studied by Eldredge and by Sheldon that led me to concentrate, in my article, on Sheldon's data[3] and to ignore other equally relevant data, such as Gingerich's[9].)

The second point is their claim that all parties to the debate "have focussed on the statistics of measured morphological change, and not published compendia of names". Would that it were so, but it is not. Stanley, in the best-documented case for punctuation[5], relies almost entirely on the duration in the fossil record of named taxa — sometimes species, but often genera or families.

I think there is much of importance in the writings of the punctuationists. Stasis is a real phenomenon, and a fascinating one. The suggestion that different rates of speciation and extinction — depending, perhaps, on differences in breeding systems, dispersal[10] or degree of ecological specialization[11] — have influenced patterns of diversity must surely be true, and it will be interesting to work out more of the details. But all this can sit very happily within the current neo-darwinist view. It seems, from their response to my article, that Eldredge and Gould now recognize this. Welcome back!

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Solitons and energy transfer in DNA

SIR—There has been discussion recently in this journal[1] on the possibility that solitons (solitary waves) play a role in the properties of DNA. The observations that stimulated this discussion[2,3], have since been questioned[4,5]. Most attention has been focused on the theoretical case for the propagation of solitons along DNA[6,7] and very little has been given to the conditions necessary for their genesis, for which a non-linear local disturbance of the equilibrium condition above a threshold value is required. Bednar[8], in discussing the energy deposition process of ionizing radiation leading to radiation damage in biological systems, postulates the genesis of solitons.

This process, in which up to 100 eV can be deposited in segments of the DNA molecule a few base pairs (bp) long, results in coherent multiple excitations and ionizations[9] and satisfies the requirement for a significant departure from thermal equilibrium. We consider here the possibility that solitons may provide a mechanism for transferring energy in DNA.

We have reviewed elsewhere[10] experiments in which strand breaks are induced in DNA primarily as a result of the direct absorption of ionizing energy[11–13] and suggest that such results require an explanation in terms of the transfer of large amounts of energy (bond-breaking energy) over larger distances in molecular terms (thousands of bp) than has previously been generally thought possible in DNA radiation chemistry.

We propose that solitons generated by the energy deposition process could provide a mechanism for this transfer. We suggest that vibrational modes characteristic of DNA (for example sugar puckering[14]) couple to excitation energy or charge to enable energy to 'ride' along the molecule.

In other words the soliton simultaneously creates both the environment necessary to support excitation energy or charge, and the conditions for its translation. This proposal is reminiscent of the solvated electron concept in which the electron couples with adjacent water molecules to form a comparatively stable 'polaron'. The effectively one-dimensional nature of DNA permits a translational wave to propagate, so transferring the energy either as an exciton (coupled electron–hole pair) or as a charge (polaron).

Energy localization, and hence damage, may result from the collapse of the soliton at some discontinuity in the structure of the DNA molecule, such as a B/Z transition, an intercalated or otherwise bound molecule (particularly with energy or charge accepting character) or as the result of the coincidence of two passing solitons.

Although there is no single piece of evidence in radiobiology that explicitly demands an explanation of the kind we have given, the results mentioned above in which the DNA is essentially native[11–13] require explanation, and this it seems to us must lie outside the present conventional radiobiological approach in which damage to the DNA is assumed to occur at the sites of initial energy deposition.

The relevance of studies on isolated DNA to radiobiology is indicated by measurements of single and double-strand breaks in plasmid DNA irradiated in 'dry' films. The energy requirements for such breaks are the same as for SV40 DNA (which is similar in size to the plasmids) irradiated in cells[15]. This we interpret to imply a common mechanism between the two systems, namely that of the direct absorption of ionizing energy which dominates in the dry films.

There are profound implications for radiobiology if mechanisms involving solitons are important in irradiated DNA. The possibility that the distribution of damage in native DNA is mediated at least in part by the microstructure of the DNA double helix, and is not solely a function of the spatial distribution of the initial ionizing events, is one that has received scant attention to date, despite having been proposed in 1972 by Neary[11].

Solitons have been mentioned in attempts to explain the basic functions of DNA in cells, for example protein production and conformational transitions. How the energy needed for the processes and control of DNA replication and synthesis is transferred is obscure, as, indeed, in

AIDS incubation period in haemophiliacs

SIR—Ekert's assertion[1], apparently accepted by Turner *et al.*[2], that the rate of conversion to AIDS of haemophiliacs infected with the human immunodeficiency virus (HIV) is a tenth of the other risk groups is unlikely to be correct.

Most haemophiliacs in the United Kingdom have now been tested and 1,087 were listed as positive in England, Wales, Scotland and Northern Ireland in December 1987. Taking into account the few positives who have so far been missed, the actual total of UK haemophiliac positives is probably between 1,100 and 1,200. By December 1987 a cumulative total of 70 UK haemophiliacs had been reported with AIDS. So far, therefore, about 6 per cent of haemophiliac infectives have progressed to AIDS.

By December 1987 a total of 1,227 AIDS cases had been reported in the United Kingdom. If 50,000 people are infected this suggests an overall AIDS conversion rate of 2.45 per cent; if the real total of infectives is 100,000, as I believe[3], the overall rate would be 1.2 per cent.

Because haemophiliacs include a much higher proportion of the very young and very old than other at-risk groups, overall they will progess to AIDS more rapidly. As UK haemophiliacs received blood products from the United States they may, in general, have been infected slightly earlier than other groups in the United Kingdom.

Whereas we know nearly all of the haemophiliac HIV-positives, in the case of other at-risk groups the known HIV-positives are a highly biased sample, because many already show signs of serious illness.

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