similarly identified suppressor determinants in the ferredoxin molecule[3].

This work should be seen in the context of a long series of studies which have identified particular molecules or parts of molecules as selectively interacting with distinct sets of lymphocytes. It traces back to the pioneering work of Leskowitz[4] and Goodman[5] on the extraordinary selectivity for T cells of arsenyl conjugates. Thus when guinea pigs are immunized with a two-headed synthetic antigen which has an arsenyl group at one end and a dinitrophenyl group at the other, the former attracts nearly all the T-cell response and the latter that of B cells[5].

From the point of view of vaccine design, the interesting question that arises is why particular structures evoke suppression. There are two possible explanations: either there are structural features which cause a particular type of processing of a determinant within the immune system, or the receptor repertoires of T-cell subsets are different and therefore detect distinct determinants. The first possibility would be compatible with the mechanism preferred by Sercarz, whereby the location of an epitope close to an appropriate 'agritope' would cause selective recognition of the epitope by a particular T-cell subset. 'Agritope' is used here in the sense defined by R. Schwartz, as the part of an antigen which binds to the molecule of the major histocompatibility complex (MHC) responsible for presentation of that antigen (the 'agritope' binds to the 'desetope' on the MHC molecule, desetope being an acronym for determinant-selecting structure).

This brings us to one of the current immunological controversies: selective antigen-presentation versus selective T-cell repertoires. In this sense Sercarz belongs to a school of thought dominant in the USA which espouses determinant selection as an explanation for immune response genes, in contrast to others who espouse repertoire selection. Evidence is accumulating that both mechanisms may operate[6-8].

The most likely cause of differences between the receptor repertoires of helper and suppressor cells must surely be self-tolerance. After all, in the design of the immune system, there is an over-riding need for tolerance in the helper-cell compartment, but if anything the reverse is true for suppressor cells. At present we know next to nothing about tolerance of self in suppressor cells, and it is the purpose of this article to draw attention to this gap in our knowledge. It should not be difficult to rectify.

If Sercarz is right, and structural features of a general nature can be identified in, or near to, suppressor epitopes, that would be good news for the Third World, for we could then hope to discover the rules of vaccine design. But if he is wrong, and there are repertoire differences mainly reflecting chance cross-reactions with self molecules, there may be no general rules, and that would be bad news. □

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Astronomy

Geminga — the source that is not there

from A.J. Dean

FIVE papers published between pages 158 and 166 of this issue of *Nature* seem to rule out the unpublished suggestion of P. Delache and his colleagues reported in these columns (*Nature* **305**, 665; 1983) that Geminga, a rather mysterious cosmic γ-ray source, might also be exciting oscillations within the Sun by means of gravitational radiation. That suggestion, which would have had profound implications for several areas of astronomy, was based on a coincidence in periodicity between the 160-minute solar oscillation and a claimed periodicity (now discounted by the Caravane collaboration*) in Geminga's γ-ray emission. The five refutations of the suggested mechanism are based on analysis of gravitational wave propagation and on the solar response to such waves, and to that extent speak for themselves. But, apart from all this polemic, what accounts for the considerable current interest in Geminga itself?

Geminga is a veritable γ-ray machine. More than 99 per cent of its power output is observed in the γ-ray spectral range and it has the rare distinction that associated optical, X-ray and γ-ray measurements are based on comparable numbers of photons. Discovered 10 years ago by the SAS-II satellite, Geminga has continued to resist positive identification with candidate counterparts at other wavelengths. Even now, after a series of deep surveys in a number of wavebands, it is impossible to discriminate categorically between a neutron star contender at 100 pc and a γ-ray quasar at ~ 5,000 Mpc. Interest will be intensified by a recent discovery by the French astrophysicist P. Durouchoux while guest observer of A. Jacobson on the JPL HEAO C-1 telescope. His preliminary analysis of data obtained in 1979 and 1980 suggests that Geminga is a powerful and variable (over a 6-month period) emitter of low-energy (1 MeV) γ rays.

It is the poor angular resolution of contemporary γ-ray telescopes that creates the crisis of identity for Geminga. Even the repeated COS-B observations have been unable to pinpoint Geminga to a region of sky better than a 0.4° error circle, rendering direct positional identification impracticable. Current efforts concentrate on the technique by which the Crab and Vela pulsars were identified — attempts to correlate γ-ray time signatures with flux variations from accurately located counterparts at other wavelengths.

A number of searches for Geminga's counterpart have in recent years yielded some exciting possibilities. After studying the relevant region of the sky with the imaging proportional counter on the Einstein satellite, G. Bignami, P. Caraveo and R. Lamb favoured identification with the brightest X-ray object in the field of view

*A telex dated 16 February 1984 from L. Scarsci says "With reference to the claimed detection of a 160-minute period in the γ-ray emission from the source 2CG195+04 (Geminga), the Caravane collaboration for the COS-B satellite wishes it to be known that, using their well tried analysis procedures, they do not find the result to be statistically significant".

100 years ago

THE latest official report on the conditions of the districts overwhelmed by the Krakatoa eruption states that the surviving inhabitants of the various villages have reassembled under their headmen, and are erecting their huts. The volcanic ashes did little harm to the soil, the growing crops all presenting a luxuriant appearance. The trees, however, have suffered greatly, as had some of the coffee plantations. Two bays, Lampong and Semengka, which were blocked up by the fields of pumice, were free by the middle of December.

ON a summer night of 1882 a woman in Högsby parish, in Sweden, saw a shining object fall from the sky, disappearing behind a stable. Search was made for the meteorite, according to the statements of the woman, but without success. Last autumn it was, however, accidentally discovered near the spot indicated, and has now been forwarded to proper quarters in the town of Oskarshamn. The surface of the meteorite appears as if it had been welded from various substances; it is about the size of a billycock hat, very thick, and weighs a little over 14 lbs.

From *Nature* **29**, 437, 6 March 1884.