yeast suggests that C-A-containing tracts are widely used in telomeres, where they are substrates both for nicking and for amplification. So perhaps they become dispersed elsewhere as a by-product of these processes.

The lability of (CA)_n blocks is further attested by their association with sites of recombinational events. In man, substantial (CA)_n blocks appear to mark boundaries of gene conversion events both between globin genes⁴ and between immunoglobulin C_κ genes²⁶. Also, a (CA)₄ block marks the boundary of an α-globin gene duplication⁵, and Rous sarcoma virus picked up its *src* gene by recombination within (CAGA)_n repeats²⁷. All this suggests that these blocks are cross-over hotspots, and Stringer²⁸ found a smoking gun: an insertion of simian virus 40 into the rat genome which involved recombination between (CA)_n blocks.

Curiously, telomeres and unequal cross-overs represent only two of many situations in which cleavage of DNA or RNA occurs in the vicinity of a C-A dinucleotide and is followed by ligation or amplification of the free end. Another is the insertion of retroposons (particularly *Alu* sequences

and processed pseudogenes), which involves the generation of a 3' A-rich tail which, when not pure poly(A), is most commonly (CA)_n. Four specific processes have been described which also usually involve C-A at a DNA cleavage site (where ' ' and ' ' will be used to mark the sites of cleavage on the written and complementary strands respectively). First, almost all eukaryotic transposons end in C-A', and a nick must be made here to permit transposition. Second, the consensus recognition sequence for immunoglobulin V-D-J joining is 'CACAGTGTG'. Third, the cleavage site for inversion of the halves of the herpes simplex virus genome²⁹ is G,C'A. And fourth, the cleavage site for initiation of yeast mating-type conversion³⁰ is C,AACA'.

In RNA, the best known case is polyadenylation, for which the most common signal is AATAAA. . . .CA; the poly(A) is apparently added following cleavage at

the C-A dinucleotide. A second case is that of the histone mRNAs³¹, whose 3' ends appear by termination or cleavage in or immediately after the sequence CACCA. Third, when influenza virus hijacks capped oligonucleotides from host nuclear RNA³², the preferred cleavage point is immediately after C-A. These three cases may all involve cleavage of a nascent RNA; post-transcriptional RNA cleavages do not favour C-A.

These cases include most of the specific cleavage-ligation and cleavage-polymerization processes which have been precisely characterized in eukaryotes. Certainly they involve a variety of mechanisms, but the common occurrence of the C-A dinucleotide does suggest that the mechanisms may have more similarity than meets the eye. □

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Materials science

Cubic diamonds

from J. Wilks

IN a recent issue of *Physical Review Letters*, M.T. Yin and M.L. Cohen¹ pose the question of whether diamonds will transform under pressure; their answer is that at around 23 Mbar diamond will adopt a crystallographic structure which is simply cubic. This result is of practical importance because of the widespread use of diamonds as anvils in equipment used to generate high pressures. Diamonds are very strong and are available in shapes which permit a pressure applied on a relatively large face to produce a much greater pressure over an opposite face of smaller area. Diamonds are also transparent to a spectrum of electromagnetic radiation, so it is possible to carry out many experiments on materials confined under pressure between the anvils. During the past ten years a wide range of important results on the behaviour of matter at high pressure has been obtained in this way².

At present, measurements are being made quite commonly at pressures up to 500 kbar (~ 500,000 kg cm⁻²). One of the most difficult tasks in this type of work is to obtain accurate values for the pressure within the high-pressure cell, but pressure scales are now reasonably well established up to 500 kbar. Progress to higher pressures involves the steady extension of present techniques, and also the requirement that the diamond anvils will not transform or fail under pressure. Extrapolations from the behaviour of germanium and silicon under pressure made by Van Vechten in 1971 predicted that the structure of diamond would change to the β-tin structure at a pressure of 1.3 Mbar (ref. 3). However, Mao and Bell⁴ subsequently claimed to have reached a static pressure of

1.7 Mbar. They observed evidence of plastic flow in one of the anvils, presumably because of off-centre forces, but no sign of any transition.

The letter by Yin and Cohen examines the possibility of a transition in diamond in a more fundamental way on the basis of an *ab initio* calculation they had previously made to account for the structural properties of silicon and germanium⁵. In this earlier paper, Yin and Cohen assumed only the atomic number of the element and the type of crystal structure and then determined the lattice constants, cohesive energies and bulk moduli at normal pressure by using a pseudopotential theory and local density-functional formalism. Their calculation gave good results for both silicon and germanium at normal pressure, and by examining the behaviour of other possible crystal structures they were also able to account for the transitions to the tetragonal β-tin form observed in silicon and germanium at pressures of about 125 and 100 kbar respectively. Making similar calculations for diamond they predict a transition not to the β-tin form but to simple cubic at a pressure of about 23 Mbar. A transition in diamond may thus ultimately limit the use of diamond anvils, but at 23 Mbar, there is still a long way to go from currently obtainable pressures. □

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