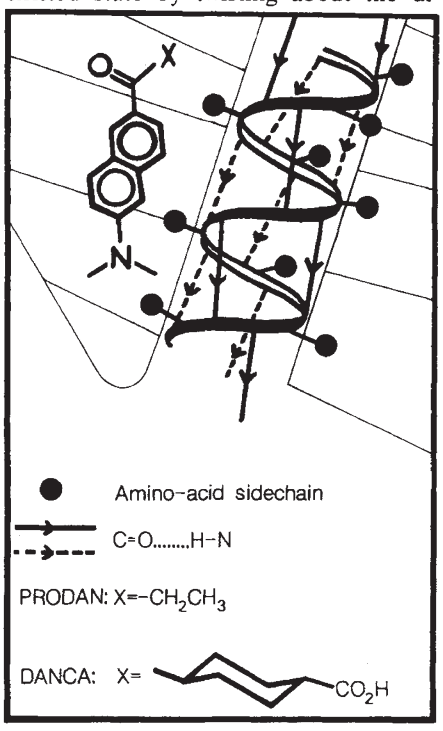
helix forming the haem pocket can exert substantial electric fields inside the pocket despite the attenuation by the insulating lining of hydrocarbon side chains (see figure). Calculations confirm the feasibility of this explanation, which may apply to many enzyme interiors.

To infer environmental polarity from fluorescence band positions requires that the surrounding medium has had the opportunity to undergo a full adjustment to the excited chromophore before the latter emits light. Otherwise the emission spectrum shifts to longer wavelengths as longer wavelengths of light are used to excite selectively more stabilized solvated chromophores. This 'red edge effect' is observed for PRODAN in glycerol at −42°C but is absent above 1°C. Since 'solvent' relaxation must be complete, dependence of the emission of DANCA-myoglobin on the wavelength of excitation at room temperature is attributed to a heterogeneity of probe orientations within the haem pocket. Haem itself binds in two distinct orientations. The reported steady-state fluorescence studies provide limited information. Time-resolved spectra and fluorescence anisotropy decay data would enable the rotational constraints on the bound probe and the exchange rates between probe configurations to be evaluated.

An additional redshift of fluorescence, above the expected solvent relaxation shift, incipient at −35°C and almost fully developed at 4°C, is intriguing. Despite the claimed merits of DANCA as a probe of well-defined geometry and electronic nature, the initial excited state may transform to a more polar, lower-energy excited state by twisting about the dimethylamino-naphthalene bond, with a likelihood that depends on the polarity and viscosity of the constraining medium. Such processes have been documented for many intramolecular charge-transfer systems analogous to DANCA, the classic example being *p-N,N*-dimethylaminobenzonitrile (Kosower, E.M. *Acc. Chem. Res*, **15**, 259; 1982 and Grabowski, Z.R. *et al. Nouv. J. Chim.* **3**, 443; 1979). If this were to be the case the 'environment polarity' would be overestimated. Notwithstanding, the high polarity of the myoglobin haem pocket is real.



The haem cleft of apomyoglobin

MacGregor and Weber calculate electrostatic interaction energies of a monopole charge within a square grid of locations in the haem plane, together with the partial charges of nitrogen and oxygen centres of the peptide backbone in the known crystallographic positions of deoxymyoglobin, on the assumption that the intervening nonpolar sidechains form a dielectric of relative permitivity 3. Several orientations of the probe molecule, represented by a pair of opposite charges 0.84 nm apart on the grid, were found to be capable of producing spectral shifts in excess of the observed shifts of $\sim 1{,}000\ cm^{-1}$.

On the basis of the often minor changes in acid dissociation constants of protic groups in water and inside certain proteins, it has been deduced that many protein cavities have a high effective polarity despite the lining of 'nonpolar amino-acid residues' (Warshel, A. *Proc. natn. Acad. Sci. U.S.A.* **81**, 4785; 1984). These deductions are corroborated by the calculations and optical evidence of MacGregor and Weber. □

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Glynn Isaac 1937–1985

Glynn Isaac died in a hospital in Japan on 5 October after a brave fight against a vicious, and as yet unidentified, infectious illness. Although 'officially' an archaeologist, he drew no boundaries between disciplines in his pursuit of evidence about the origins and early stages of human behaviour. His field contributions are important enough in their own right, but Isaac will mainly be remembered for his eclectic use of evidence and for his passionate insistence that the hypothetico-deductive method can, and should, be applied to problems of prehistory.

Glynn Isaac's introduction to archaeology began as a schoolboy and continued as a student in Cape Town, and came from A.J. Goodwin and Monica Wilson. His mentors at Cambridge were Graham Clark and the late Charles McBurney. In 1961 he accepted a research post with Louis Leakey in Kenya which was the beginning of his professional association with African prehistory. Louis and Mary Leakey had investigated the site of Olorgesailie between 1942 and 1954 and, with typical generosity and perspicacity, Leakey gave Isaac the responsibility of further excavating and analysing the site. Isaac's monograph on Olorgesailie is a classic of its kind, and contains clear evidence of his sensitivity to the confounding problems that the geological context can bring to the interpretation of archaeological sites.

Field work in Nakuru and in the Natron Basin followed and it was at Natron, at Penini, that Isaac began his association with Richard Leakey. In 1969, Leakey invited Isaac to investigate the archaeological evidence which had then been recently discovered at the KBS site, at what was then East Rudolph, now Koobi Fora, in northern Kenya. However, Issac's contribution to the work at Koobi Fora was much wider, for he joined Leakey as co-director of the Koobi Fora research project and was instrumental in the development of nearly all aspects of the research that flowed from that area. His broad training in zoology and geology was crucial for this task. His strength as a scientist was most evident at the time when there was a conflict between the isotope and palaeontological evidence for the age of the KBS tuff. Isaac was determined to see, and was instrumental in achieving, the reassessment of the evidence. The apparent resolution of this problem proved to be the stimulus to important geochemical research which has resulted in more precise and accurate correlations of ash layers at four of the major East African sites.

Isaac was an inveterate hypothesis maker. His hypotheses about early hominid land use, behaviour and subsistence were mostly based on evidence that he and his collaborators had painstakingly recovered at Koobi Fora and elsewhere. The diverse and pertinent projects undertaken by his students, from studies of food availability to contemporary hunter–gatherers to the factors which disturb contemporary archaeological sites, speak for his willingness to put his own ideas to the test.

Isaac loved Africa and its people and he, more than any other, saw the need and the obligation to involve Africans in prehistory research. Prehistory is a field not usually noted for the humility of its practitioners but Isaac stood out as being wholly without self interest. His enthusiasms and influence spread far, and his impact on palaeontology, dating and on the conduct of anthropological field and laboratory research, as well as prehistoric archaeology, were more profound than I suspect we presently realize. Bernard Wood