bubbling the biologically generated Me_4Pb from one flask (containing 5 mg Pb l^{-1} as Me_3PbOAc) into the culture medium in another flask where a test alga *Scenedesmus quadricauda* was grown. As Me_4Pb is not soluble in water and is volatile, the exposure of an alga to this lead compound was only momentary. We estimated that less than 0.5 mg Pb(Me_4Pb) had passed through the culture medium. We found that the primary productivity and cell growth (determined by dry weight), however, decreased by 85% and 32% respectively, as compared with the controls without exposure to Me_4Pb. Furthermore, cells exposed to Me_4Pb tended to clump together. Similar results were obtained with *Ankistrodesmus falcatus.* To obtain similar inhibition, twice as much lead, in the form of ME_3PbOAc, and twenty times as much lead nitrate would be required. These numbers were calculated from our studies on the toxicity of various forms of lead compounds on algae.

We conclude from the results of 50 experiments that incubation of some lead containing sediments generates Me_4Pb; that Me_3Pb^+ salts are readily converted to Me_4Pb by microorganisms in lake water or nutrient medium, with or without the sediment, and in the presence or the absence of light; that conversion of inorganic lead (such as lead nitrate or lead chloride) to Me_4Pb occurred on several occasions in the presence of certain sediments; and that the conversion is purely a biological process.

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A study of age group track and field records to relate age and running speed

AGE affects man's ability to run fast but to date there has been little interest in quantitating the relationship. The few published studies, such as the one by Dill on marathon runner Clarence DeMar[1], are concerned mainly with reporting lung volume, heart rate, and other physiological characteristics of notable performers, with only brief reviews of race performances over the runner's life span.

Two recent compilations of track and field records present an opportunity to study ageing effects on running speed. One contains records for men[2], in 1-yr age groups for ages 1 to 78, and the other contains women's records[3], in 1-yr age groups for ages 3 to 60. This study was designed to determine how rapidly running speed deteriorates with age and whether the rate of deterioration depends on the length of the race; and to compare deterioration rates of running speed, strength and stamina in men and women.

When speed (m s^{-1}) is plotted against age, it is evident that speed improves up to age 20 or so and gradually deteriorates beyond age 30. Between ages 20 and 30, running speed is near the maximum and almost constant for all distances included in the records (100 m, 200 m, 400 m, 800 m, 1,500 m, 3,000 m, 5,000 m, 10,000 m and marathon (42,195 m)). An exponential model was chosen to fit the age records for each distance:

$$Y = A_1\,[1-\exp(A_2\,X)]+A_3\,[1-\exp(A_4\,X)],$$

where Y is the speed in m s^{-1}, X is the age in years, and the constants A_1, A_2, A_4, A_3 are determined from the age records by the method of least-squares. This model has the advantage of fitting the data well over the entire age range, whereas the more usual Gompertz-type equations can be applied only to ages where speed is decreasing with age. In addition, this model allows the rate of increase in speed (under age 20) to differ from the rate of decrease (over age 30). The model also goes through the origin so that at zero age the speed is zero. Examples of the fit for several running events are shown in Fig. 1.

A comparison of the fit curves for all the men's running events reveals that age of maximum performance increases with distance. This is also true of the recorded data, where the sprint records are held by men in their early twenties but the marathon record-holder is 26 yr old. Comparison of the slopes of the fit curves reveals that speed deteriorates more slowly at longer distances than at shorter ones. For example, at age 50 speed in the 200 m sprint is slowing at a rate of 0.09 m s^{-1} yr^{-1} but for the marathon the rate is only 0.06 m s^{-1} yr^{-1}. This observation suggests that strength deteriorates faster than stamina.

This hypothesis was tested further by fitting the exponential model to the age records for the men's shot-put and discus, events which are even more strength-dependent than the 200 m sprint. Direct comparison of the slopes for running events with those for the field events is not valid because the recording units differ. A comparison can, however, be made if all age records are converted to percentages of the world record.

Fig. 1 Running speed records by age. Exponential curves (for model, see text) were fitted to published age records. (*a*) Men's records for 200 m, 800 m, and marathon (42,195 m). (*b*) The 400 m records for men and women.

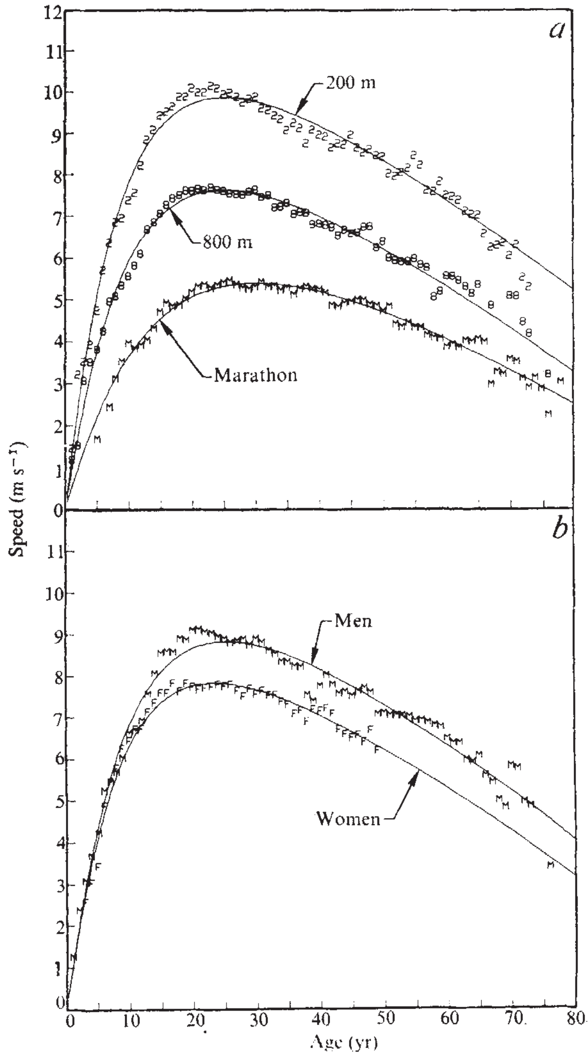

Table 1 Age records as percentages of world records

Age	Shot-put	Discus	200 m	Marathon
10	61	60	79	68
20	91	90	98	94
30	100	100	99	100
40	98	95	93	96
50	76	78	84	88
60	49	53	74	76

Percentages based on fitting the exponential model (see text), to published data.

