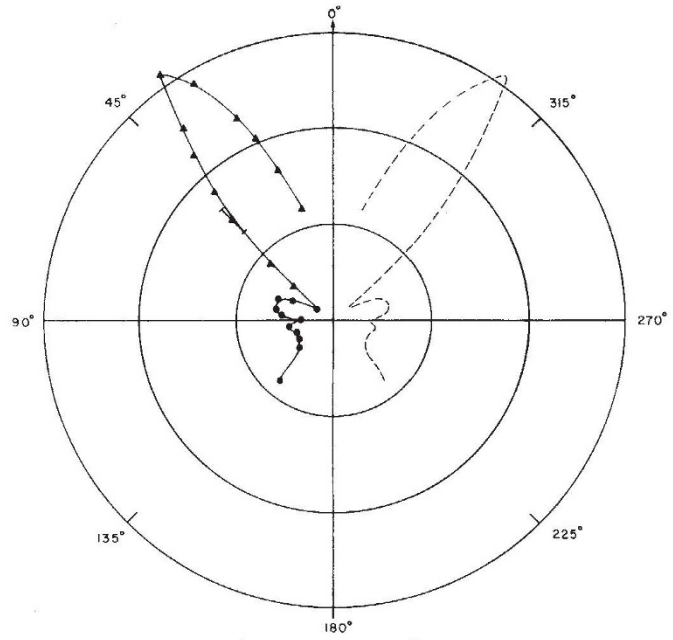

Fig. 3 Plot of CIDS $[(I_L - I_R)/(I_L + I_R)]$ versus scattering angle for *E. cirrhosa* sperm heads at a concentration of 0.25 mg ml^{-1} in the buffer of Fig. 2; the arrow illustrates the direction of incident beam (wavelength = 442 mm). ▲, Positive values; ●, negative values; ——, measured data; – – –, constructed by symmetry. The plot has a maximum positive value of 1.4×10^{-2} at about 35°; the positive value means left circularly polarized light is preferentially scattered.

in the back direction of the scattering envelope. The FDCD technique involves the use of a fluorescer molecule that is not optically active and that does not bind to the particle being measured. Each scattering particle is now surrounded by a cloud of fluorescent molecules which measure all the light that is not absorbed, including light scattered backwards along the incoming light beam. Considering the minor corrections to the measured CD by the fluorscat and FDCD techniques (Fig. 2), we conclude that the sperm heads mainly scatter light differentially in the forward direction.

The apparatus used to measure CIDS directs linearly polarized light from a He–Cd laser (442 nm) through a Pockels' cell (an electro-optical quarter wave plate) with an applied square voltage pulse which produces alternately pure left and right circularly polarized light. The circularly polarized light is incident on the sample cuvette, and the scattered radiation is measured by a detector mounted on a goniometer. The signal from the detector is processed by a modified Cary 60 spectrophotometer and analysed in terms of CIDS.

Figure 3 shows the resulting polar plots of CIDS versus scattering angle for the sperm heads; a reference sample of polystyrene beads shows no differential scattering in the same conditions. This plot shows that the CIDS does occur mostly in the forward scattering direction (with a maximum at 35° from the incident beam), and also that left circularly polarized light is scattered more intensely than right circularly polarized light, that is, the forward lobe is positive. There is evidence of small negative differential scattering to the sides (90°) as is predicted from the minor correction of the fluorscat method (Fig. 2). The results presented here are preliminary and have been obtained with a maximum angular resolution of 5°; however they are very reproducible. We are now working to improve the resolution of the apparatus to obtain more detailed information about the angular dependence of the differential scattering intensities.

The data shown in Fig. 3 are of the type expected from theory for a helix whose pitch or radius is larger than, but similar to the wavelength of incident light. The preferential forward scattering of left circularly polarized light indicates a left-handed helix. We have measured differential scattering from T4 and T7 bacteriophage[14] which are very different from each other and from the octopus sperm. We think that differential scattering of circularly polarized light can be very useful in determining the packing of DNA in bacteriophages[15,16], and the higher order structures of DNA in chromosomes[17].

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Erratum

In the letter 'Atmospheric angular momentum and the length of day: a common fluctuation with a period near 50 days' by R. B. Langley *et al. Nature* **294,** 730–732 (1982), the curves in a panel of Fig. 1 were rotated through 180°. The figure is shown correctly in reprints and (reduced in size) below.