basis of their studies of the formation of megaspores, female gametophytes and archegonia, in both the big tree and the redwood, that the two species belong to different genera. Following is a quotation from their conclusions:

Buchholz (1939c) has recently published a short paper on the generic segregation of the Sequoias. In this he tabulates numerous differences between them, and concludes that they can not be retained as species of one genus. To these points others might be added, notably perhaps the difference in wood structure in typical specimens. Many of these points may be only such as are natural to different species, but the differences in proembryo and embryogeny are more important. When to these are added the further differences in development, outlined in this paper, in gynospore origin, in tapetum, in early prothallial growth and expansion, and in maturer cellular formation in the prothallus, it is clear that the two redwoods differ essentially in practically every phase of their life-history. In no other coniferous genus have such differences between species been recorded; on the contrary, true species of any other genus show extremely close similarities in their development. The other differences noted by Buchholz (1939c) are thus given greater importance, and we, therefore, without hesitation, agree with him that the Sierra Redwood, the Big Tree, commonly now known as *Sequoia gigantea*, can no longer be retained as a species of *Sequoia*, a generic title to which *Sequoia sempervirens* has priority claim. . . .

They go on to say that they prefer to use the generic name Wellingtonia, instead of Sequoiadendron, for the big tree. That is, however, beside the point. The significant facts are (1) the two species differ essentially in practically every phase of their life-history, and (2) in no other genus of conifers have such extreme differences between species been recorded. Additional biological evidence supporting the theory that the two species are more than specifically distinct was adduced as early as 1894 by Radais,[3] who proposed two subgenera of Sequoia, subgen. Eusequoia for *S. sempervirens* and subgen. Wellingtonia for *Sequoiadendron giganteum*. In 1931, Florin[4] pointed out that Arnoldi, in 1900, and Lawson, in 1904, had presented sufficient evidence from embryogeny to show the fundamental generic differences between the two species. Doyle,[5] in 1940, has indicated that the segregation of the big tree into a separate genus is fully justified.

It may be not altogether without significance that, although not proposed until 1939, the name Sequoiadendron already has been adopted by some of the most distinguished authorities on North American botany, including Alfred Rehder,[6] L. H. Bailey[7] and several others. During the last three years several articles, in which the name Sequoiadendron has been employed, have appeared in both European and American botanical journals.

G. NEVILLE JONES
UNIVERSITY OF ILLINOIS

[3] M. Radais, *Ann. Sci. Nat. Bot.*, ser. 7, vol. 19. Paris (thesis).

[4] Rudolph Florin. Untersuchungen zur Stammesgeschichte der Coniferales und Cordaitales. K. Svenska Vet.-Akad. Handl. ser. 3 vol. 10. Stockholm.

[5] *Nature*, 145: 900, 1940.

THE APPARENT TIME ACCELERATION WITH AGE

HAVING for some time given a little attention to the physiology of aging and still having a fair memory at sixty-eight, I was more amused than instructed by the current discussion in SCIENCE of the apparent acceleration of time with advancing chronologic age. This discussion reminds one of the old quip: "Married men do not live longer than bachelors, it just seems longer," of which the truth and the why depend on the individual (and his mate). When we eliminate amnesia for current events and make the comparison in matters of approximately equal desirability, anxiety and boredom, there is no difference in the estimate of time speed at six and at sixty, so far as one can rely on memory. Death is obviously not in the category for comparison, because of the limited experience and understanding of youth. At the age of 7 to 10, when I greatly desired to reach the stature, the capacity and the dignity of a grown-up man, called to mind the prospect of a brief visit to my mother or longed for the end of the current day when sound slumber would shut out the perpetual baa-ah of the sheep in my care, the hours, weeks and years seemed *long* indeed. But in those same years a day's visit with mother, an hour in the swimming hole or fishing in the river passed with incredible speed. It is purely a question of the item of particular concern (desirable or objectionable) in the thought of the individual. Age has nothing to do with the illusion. For now at sixty-eight, the days, weeks, months and years of war drag on as slowly as they did sixty years ago when I wanted to grow up in a hurry. Then, I wanted (above all things) to be a man. Now, I want (above all things) mankind at peace. The time to attain either seemed and seems unduly long. On the other hand, a day at fishing, now, an hour at attempting to teach, a conference with intelligent colleagues, verily, *tempus fugit*.

