polyprotein is involved with the neuropathology of AIDS are in progress.

WILLIAM A. HASELTINE
ROBERTO PATARCA

Laboratory of Biochemical Pharmacology, Dana-Farber Cancer Institute, Harvard Medical, School, Boston, Massachusetts 02115, USA

1. Levy, R.M. *et al. J. Neurosurg.* **62**, 475–495 (1985).
2. Prusiner, S.B. *et al. Cell* **38**, 127–134 (1984).
3. Diringer, H. *et al. Nature* **306**, 476–478 (1983).
4. Oesch, B. *et al. Cell* **40**, 735–746 (1985).
5. Goldwater, P.N. *et al. Lancet* **ii**, 447–448 (1985).
6. Smith, T.F.J. *J. molec. Biol.* **147**, 195–197 (1981).
7. Ratner, L. *et al. Nature* **313**, 277–284 (1985).
8. Sonigo, P. *et al. Cell* **42**, 369–382 (1985).
9. Weiss, R., Teich, N., Varmus, H. & Coffin, J. (eds) *RNA Tumor Viruses*, (Cold Spring Harbor Laboratory, New York, 1982).

Similarity of *mas* and rhodopsin gene products

SIR—Recently a new human cellular oncogene *mas* encoding an integral membrane protein with seven potential transmembrane domains has been described[1]. Despite the close similarity in hydropathic profiles between *mas* and rhodopsin[2], a protein of the visual system that also has seven potential transmembrane domains, no sequence homology between the two proteins was detected. However, using our method of computer-assisted comparison of amino-acid sequences[3], we have found a marked homology between bovine rhodopsin and the *mas* protein and a weak homology between the β-adrenergic receptor[4] and *mas* proteins.

Alignment of *mas* and bovine rhodopsin is shown in Fig. 1 below. Counting gaps as substitutions regardless of their length, the sequences exhibit 25% homology. The probability that this is a chance occurrence is less than 3.0×10^{-5}. Of the 48 amino-acids that are invariant among the eight members of the rhodopsin family sequenced to date[5], 24 are conserved (identical or chemically similar) in *mas*.

HIDENORI HAYASHIDA
KEI-ICHI KUMA
TAKASHI MIYATA

Department of Biology, Faculty of Science, Kyushu University, Fukuoka 812, Japan

1. Young, D., Waitches, G., Birchmeier, C., Fasono, O & Wigler, M. *Cell* **45**, 711–719 (1986).
2. Nathans, J. & Hogness, D.S. *Cell* **34**, 807–814 (1983).
3. Toh, H., Hayashida, H. & Miyata, T. *Nature* **305**, 827–829 (1983).
4. Dixon, R.A. *et al. Nature* **321**, 75–79 (1986).
5. Nathans, J., Thomas, D. & Hogness, D.S. *Science* **232**, 193–202 (1986).

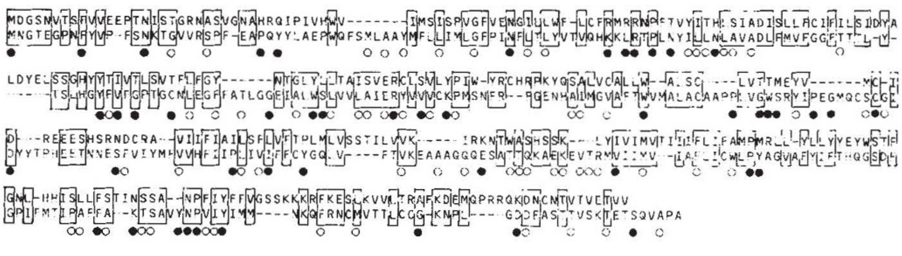

Fig. 1 Alignment of amino acid sequencses of *mas* (top) and bovine rhodopsin. Amino acids that are identical or conservative changes (chemically similar[3]) are boxed. Gaps (–) are inserted to increase sequence similarity. The positions of identical (●) and chemically similar (○) amino acids among the eight known sequences of rhodopsin are shown.