Thus, a speed of 8.12 m s^{-1} for the 200 m race is 80% of the world record speed (10.15 m s^{-1}), whereas a shot-put of 17.46 m is 80% of the corresponding world record (21.82 m). These comparisons (Table 1) lend further support to the hypothesis that strength deteriorates faster with age than does stamina.

Fewer data are available on women's age records (current records only include running events up to 3,000 m, and rarely are there records for women over 45 yr of age). A comparison with those for men suggests that girls mature faster than boys (with respect to running events) in the age range 8–12 yr. For example, at ages 8, 9 and 11 women's records are faster than those for males in the 400 m run (see Fig. 1*b*). It also appears that beyond age 30, speed deteriorates at a faster rate for women than for men. For example, the fit curves show that in the 100 m sprint the women's record at age 45 is 85% of the women's world record, whereas the corresponding figure for men is 90% of the men's world record.

The records analysed here comprise the marks of many individual athletes but they can be thought of as those set by a 'super' runner; one who is in top condition throughout his life span. The ordinary runner is one whose speed is slower, perhaps by some fixed amount over the entire age span, than that of the super runner. The speed curve for the ordinary runner may have the same shape as that of the super runner and the rates of change of speed with age would be the same. This hypothesis could be tested by following up several runners over their life spans, recording annually their running times over measured distances. This could be done retrospectively, by contacting those who have run for a number of years and determining their best times at various distances each year.

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The capacity for joint visual attention in the infant

LITTLE is known about how visual attention of the mother–infant pair is directed jointly to objects and events in the visual surround during the first year of the child's life. To what extent does the child follow the mother's lead and the mother the child's, and what are the processes involved? The ability of the infant to respond successfully to such signals allows the mother to isolate and highlight a much wider range of environmental features than if the infant ignores her attention-directing efforts. We report a preliminary investigation of the extent of the infant's ability to follow changes in adult gaze direction during the first year of life.

Mothers who had volunteered as subjects in response to newspaper advertisements were asked to bring their infants into our laboratory at a time when the infant was 'usually active'. Thirty-four infants, 2–14 months old, were tested in a small, sparsely-furnished room (15 ft by 10 ft) with a one-way screen at one end and a window with drawn blinds at the other. The infant was placed in a highchair, appropriate to his age, in an upright position. The mother played with him until he seemed settled and was then replaced by the experimenter—either male or female in their twenties, unknown to the baby. It was not practicable to have the mothers as experimenters with the rather strict testing requirements used here although many observations were made prior to this on other mothers and infants in a similar, though less controlled, situation. The experimenter first played with the infant for a short period and, if the latter showed no signs of distress, the mother left the room. The experimenter remained seated in front of the infant, eyes at the same level, about 0.5 m away. The infant was then given two trials in a prearranged order.

On each trial the experimenter first made eye-to-eye contact then silently turned his (her) head through 90° to fixate a small (concealed) signal light, 1.5 m away, for 7 s. He then turned back to interact with the infant. Two trials were given, one involving a head turn to the right, one a turn to the left, with inter-trial intervals varying from 20 to 50 s, depending on difficulties in establishing subsequent eye-to-eye contact. The infant's behaviour was recorded by two concealed video cameras set at 45° to the experimenter–infant face-to-face axis, giving a split-screen 45° profile of the infant from two sides. The experimenter was not visible on the screen. The infants were also filmed for calibration looking at experimenter in fixed positions of known angular displacement.

Trials were scored from the videorecord by the experimenter, based on infant head movement only. A positive response was scored if the infant looked (a) in the same direction (right/left) but not down at the floor or up at the ceiling; (b) without an intervening look elsewhere (ignoring short looks down during postural adjustment); (c) within 7 s; and (d) appeared to be looking for or at something (involving halting the head turn for 0.5 s or more with a cessation of limb movement). The infant did not have to appear to be fixating exactly the same point. Scoring reliability was ascertained from three naive observers uninformed as to experimenter's judgment. They produced 96% agreement on trials scored as positive, 90% on those scored as negative.

The proportion of infants judged as having produced a positive response on one or both trials increases steadily with age (Table 1). The form of the response, that is, how soon and where the infants look, did not show systematic change with age. Latencies in response were very variable—any point up to the end of the trial, and the infants would look anywhere from about 20° to 90° away from the midline. Labelling responses as positive does not, of course, mean that infants were looking for something to look at. In the upper age groups, however, there was strong evidence to suggest this may be so with infants often looking away, looking back at the experimenter and then looking away again. This had been even more marked when the mother was the experimenter in earlier observations. Of the negative trials over 80% were comprised of responses where the infant either kept his eyes on the experimenter or looked down at the highchair table top.

The proportion successfully responding may well be depressed by the strangeness of the setting although the incidence

Table 1 Percentage of children judged as following line of regard in one or both trials

Age (months)	No. infants	% Showing positive response
2–4	10	30
5–7	13	38.5
8–10	6	66.5
11–14	5	100