

ribosylation and in protein methylation. There was much discussion of the role of the IFN-induced protein kinase and 2',5'-oligoadenylate (2',5'-A_n)-related systems in the actions of IFNs. The 2',5'-A_n-activated endonuclease is important in determining the antiviral action of IFNs (I. Kerr, Imperial Cancer Research Fund). The endonuclease may also be important in IFN inhibition of cell growth; endonuclease activity was absent in human melanoma cells resistant to growth regulation by IFN, but present in melanoma lines sensitive to it (A. Creasey and T. Merigan, Stanford School of Medicine). The 2',5'-A_n system may have other roles: the degree of natural killer cell activity in large granular lymphocytes was increased by transfection with 2',5'-A_n (R. Herberman, NIH). P. Torrence (NIH) explored the significance of the IFN-induced kinase in inhibiting *in vitro* viral protein synthesis. Adding the double-stranded RNA, poly(A) poly(2'-fluoro, 2'-deoxyuridylic acid), that activates the protein kinase, but not the 2',5'-synthetase, to extracts of L cells does not cause inhibition of protein synthesis; although the same inducer inhibits protein synthesis in reticulocyte lysates. Several other model systems for IFN activity were presented. In mouse cells transformed by bovine papillomavirus, in which the viral DNA remained as an episome, the viral DNA copy number per cell was decreased by IFN treatment (P. Howley, NCI, and R. Friedman). After 10 passages morphological cell revertants, entirely lacking in viral DNA, were found. Such 'cured' cells could be again transformed by the virus.

IFNs were reported to be present in a variety of human diseases, but their origin and effects remain cryptic. An unusual species of acid-labile IFN- α is present in about 50 per cent of patients with systemic lupus erythematosus (SLE) and in male homosexual patients with Kaposi's sarcoma or lymphadenopathy (O. Preble, J.A. Sonnabend (NIH), R. Friedman & J. Vilcek). One SLE patient was found to carry antibody to human IFN- α . The glomerular basement membranes from the kidney of another SLE patient with membranous glomerulonephritis developed fluorescence when sequentially exposed to rabbit anti-human IFN- α and to fluorescent anti-rabbit IgG (S. Panem, University of Chicago). The latter suggested that immune complexes containing human IFN- α may contribute to the development of renal disease in SLE. Another morphological relationship between SLE and IFN was reported by S. Rich who found that tubuloreticular structures, that are induced by IFN treatment of human lymphoblastoid cells, are present in both SLE patients and human cancer patients undergoing IFN treatment. J. Hooks (NIH) described the *in vitro* production of IFN- γ by the tumour cells of a patient with an OKT8-positive

Olivine transformed *from J. Zussman*

J.D. BERNAL (like W.L. Bragg) applied his knowledge of crystal structures to a broad range of topics and, as early as 1936, was able to suggest that the mineral olivine, (Mg,Fe)₂SiO₄, would transform to the spinel structure at the high pressures found deep in the Earth's mantle. There is now much evidence that olivine is the major constituent of the rocks of the Earth's upper mantle, so any transformation that occurs at greater depth is of obvious geological and geophysical importance.

In 1966, Ringwood and Major¹ produced the transformation in the laboratory (at about 1,000°C and 115 kbar) and found not one, but two, high-pressure polymorphs, β - and γ -Mg₂SiO₄. The higher-pressure γ -phase does, as suggested, have the spinel structure and the β -phase a modified version of it. Analogous structures for Co₂SiO₄ were later determined by Morimoto *et al.*². Density increases of about 10 per cent are associated with the transformations and probably explain the discontinuity in seismic P-wave velocity³ observed at a depth of about 400 km. The phase change with increased density may perhaps also be a driving force for the downward movement of slabs of oceanic crust at continental plate margins, and may act as a trigger for deep-focus earthquakes in these regions⁴.

The β - and γ -phases have also been found in certain meteorites and are thought to have been produced by extraterrestrial — rather than Earth impact — shock pressures. Studies of the Tenham chondritic meteorite by Putnis and Price suggested that the β -phase was metastable, but phase relationships in the system Mg₂SiO₄-Fe₂SiO₄ at high pressures and temperatures are particularly complex at the Mg-rich end.

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T-cell leukaemia, and C. Chany has (INSERM) found a variety of IFNs in human amniotic fluids. In addition, L. Epstein discussed several defects in IFN- α or γ production, but saw no reason for treatment of the immunological disturbances in these conditions with IFNs at present, or until there is further understanding of the role of IFNs in the pathogenesis of primary and secondary immunodeficiency diseases.

One purified recombinant DNA-produced IFN, $\alpha 2$, (Hoffman La Roche) stimulated low levels of antibodies in 10 out of 200 treated patients and in this respect, it resembles native IFNs. The National Cancer Institute's Phase I trials of recombinant IFN- $\alpha 2$ and lymphoblastoid IFN also indicate some antitumour activity in various human cancers. In contrast to other published results, an increase in natural killer cell activity could not be

It seems likely that the direct $\alpha \rightarrow \beta$ transformation, and also $\gamma \rightarrow \beta$ and $\gamma \rightarrow \beta \rightarrow \gamma$ can all occur with increasing depth because the associated temperature increase enlarges the stability field of the β -phase⁶.

In this issue of *Nature* (p.729), Price, Putnis and Smith now describe transmission electron microscopic studies of veinlets in the Peace River meteorite. The β -phase occurs in micron-size crystals as pseudomorphs of olivine and also replace ringwoodite (naturally occurring α -Mg₂SiO₄). They identify defects in the ringwoodite as stacking faults which are, in effect, very thin sheets of the β -structure in the fault plane. They point out that the β - and γ -structures can, as a whole, be considered related by such stacking faults, and suggest that growth of the β -phase from the fault plane produces fault-free β -crystals. In the meteorite the β -phase is thus derived from the γ -phase in a post-shock retrograde process occurring on reduction of pressure. This contrasts with the views of Madon and Poire⁷ that the faults in ringwoodite are associated with the prograde olivine to spinel transformation.

The authors round off with some speculation as to the relevance of the mechanism of transformation that they describe to a $\gamma \rightarrow \beta$ transformation in the Earth's mantle. They suggest that the systems of stacking faults involved might well be sensitive to external shear forces and thus pertinent to the rheological properties of the mantle.

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4. Ringwood, A.E. *Earth planet. Sci. Lett.* 14, 233 (1972).
5. Putnis, A. & Price, G.D. *Nature* 28, 217 (1979).
6. Akimoto, S., Matsui, Y. & Syono, Y. in *The Physics and Chemistry of Minerals and Rocks*, 327 (Wiley, New York, 1976).
7. Madon, M. & Poiret, J.P. *Science* 207, 66 (1980).

demonstrated. Positive results in cancer patients also come from a French trial of IFN- β in which dosage level and scheduling were the minimum necessary to elevate natural killer activity *in vivo*. Preliminary clinical trials of IFN- β in Germany and Japan were presented, as well as studies of lymphoblastoid IFN produced by the Burroughs-Wellcome group. J. Gutterman (MD Anderson Hospital) reported a series of 19 renal cell carcinoma cases in which 7 patients showed shrinkage of disease with IFN treatment.

Two newly analysed randomized, controlled trials showed positive results. A group from Stanford observed that varicella virus infections in leukaemic children can be improved with IFN and M. Hirsch (Massachusetts General Hospital) reported that the impact of CMV infection on renal transplant recipients can be lessened with IFN- α prophylaxis. □