scratches at the surface of the substratum on which the eggs are to be deposited. As the eggs are extruded the cloaca is brought into close contact with this surface and attachment is thus effected. The female removes any eggs which may partially adhere to the cloaca during extrusion by a precise flexor-extension reflex of the hind legs. In this the tarsi are applied directly to the adhering eggs and a slow extension effects the removal.

Deposition of an egg mass is usually followed by a quiet moment during which the bodies of the pair become slightly more inflated than normally. The intervals between egg deposition, ranging from 2 to 10 minutes or longer, are spent in bursts of vigorous activity, mainly on the part of the female. What function this may serve, if any, is conjectural, but it apparently takes place under natural as well as artificial conditions. In the laboratory such periods are followed by a rest and then further oviposition. Shortly after laying is complete, the pair becomes separated. The entire time in amplexus has been observed to range from 8 to 40 hours or more.

The total number of eggs deposited was found to range from 500 to 750; however, Storer[1] reports an instance of 1,250 eggs being laid. The number of eggs per clutch is usually about 16, but varies from 5 to 60. Further, a tendency exists toward the close of the laying for the size of the clutch to taper off to 3 or 4 or even single eggs. There is indication that the embrace of the male may be requisite to the proper extrusion of eggs by the female. Three gravid females, isolated without mates, laid only 26, 92 and 80 eggs, respectively, on the evening following capture, and all three died during the ensuing day. The evidence at hand indicates that resorption of eggs does not occur in the gravid, unmated female. It would thus appear that retention of the eggs is fatal to the animal.

ROBERT EMRIE SMITH

UNIVERSITY OF CALIFORNIA

THE PROPOSED TERMS "EXERGONIC" AND "ENDERGONIC" FOR THERMODYNAMICS

THE terms "exothermic" for reactions giving off heat and "endothermic" for those absorbing heat were coined in the last century when it was hoped that a concentrated attack on thermochemistry would solve the problems of chemical affinity and enable the chemist to predict the direction of spontaneous chemical reaction. This hope was illusory, but the nomenclature is quite useful and may also be applied to reactions for which the decrease in heat content $-\Delta H$ is positive or negative, respectively.

Those reactions do go spontaneously for which the entropy of the system and surroundings increases. This criterion of the second law of thermodynamics is rather general, and it has been found more convenient to particularize the law with reference to the free energy F and use the criterion that a reaction will go by itself if the free energy decrease $-\Delta F$ is positive at constant pressure and temperature, or in other words, if useful work (rather than heat) could be produced by a reversible mechanism. An interesting chemical analysis of the correlation of these two thermodynamic criteria has been given by T. W. Davis,[1] since the change in entropy ΔS is negative for many reactions for which $-\Delta F$ is positive and reaction occurs spontaneously. The importance of free energy in chemistry is so great that G. N. Lewis and M. Randall[2] included it in the name of their classical book that crystallized the course of research in chemical thermodynamics.

No terms have received wide acceptance which aptly characterize so-called spontaneous and nonspontaneous reactions. We therefore propose that the term "exergonic" be applied to reactions which can produce work, and "endergonic" be applied to those on which work must be expended to cause the reaction to occur. At constant pressure and temperature exergonic signifies $-\Delta F$ is positive, and endergonic signifies $-\Delta F$ is negative.

These two words are derived from the Greek *ergon,* work, and are etymologically analogous to the corresponding thermochemical terms derived from *thermē,* heat. The word *ergon* was formerly used as a synonym for the unit of work, the erg, and in a more restricted sense applies in physics to a unit of work measured in heat. This application of the cognate word is consistent with modern scientific usage to express free energy values and changes in calories.

CHARLES D. CORYELL

THE UNIVERSITY OF CALIFORNIA,
LOS ANGELES

SAT-CHROMOSOMES

THIS technical term, introduced by Heitz,[1] is widely misunderstood and has been misused repeatedly in cytological literature. "SAT" is an abbreviation[2] of "Sine Acido Thymonucleinico." "SAT-Chromosome" is not a synonym for satellited-chromosome but signifies either a satellited chromosome or a chromosome with a secondary constriction that is associated with the formation of the nucleolus. All satellited chromosomes are SAT-chromosomes, of chromosomes with secondary constrictions, some are SAT-chromosomes,[3]

1 T. I. Storer, *Univ. Calif. Publ. Zool.,* 27: 225, 1925.

1 *Jour. Chem. Educ.,* 13: 376 (1936).

2 "Thermodynamics and the Free Energy of Chemical Substances," McGraw-Hill Book Company, New York, 1923.

1 E. Heitz, *Planta,* 12: 775–844. 1931.

2 E. Heitz, *op. cit.,* p. 812.

3 L. Geitler, "Chromosomenbau," Berlin, 1938, p. 24.