Siberian fire as "nuclear winter" guide

SIR—That the capacity of global models to predict the future can be well tested by their capacity to reconstruct past events is generally agreed[1], as is the definition of normal winter as the numerical equivalent of $>5\times10^3$ degree-days (with the degrees in Fahrenheit). One-dimensional radiative-convective models of the interaction of radiation, aerosols and the atmosphere have recently been used[2] to predict cooling of about 10^4 degree (F)-days in response to the injection of some 100×10^{12} g of smoke, much of which might arise from some 10^5 to 10^6 km^2 of wildfires, themselves caused by a major nuclear exchange. More recent three-dimensional interactive global climate models[3], however, predict only some 10^2 degree-days of cooling from between 20 to 180×10^{12} g of realistic "grey" smoke even in the worst case, at midsummer.

The new models assume smoke injection on a continental scale followed by global transport. Temperature drops are from 6 to 18°C, associated with optical depths between 1 and 3, but decay to ambient conditions in between two weeks and a month. These results agree in large part with the observed outcome of a real smoke injection event of similar magnitude and greater persistence — the great Siberian fire in July and August, 1915.

In a series of wildfires described as "gigantic", some 10^5 to 10^6 km^2 of Siberia burned (see refs 5,6). The meteorological impact was significant throughout the region (Fig. 1). Reductions of hours of direct sunlight averaged 16 per cent in July and 35 per cent in August, with some stations (for example, Ust Kalskoye. 53°N, 91°E) reporting[7] more than a 50 per cent reduction. A continuous region the size of Germany, the 250,000 km^2 lying between the Angara and lower Tunguska rivers, was "completely devastated"[8]. On a conservative estimate, the amount of biomass consumed (including peat, grassland and standing timber) must have produced more than the 20×10^{12} g of smoke taken as a lower limit in the more recent models. Estimating the amount of smoke produced by widespread fires is notoriously difficult, as the variety of estimates of smoke produced in nuclear exchanges has shown, but central Siberia's rich biotreme (it carries the largest boreal forest in the world) suggests there is a clear possibility that the smoke produced may have equalled the 180×10^{12} g of the worst case[3].

It is similarly difficult to assess the contemporary accounts of the 1915 fires. When observers reported that upwards of 1 million km^2 of forest had been destroyed, they were dealing with an area less than 20 per cent of which had been surveyed[9].

But even if estimates of smoke production are confined to the 1.4 to 1.6×10^5 km^2 of surveyed (Class IV density) mature coniferous timber close enough to rivers for economic harvesting the outcome could well have been 20×10^{12} g of smoke. The unsurveyed remainder, even with the warning against exaggeration offered by reference 10, could easily yield some 100×10^{12} g.

The principal investigators on the scene in 1915, V.B. Shostakovitch, A. Vosnesensky and J. Belyaeff of the Irkutsk Magnetic-Meteorology Observatory, fortunately despatched 500 questionnaires throughout Siberia[7]. The 350 respondents, including 142 meteorologists, defined the limits in which fires had occurred as between 70°N (corresponding to the tree line) and 52°N, and between longitudes 60° and 112°, a total area of about 4 million km^2.

In the area of about 1.8 million km^2 in which the densest smoke (which was coextensive with the fires) was reported, visibility at times fell to between 4 and 20 m. Reductions of visibility below 100 m occurred over an area of more than 4 million km^2 and in places more than 1,500 km from the fire zone. These phenomena persisted for an average of 51 days, from which it is possible to estimate the smoke mass at 40×10^{12} g if the cloud were 1 km thick or 50×10^{12} g if it were 2 km thick[11].

The fires were precipitated by a phenomenal drought, the worst since records had first been kept in 1870. According to Furgaev[12], the desiccation was so extreme that virtually all the black (coniferous) *taiga* was in a combustible state, which is borne out by contemporary meteorological records from which modern flammability indices may be derived[13,14]. Many of the fires which occurred were "topping fires" in which flames first engulf the high branches of trees; smoke from such a fire at Tillamook (Oregon) in 1933 rose to 12 km and the sky was dark at noon.

As well as trees, the fire burned the thick humus of the Yeleni larch forest east