A. J. CARLSON
UNIVERSITY OF CHICAGO

IN a recent discussion in SCIENCE on the apparent time acceleration with age, Frank Wilen made a statement, the implications of which I should like to dis-

[6] "Manual of Cultivated Trees and Shrubs," second edition, 1940.

[7] "Hortus Second," 1941.

pute, especially since by so doing it will be possible to bring to the discussion some further matters of psychological interest.

In referring to Pitkin's "Life Begins at 40," the statement was made that "Whatever consolations the author may have adduced to support the title, realists know that at forty life begins to end, that they have gone over the top of the hill and are coasting, brakeless, toward extinction." I am a little tired of the "realists," and am not willing to admit that they "know" anything of the kind. But let that pass.

The real point of interest is Wilen's implication that (1) all persons are afraid of old age and death, and (2) that those past middle life are more afraid of it than others. I consider that an unscientific generalization, not supported by the facts.

In the first place, many young persons are more afraid of death than their elders. When I was in my twenties I felt much as if I were walking a tight-rope over an abyss. This was not unique. Hugh Walpole once said that he was pleased when he became forty because he no longer felt that "disaster is waiting for me around the corner." And it has been a habit with me now, in view of my experience, to ask my older friends how they feel about the matter. There is reason to believe that most of them are sincere. About 10 per cent. have told me that they definitely fear old age and death, about 40 per cent. have told me that it "bothers them occasionally," while those of the remaining 50 per cent. are mostly indifferent. Many, like Walpole, actually feel more confident than do the young.

There must be some reason for this confidence. No doubt part of it results from an increase in economic and social security, but there is, I believe, another reason: that having lived for a certain period gives one a subconscious confidence that he will continue to live. This subconscious feeling is so strong that even the certain knowledge that death is coming can not eliminate it from the mind. This may explain the avarice of the aged. At least this seems a reasonable conception, and I should be pleased to have the reactions of other readers to it.

By the way, do those who criticize Pitkin's book ever read it? Mr. Pitkin has expressly emphasized, at the beginning of his book, that physically one is going down hill after forty. What he maintains is that many persons have their most interesting experiences and produce their best work after that age—which is something quite different from what most persons *suppose* the book implies.

CYRIL E. ABBOTT

DOANE COLLEGE

WHY does time appear to move faster as we grow older? In SCIENCE of July 30, an answer to this question was attempted by F. N. Nitardy which suggested a measurement of time as it relates to the individual. His impressive note called forth some interesting commentaries. Dondlinger points out that "the content of the elapsed time, that is, the events, occurrences, incidents and circumstances experienced during the elapsed time, is also a factor." This happens also to have been our own contribution to the discussion—we said something to this effect in an editorial. But we went farther than that; we dwelt morbidly upon what is happening *to* a person in middle age, rather than merely what is happening all around him, and suggested that cirrhosis of the liver, and the income tax, have something to do with the sensation that time is flying faster and the jig is about up. We have since noted, in Glass's recent "Genes and the Man," the suggestion, neatly parallelling Nitardy, that "the value of a year at any age is about equal to its proportion of the total life up to that age, so that a year to a child of ten has approximately four times the value of a year to a person of forty," but with the additional comment: "Our sense of time is not based on clocks or stars or even the alternation of day and night, but on the changes *within* us as we grow and develop." (Italics mine.)

Wilen takes the view that "there are at least limited circumstances in which the time-lapse sensation does not depend chiefly on age": if a man of sixty and a man of twenty are suffering extreme hardship on a life raft, both will find time dragging slowly along. A factor which none of these contributors has taken into consideration, apparently, is the psychological make-up of persons with relation to time. Of two persons of the same age, one feels he has a mission to accomplish, a great task to perform, and he is acutely aware of time's flight; the other, an easy-going sort who merely hopes to enjoy life without accomplishing much of anything, does not feel the acceleration to a comparable degree. A good example of the type of whom it has been written—

> But at my back I always hear
> Time's wingèd chariot hovering near

was Thomas Wolfe. Wolfe felt that he had a gigantic literary task to perform; he worked frenziedly to get it all out, and he produced magnificently. He was preoccupied with time and the briefness of man's days. Whether this terrific drive hastened his death, whether he had a premonition of his relatively early end, are debatable matters. It is hardly debatable that to such a man time moves far more rapidly than it does for his less dynamic, less intense, contemporaries.

R. P. HARRISS

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