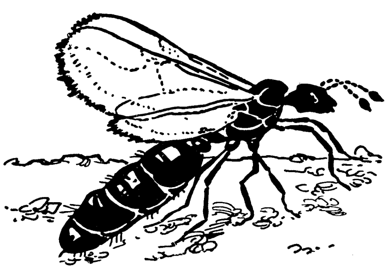
PALEONTOLOGY

NATURE RAMBLINGS
by Frank Thone



Tertiary Termites

VAST swarms of mating termites flitted through sultry sub-tropical air in what is now the Rhine valley, 25 or 30 million years ago. They alighted on the leaves and twigs of laurel, fig, cinnamon, camphor and palm trees by a shallow, mud-bottomed lake. They shook off their wings, as termites do when preparing to settle down and found colonies.

The wings drifted in shimmering clouds out over the lake. With them drifted some of the insects themselves, injured, or weaker than the rest. Shed wings and dead insects sank to the silty bottom, became entombed, finally fossilized. Now they constitute one of the most striking records of ancient insect life to be found anywhere in the world.

The winged hecatomb on the silty bottom became layers of slate, with insect and plant remains pressed flat, but with details of structure beautifully preserved. It is possible to identify both plant and insect species with great exactness. Associated with the slate layers were larger masses of the plant remains, changed into brown coal or lignite.

A picture of the termite-infested forests of the Oligocene Rhineland is presented by a German paleontologist, Dr. Georg Statz. The particular lignite bed which he studied lies in the hill country not far from Bonn, does not yield fuel suitable for use in stoves or under boilers, but it was once worked for the lamp oil that can be extracted from it, which was sold as "German petroleum." In 1866, however, competition of American kerosene killed the industry and the oil-lignite pits were abandoned.

Eleven species of fossil termites have been found in this one bed, out of a known total of 52. This site thus constitutes one of the most important places in the world for research on the evolution of the termites.

By far the greater part of the mass of insect remains found in the slate-heaps are of primitive forms, especially one family now represented by only one species of living termites, found in Australia. Some of the specimens are quite large, as termites go, with body lengths between one-half and three-quarters of an inch.

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●RADIO

Alvin W. Hall, director of the U. S. Bureau of Engraving and Printing, will discuss the technical aspects of the production of defense bonds and stamps as guest scientist on "Adventures in Science," with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Thursday, May 22, 345 p.m. EDST, 2:45 EST, 1:45 CST, 12:45 MST and 11:45 a.m. PST. Listen in on your local station. Listen in each Thursday.

BIOPHYSICS

New Studies Add 'Vitreous' As Fourth State of Matter

ADD TO the three classic states of matter—solid, liquid, gaseous—a fourth state, the vitreous or glassy. This reclassification is desirable because of the wide differences between ordinary solids, which are crystalline in structure, and vitreous substances or glasses, which have no crystals in them, declares Prof. B. J. Luyet, St. Louis University biophysicist, joint author with Dr. P M. Gehenio of a recent monograph, *Life and Death at Low Temperatures.* Crystalline solids are produced by relatively slow cooling of liquids; vitreous bodies by cooling too rapid to permit the formation of crystals.

The difference between crystalline solid and the non-crystalline glass becomes especially important in the reactions of living protoplasm when subjected to low temperatures. Freezing to death ordinarily occurs when cells are too slowly chilled to temperatures very little below the freezing point of water, permitting ice crystals to form in and about them. If they are chilled very suddenly, their watery contents become vitreous instead of turning to crystalline ice, and they may survive the experience without permanent injury.

Prof. Luyet and his associates have plunged thousands of single-celled organisms and thin tissue-layers into liquid air, and brought them to life again by warming them up rapidly. The materials of their experiments have ranged all the way from protozoa to the leaves of mosses. Moss leaves are especially suitable because each leaf is a single layer of cells; leaves of higher plants are many cell-layers thick, and are difficult to vitrify and to subject to "vitrofusion" rapidly enough.

The critical, crystal-forming temperature zone extends only a few degrees below the freezing point of water. Cells and tissues must be hurried through it, both going down and coming up; for a vitreous substance will become crystalline if the warming-up process is slow. The change, however, is irreversible; a crystalline solid cannot be turned directly into a vitreous substance.

It is practically impossible, Prof. Luyet states, to chill larger organisms, like frogs or goldfish, to extremely low temperatures without killing them. This is because their body heat cannot pass out through their relatively thick tissue fast enough to prevent that fatal crystallization just below the freezing point.

It is possible to give such animals a partial chilling, by exposing them only briefly to the extreme low temperatures. This permits their superficial tissues to freeze; as long, however, as the freezing does not reach their vital organs the animals can survive. But if a fish is frozen through and through, it is a dead fish, and will never wiggle again no matter how you warm it.

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