complementary to part of the phage φX174 sequence in all but one nucleotide corresponding to the position of the *am*3 mutant. The oligonucleotide was incorporated into a complete, circular, complementary strand, when used as a primer on wild type DNA, with the deliberate G–T mismatch causing an amber mutation in the newly synthesised strand. The use of mismatched oligonucleotide primers could in principle also be used to induce transversions, insertions and deletions, and it is likely that site-specific mutagenesis by this and other techniques will be an area of great future activity.

Synthetic oligodeoxyribonucleotides have also found increasing use in the analysis of DNA structure and function. This topic has been recently reviewed by R. Wu *et al.* (*Prog. Nucleic Acids Res. molec. Biol.* **21**, 101; 1978) and includes applications to DNA sequence analysis, the study of protein–DNA interactions, and the use of oligonucleotides as probes for genes and as tools for molecular cloning of DNA. Indeed the recent dramatic increase in the demand for synthetic DNA has only been partially met by the introduction of more rapid synthetic methodologies. Until commercial enterprise can meet this phenomenal demand some sort of DNA synthesis facility is now an important asset to laboratories involved in molecular biology. □

Moscow revisited—laser fusion 1979

from Ian Spalding

It is eight years since the European Conference on Laser Interaction with Matter (ECLIM) was last held in Moscow. At that time only a handful of visitors from the West contributed to an otherwise well-attended conference; the practical importance for laser fusion of creating highly compressed DT targets (with densities much exceeding those normal in the solid state) was becoming increasingly stressed in the published literature, but the available laser technology was still relatively primitive. As a particular example, the energy then available from a state-of-the-art pulsed CO_2 laser was only 10 J, with a peak power of ~10 MW! Of comparable importance, the absorption coefficient for radiation of wavelength λ between $\frac{1}{2}$ and 10 μm as a function of incident angle, polarisation and intensity, and as a function of plasma composition and initial distribution, had not been characterised in systematic experiments—nor were the existing measurements well coordinated with available theoretical (mostly analytic) models of relevant linear and non-linear interactions. Although no fundamental break-through was reported at the twelfth conference in the series held recently*, overall progress in the field has been significant and encouraging.

Advances in laser technology over the past eight years have been particularly striking. 10 kJ, 27 TW, Nd : glass and 10 kJ, 20 TW, CO_2 laser systems have been successfully commissioned in the past year at the Lawrence Livermore and Los Alamos Scientific Laboratories respectively; all of the 1 μm and approximately a quarter of the 10 μm power has already been symmetrically focused onto gas-filled microballoon 'exploding pusher' targets. DT neutron yield increases with incident Nd laser power to an (unoptimised) 3×10^{10} neutrons at 27 TW; scaling at both wavelengths fits quasi-analytic models. Significant thermonuclear burn will however require the experimental achievement of an isentropic compression of the target's core, so more complex layered microballoon 'ablative burn' targets are now receiving increasing experimental attention. At incident powers $<10^{12}$ W, the KMS and KALMAR (Lebedev) Nd lasers have demonstrated compressions approaching × 35 (hydrogenic) solid-state densities, using cryogenic targets and α-emission spectroscopy KMS claim that this compression is partly adiabatic. In summary, available 'driver' powers have increased tremendously over the past eight years—for CO_2 lasers by a factor of 10^6; ideas advanced for larger systems (regenerative relayed amplifiers, stimulated Raman/Brillouin convertors and so on) suggest that 0.1~1 MJ drivers (predicted to be of practical interest) may well be operational within the next decade.

Developments in the understanding of laser–plasma interactions, and of the necessary diagnostic techniques, are equally impressive. Various groups have experimentally investigated the absorption of laser light at wavelengths λ of $\frac{1}{4}$, $\frac{1}{2}$, 1 and 10 μm, and at intensities I within at least part of the range $I=10^{10}-10^{16}$ W cm^{-2}; there now seems to be universal agreement that strong density-profile modifications are induced by radiation pressure effects when $(I\lambda^2)\sim10^{15}$ (W cm^{-2}) μm^{-2}, and that resonance absorption significantly increases the total absorption coefficient at the longer wavelengths. Related measurements suggest that much of the absorbed radiant energy is then converted to hot, non-thermal, electrons. Developments in two and three-dimensional soliton theory, and in analytic modelling of strong turbulence by the Russian school, are equally impressive. The main topic for controversy appears to be the computer optimisation of target designs, where the avoidance of unwanted core preheating by the 'hot' electrons and of possible deviations from the desired symmetry of implosion (due to Rayleigh-Taylor instabilities) poses significant modelling problems in the hydrodynamic codes. The US prefer 'thick' (lower aspect ratio) double-shell designs to obviate both of these problems. The increasing tendency of American and Russian theoreticians to 'cross-calibrate' predictions from their codes against published experimental work seems therefore a noteworthy and potentially fruitful development.

It is particularly interesting that Academician E. P. Velikhov took the opportunity of a round-table discussion (including proponents of electron-beam fusion and fission/fusion hybrids) to suggest that the time was ripe for a cooperative international venture in laser fusion, perhaps under the auspices of the IAEA. In making this personal suggestion, he cited the recent IAEA decision to initiate the Intor (joint-Tokamak) study as a bold and historic venture. □

I. J. Spalding is in the Experimental Division A. UKAEA, Culham Laboratory.

*ECLIM XII was held in Moscow's Polytechnic Museum on 11–15 December, 1978.

Variations on a theme

from Peter Newmark

Without their analogues, synthetic or natural, insulin experimenters would soon be on the streets. Fortunately the chemist's ingenuity keeps ahead of the biologist's appetite for quantity and variety. For it is through the application of old and new analogues that those attending a recent meeting* saw the eventual solution to most of the mystery still surrounding the actions of insulin.

How exactly, for example, does insulin bind to its cell surface receptor? The combined powers of crystallography and analogue study have outlined the domain on the surface of the insulin which is implicated in binding—a domain which has never been so clear as in the computer-generated molecule presented by P. de Meyts (ICP, Brussels) and R. A. Feldman (National Institutes of Health, Bethesda). (This film was not just a

*A European Workshop on Insulin Structure organised at the ICP, Brussels, 13–15 December, 1978 by P. De Meyts and D. Brandenburg.

0028–0836/79/0277—0431$01.00