Table 1. Product radicals (detected as $RC^{14}OONa$) (percentage of total activity)

Parent hydrocarbon	Octyl	Heptyl	Hexyl	Pentyl	Butyl	Propyl	Ethyl	Methyl	H
n-Pentane			3.0	2.0	6.0	2.8	2.0	20	65
n-Hexane			0.5	1.0	0.6	0.4	2.0	41.0	55
n-Heptane	0.5	2.0	10.0	2.0	1.0	1.0	8.5	37.0	36
2-Methylpentane		0.6		1.5			4.0	5.0	86
2,2,4-Trimethyl-pentane		14.0	6.0	6.0	5.0	17.0	8.0	15.0	23

culated from the known specific activity of the $C^{14}O_2$ used and from reasonable assumptions about counting efficiency, self absorption, geometry, and other factors. Energy absorption is based on the ferrous sulfate dosimeter yield of 15.6 ferric ions per 100 ev absorbed, with necessary corrections for differences in absorption coefficients. These calculations are based on the energy absorbed in the liquid hydrocarbon only.

The 1000-fold difference in total free radicals originating from the straight-chain hydrocarbons captured by sodium as compared with the branched compounds is possibly in part due to the presence, in the latter compounds, of a tertiary hydrogen atom which would be especially susceptible to attack by the free radicals produced in the bulk of the liquid. This is substantiated by the observation that in the case of both branched compounds the percentage of methyl radicals captured is appreciably lower, and the larger radicals higher, than in the case of the straight-chain compounds, while the over-all yield remains low.

That diffusion rates of the free radicals may also play a role can be inferred from the relative yields (Table 1). In all cases, except 2,2,4-trimethylpentane, the H-atom and methyl yields are much greater than those of any of the larger species produced by radiolysis.

For the highly branched compound, random carbon-carbon scission seems to predominate, while in the case of the straight-chain compounds, the order of susceptibility to breakage is C_1-$C_2 > C_2$-$C_3 > C_3$-C_4—that is, a terminal methyl group is most readily removed. This generalization must be tempered, of course, with the observation that the methyl radical may simply have a better chance of being captured and that it thus gives the appearance of being produced in greater abundance. The observation is, however, in general agreement with the results obtained by Gevantman and Williams (*4*), who used iodine as a free radical trap. These workers found that in the case of ethane, propane, *n*-butane, and *n*-pentane, the radicals corresponding to the parent hydrocarbon were not predominant and that methyl radicals represented 25 to 50 percent of the total radical yield, with other small fragments making up the bulk of the remaining products of the radiolysis.

It is not clear from this study whether or not the reactive species captured are produced on the monolayer of hydrocarbon immediately adjacent to the sodium surface or in the bulk of the system.

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Prolonged Natural Deferment of Hatching in Killifish

Abstract. The drying up of flooded lowlands stranded eggs of *Fundulus confluentus*, which were unhatched and viable after as much as 3 months' exposure. The eggs were found in the moist plant debris on the soil surface. When ovigerous sods were immersed in tap water, normal fish hatched within 15 to 30 minutes.

Under natural conditions, delay in hatching greatly exceeding the minimal incubation period is recorded only of the California grunion (Atherinidae) and certain of the Cyprinodontidae in South America, Africa, and India. The eggs of these fishes lie buried in sand (*1*) or mud (*2*) or immersed in stagnant water (*3*), as the case may be, pending onset either of a rainy season or of spring tides, when they hatch. Fundamentals of the hatching mechanism have been worked out experimentally for the Nearctic cyprinodont, *Fundulus heteroclitus* (*4*), and its hatching has been indefinitely postponed artificially (*5*). The hatching physiology of the Japanese cyprinodont, *Oryzias latipes*, has been clarified by a series of experiments (*6*). Since neither species is at present known to undergo a significant delay in hatching in a state of nature, the experimental results have not been examined in an ecological context.

In the autumn of 1957, in Vero Beach, Florida, eggs of marsh killifish, *Fundulus confluentus* Goode and Bean, were found to remain viable out of water for long intervals, when stranded on the ground surface among plant litter after accumulations of rainfall runoff had dried up. Sods cut during the period 9–18 December from a swale bottom from which the water had disappeared 2 months or more earlier yielded hatchlings 15 to 30 minutes after the sods were immersed in pans of tap water. At the time of hatching, the yolk sac is obsolescent, and the larval fish start feeding as soon as they escape from the chorion. A sod cut from an exposed lowland bottom on 19 September was kept out of water in the shade for 3 months and 5 days and lightly sprinkled once a week. After being immersed in a pan of water on 23 December, it yielded a hatchling fish.

All oviposition sites located by sampling were at the margins of formerly flooded areas, where the eggs would be left stranded by the first contraction of the perimeter of the standing water. Oviposition had been confined to accumulations of fresh water from rainfall runoff, which may have devious temporary connections with nearby brackish waters during the August–September rainy season. However, *F. confluentus* is euryhaline, with a preference for brackish water, and is abundant in regions without access to fresh water, so that it probably oviposits also at the fluctuating margins of brackish tidal waters.

The hardiness of the stranded eggs exposed to the atmosphere is evident from the fact that fry were obtained from the swale on 29 January, after it had been reflooded by heavy rainfall at the beginning of January, following the most sustained cold weather in Florida in over 15 years. These ranged from roughly 2-week to 4-week size, as measured by those reared from the egg in the laboratory. In both field and laboratory, the hatchlings developed normally and rapidly in fresh water (*7*).

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