matters arising

Molecular chirality of life and intrinsic chirality of matter

BONNER *et al.*[1] stated that if racemic DL-leucine was bombarded with left-handed electrons (−1 helicity) plus their bremsstrahlung, the D enantiomer decomposed more quickly, whereas with right-handed electrons (+1 helicity) plus their bremsstrahlung the L enantiomer decomposed faster. In an aqueous system of D- and L-tyrosine and using only natural, left-handed β^- particles and their bremsstrahlung radiation I found[8] similar results in 1968. Bonner *et al.*[1] referring to my experiment, wrote: "One of us has been unable to repeat Garay's original type of experiment". They used the word 'repeat', erroneously. Bonner[2] certainly repeated parts of my experiment for his paper but he used only bremsstrahlung radiation and left out β^- particles from the reaction mixture. This altered the situation fundamentally and therefore it cannot be considered repetition. Bonner *et al.* discussing their results, state: "We do not know whether the asymmetric degradations are caused by the longitudinally polarised electrons or by their bremsstrahlung"[1]. Thus the presence of longitudinally polarised electrons are clearly important. According to our hypothesis[8,9] and to a similar one put forward by Noyes[3], longitudinally polarised electrons are responsible for stereoselective degradation. Additionally, Keszthelyi[4,5] and Walker[6] pointed out that selective decomposition of enantiomers cannot be caused by bremsstrahlung. Finally, in recent experiments, Darge *et al.*[7] studied the stereoselective decompositions in a similar system. They changed the radiation source and target molecule, but did not omit β^- particles from the reaction mixture. Referring to my work they wrote that their result 'is in qualitative agreement with previously reported experiments on the interaction of D- and L-tyrosine with β^- particles".

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BONNER, VAN DORT AND YEARIAN REPLY— Garay quotes incompletely from our paper[1] on the asymmetric degradation of DL-leucine, then claims that we use the word "repeat" erroneously. We said[1], "In addition, one of us has been unable either to repeat Garay's original type of experiment with alkaline DL-tyrosine or to observe the induction of optical activity in a number of other racemic amino acid substrates as well". Neither in this quote nor in the paper to which it refers[2] do we claim an attempt to repeat Garay's exact experiment. In fact, we elaborate in detail on the reasons for which we modified Garay's experimental protocol, because[2] "we have felt some slight misgivings about Garay's experiment. In the first place the β-source was relatively weak, only about 0.36 mCi of $^{90}SrCl_2$. Second, the intended reaction was not primarily induced by the β-rays or their bremsstrahlung, but only presumed to be in some way enhanced by them. Thus the effect was noted only in alkaline, but not acidic solution. Third, the reaction was conducted in aqueous-ethanol solvent, where solvent photochemistry or radiochemistry (which would involve symmetrical radical intermediates) would be superimposed upon and might obscure any actual asymmetric β-ray or bremsstrahlung effects. Lastly, we felt that mere differences in the shapes of two ultraviolet absorption spectra were hardly the best or most convincing criteria for the generation of optical activity. For these reasons we decided to repeat Garay's type of experiments, with considerable modifications which would hopefully circumvent some of the above drawbacks." Since the Vester–Ulbricht β-decay mechanism[3] which we were investigating involves β-ray bremsstrahlung, we used [2] the strongest bremsstrahlung source we could locate, 61.7 kCi of ^{90}Sr–^{90}Y oxide in storage at Oak Ridge National Laboratory. To minimise other sources of ambiguity inherent in Garay's original experimental design we irradiated both racemic as well as optically-active amino acids, both crystalline and in solution, then analysed the percentage degradation and enantiomeric composition of the radiolysed samples by gas chromatography. Clearly, these experiments represented extensions of and not a repetition of Garay's original experiment. In none of these experiments was asymmetric degradation observed. Our subsequent successful asymmetric degradations of DL-leucine with longitudinally-polarised linear accelerator electrons of both handedness[1] involved crystalline amino acid targets in a collodion matrix under high vacuum, and certainly also do not remotely approximate Garay's original experimental conditions. Nor do the recent experiments of Darge[4] involving the radiolysis of DL-tryptophan by ^{32}P in a frozen ice matrix constitute a duplication of Garay's experiment. The simple fact is that no one, including Garay, has made an attempt to repeat his original experiment exactly, and no one has claimed to.

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Do viruses use calcium ions to shut off host cell functions?

DURHAM[1] suggests that Kamine and I[2] have been "misled into putting false emphasis" on the role of Mg^{2+} relative to Ca^{2+} in controlling cellular metabolism because we have been unduly influenced by the fact "that cells respond more to changes in external Mg^{2+} than Ca^{2+}". This represents a ordinate control of metabolism and misreading of my reasons for proposing a central role for Mg^{2+} in the co-growth of animal cells. These reasons were set out at greater length previously[3,4] and have been reiterated and expanded more recently (see ref. 5 for example). My emphasis on a regulatory role of Mg^{2+} stemmed from the observations that any of a variety of unrelated substances which stimulate the multiplication of chicken embryo fibroblasts in culture, also stimulate a singular array of reactions associated with transport[6], energy metabolism[7], differentiated function and macromolecular synthesis[8,9]. This singular array was termed the coordinate