

analysis of their complete detailed data by rigorous methods (2) may be able to show whether the data truly support this.

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References and Notes

1. F. Lacour, G. Delage, C. Chianale, *Science* **187**, 256 (1975).
2. R. Peto, *Br. J. Cancer* **29**, 101 (1974).
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Immunity in Cancer

Lacour *et al.* (1) demonstrated "a significant reduction in the occurrence of mammary tumors" in C3H/He female mice given injections of poly(A)·poly(U). Practically identical results were obtained in the same strain of mice by Riley (2) with living LDH-virus. Seibert *et al.* (3) also showed similar significant immune response against spontaneous C3H tumors with a heat-killed vaccine from a bacterium (C3H ♀ 27 Brtu) isolated from a C3H spontaneous mammary tumor and shown to be filterable through 0.1- μ m Seitz filters. At the peak period of tumor reduction in all three sets of experiments there was an increment of survival of about 20 percent treated mice over control untreated mice.

The necessity, even though tedious, of continuing such experiments until death of mice, not done by Lacour *et al.* (1), was demonstrated by both Riley (2) and Seibert *et al.* (3), who found 90 to 100 percent tumor incidence in both control and treated mice after the 380-day period, probably due to loss of cellular immunity with age. However, since delay of spontaneous tumor development as affected by all of these agents is most desirable in middle age, such agents may be of immediate practical value.

The advantages of a sterile autogenous or homologous vaccine, as used by Seibert *et al.* (3), are evident from the problems with viral vaccines recently discussed by Kolata (4). Caution is indeed timely. Agents, whether chemicals, including that used by Lacour *et al.* (1), or tumor extracts, viral vaccines, and the like must, throughout their entire preparation, be made so as to avoid contamination with bacteria, alive or dead, even in their filterable forms, since bacterial products are potent immunogens (5). Tumors fre-

quently used for extracts do harbor viable bacteria (5) and their products, and whether filterable forms or phages are also always present is not yet known.

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Dates for the Middle Stone Age of East Africa: A Discussion

Two new K-Ar dates from Ethiopia (1) augment a small, but growing, body of data implying that the beginnings of the African "middle Paleolithic" and of the associated "late Pleistocene" fauna are at least as early as 200,000 years ago. This recent acquisition is also an important one. It invites reexamination of relationships between the middle Paleolithic and late Pleistocene of Africa and presumably comparable successions in other parts of the world. We wish to comment on the authors' treatment of this aspect of their data.

In South Africa, as in Europe (2), late Pleistocene is commonly equated to Last Glaciation (Weichsel) plus Last Interglacial (Eem). Through this equation, the authors suggest that the new dates may also provide new minimum ages for the beginning of the Last Interglacial (Eem) in northwest Europe, as well as in South Africa. This extension, however, introduces "conflict with a series of K-Ar dates for Laacher See Volcanics (West Germany), which are incorporated in Rhine terraces . . . [four of which] place the period between late and early Saale (Riss) at about 145,000 years ago . . ." Further, "the most serious conflict . . . [is with] dates obtained by analyses of ^{230}Th and ^{234}U in shells from Atlantic and Mediterranean beaches and raised coral reefs regarded as of Eem age . . . [which] suggested a time range between 80,000 and 140,000 years ago."

The conflicts envisioned by Wendorf *et al.* (1) are not introduced by radiometric ages and their relationships to local stratigraphies (Fig. 1). Rather, they arise from an unwarranted use of the equation late Pleistocene = Last Glacial + Last Interglacial = Middle Stone Age in widely scattered areas. They require explication.

The Eem beds, in the type area, record a marine transgression directly overlying Saale till. In northwestern Europe, these and correlative deposits do represent the last interglacial. They have also been taken, arbitrarily, as the base of the late Pleistocene in that area. Their absolute age is not directly determinable. Extrapolation

References

1. F. Lacour, G. Delage, C. Chianale, *Science* **187**, 256 (1975).
2. V. Riley, *ibid.* **153**, 1657 (1966).
3. F. B. Seibert, J. A. Baker, J. Dierking, R. Abadel, R. L. Davis, *J. Intern. Res. Commun.* **1**, 53 (1973).
4. G. B. Kolata, *Science* **187**, 522 (1975).
5. F. B. Seibert, F. Yeomans, J. Baker, R. L. Davis, I. R. Diller, *Ann. N.Y. Acad. Sci.* **34**, 504 (1972).

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from ^{14}C dates of younger sediments (3) yields a minimum age of 75,000 years. On the other hand, the K-Ar age of 145,000 years for Laacher See Volcanics dates materials recognizable as detritus in the younger Middle Terrace of the Rhine (4) which downstream "at the Saale drift border, includes glacial-lake rhythmites and is overlain by Saale till" (5). Thus, both Saale (including Warthe) glaciation and Eem interglacial may be younger than 145,000 but older than 75,000 years.

As pointed out by Richmond (6), the implications of the Laacher See dates are consistent with a series of K-Ar dates from Yellowstone Park, where Bull Lake glaciation postdates a flow 150,000 years old and antedates a flow 70,000 years old. Additionally, an intra-Bull Lake interval of deglaciation may be 105,000 years old.

The $^{230}\text{Th}/^{234}\text{U}$ ages of molluscan shell from Mediterranean and Moroccan beaches do not suggest a time range for the Last Interglacial of 80,000 to 140,000 years. Rather, two intervals of (interglacial?) high sea level are indicated (7). The younger, Neotyrrenian, yielded ages between 75,000 and 95,000 years. It is separated by strong regression (glacial?) from the older, Eutyrrhenian, which yielded ages between 115,000 and 220,000 years. The $^{230}\text{Th}/^{234}\text{U}$ ages of molluscan shell are inherently unreliable (8), but $^{230}\text{Th}/^{234}\text{U}$ ages of coral from the Salentine peninsula confirm at least the age range of the Eutyrrhenian (120,000 to 220,000 years) (9).

Dated Eutyrrhenian deposits on Mallorca can be interpreted as belonging to two separate episodes of high sea level, separated by regression about 160,000 years ago (10). The same inference could be drawn from stratigraphic relations of Ravagnese and Cafari, Calabria [dates included in (8)] and near Cerveteri, Roma (11). A break in the series of dated reef-terraces in New Guinea (12) may record the same interval.

The classic littoral deposits of the Grotte du Prince (13) have traditionally been regarded as last interglacial (Riss-Würm) and late Pleistocene. They are older than