ponents in the gas stream is progressively varied by adjustment of the rate of flow of diluent gas until the equilibrium composition is attained. This can be done with a high degree of precision, since the equilibrium point can be approached from both sides, *i.e.* by determining the composition at which a condensate first forms on the target, as well as the point at which a film previously formed is removed by a more dilute gas mixture. This critical point, at which a condensate barely begins to form or, once deposited, barely begins to disappear, represents the equilibrium condition for the binary vapor mixture at the temperature of the condensation surface.

By means of this experimental technique the vapor-phase equilibria have been determined at three temperatures (Fig. 1). The graphical presentation of these results, with the marked deviations from a straight-line relationship, indicates that at any relative humidity the saturation point is reached with glycol vapor concentrations well below the theoretical value based on Raoult's law.[2] The area under each curve represents an isothermal region in which glycol vapor and water vapor can coexist in the air without formation of an aerosol. Conversely, any concentration above each curve identifies an atmosphere supersaturated with the vapor mixture.[3] The relative saturation of the air with glycol vapor will therefore be a function not only of relative humidity but also of temperature. A rise in temperature from 20° to 29°C. at 50 per cent relative humidity will more than double the capacity of the air to hold triethylene glycol vapor. A similar effect may be achieved at a constant temperature of 25°C., for example, by lowering the relative humidity of the air from 50 to 16.5 per cent. The accuracy of the experimental results is approximately $\pm$ 3 per cent.

By interpolation, the saturation concentrations for intermediate temperatures may be computed from the experimental results obtained at the three temperatures indicated. The temperature coefficient throughout this region is best calculated by means of the Clausius-Clapeyron equation. For pure triethylene glycol, the equation obtained is $\log_{10} P = \frac{-3,170}{T} + 7.758$, where P is the vapor pressure in mm. Hg and T is the absolute temperature. The partial pressure of triethylene glycol vapor at various relative humidities can be computed for intermediate temperatures by means of this equation, or a graphical interpolation may be employed. Fig. 2 presents the results of such an interpolation.

[2] It should be noted, however, that for this type of graphical presentation, positive and negative deviations from the straight line do not indicate the sign of the deviations from Raoult's law.

[3] Under natural conditions, the critical concentration at which an aerosol begins to form will also be affected by the number and type of condensation nuclei present in the air.

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Book Reviews

The operculate land mollusks of the family Annulariidae of the Island of Hispanola and the Bahaman Archipelago. Paul Bartsch. (U. S. National Museum Bull. 192.) Washington, D.C.: Government Printing Office, 1946. Pp. iv + 264. (Illustrated.) $.75.

This taxonomic treatise on the pomatiasid operculate land snails of the islands of Haiti and the Bahamas categorically divides their shells into 24 genera, and "*Incertipoma*," which is "a catch-all for all annulariids that cannot be definitely assigned to their proper genus" and which includes 11 new species. The major groups are founded mainly on the structures of the opercula, which, according to the descriptions, show remarkably little variation inside each genus. Of the 24 genera, 16 are new (and one renamed); of the 17 subgenera, 8. Of 194 species, 117 are described as new; of 96 subspecies, all but 6. In general, the dimensions of only the type shell are given, without specification of sex, although the pomatiasid males are much smaller than the females, and usually little intergradation in shell size is found on examination of the animals. Occasional notes on habitat are included. One of the most notable species is *Sallepoma mutabile* Bartsch, which is omitted from the key to the species in this new genus because its range of variation covers all the differences used for the demarcation of the other species (with the possible exception of its sutural characters, which are not described). The shells of practically every species and subspecies are illustrated by excellent photographs. The taxonomic index is apparently very complete.

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Performance records of individual trees and clones of Cinchona in Guatemala. John R. Shuman. Pp.: text, 4; Tables, 80. (Tabulation filed with Library, U. S. Department of Agriculture, 1947.)

Along with the procuring of cinchona bark in Latin-American countries during the war, great efforts have been made by public agencies, as well as by private Cinchona growers, toward the permanent re-establishment of quinine in the Western Hemisphere. The numerical results of a three-year study on the performance of individual trees and clones of Cinchona in Guatemala are made available to those interested in its commercial cultivation through this tabulation, which is being filed with the Library of the U. S. Department of Agriculture in Washington, D. C. It is the purpose of this review to bring this summary, which represents the largest tabulation of clonal performance records of Cinchona in the world, to the attention of all interested agencies, private as well as public. The final, bound, International Business Machine tabulation is in book form.

A general idea of the scope of this work is obtained from the following summary of data represented:

Data collected and analyzed in Guatemala, C.A.: March 1943–July 1944.

Further analysis of variance of data in U.S.A.: October 1944–March 1945.

Number of chemical assays in data: 3,573.

Number of grafts attempted during 1937–42, inclusive: over 180,000.

Number of grafts set out in the field for same period: 27,531.

Number of trees one or more years in the field and included in the study: 31,058.

Number of trees measured from 1 through 7 years of age, inclusive: over 17,000.

Number of clones: 709.

Number of additional different pedigrees represented by individual trees: 1096.

Number of principal *fincas* where most of plant material is growing: 7.

Number of fields represented in above *fincas*: 27.

Range of elevations of fields: 3,000–6,000 feet, or 914–1,829 meters.

Total area in study: 35.2 acres, or 14.2 hectares.

A total of 709 clones, already established in Guatemala through grafting, together with the individual trees that were assayed but not grafted at 7 principal *fincas*, or estates, represents the material of the clonal performance records. On the basis of these it is possible for the first time to see what has been done with respect to each pedigree and clone and to make certain comparisons. The information given for each pedigree may be classified as follows: (1) identification and description by pedigree; (2) chemical analysis of bark with additional pertinent data on factors believed to affect the alkaloid content of a tree; (3) figures concerning the size of the trees, general appearance, abnormalities, and diseases; (4) ability of plants to survive in the field; and (5) data relating to the ease with which the various plants may be grafted.

Three measures of performance have been computed to permit direct comparisons between pedigrees. Differences due to age and certain environmental conditions are equalized in these three figures. The first is termed *quinine value*, a comparative figure adjusted for differences in age and differences due to fields and altitude. This is computed as a per cent of the average content of the three highest assaying types, namely *ledgeriana*, *ledgeriana* hybrid, and hybrid. *Size value*, the second measure, is adjusted for differences due to age and is computed as a per cent of the average of the three types mentioned above plus *succirubra* hybrid. The third figure, *survival value*, which is adjusted for age, number of years in the field, effect of original planting and replanting, is computed in terms of the average per cent survival for the same four types as were used to determine the average size of the trees.

These figures show the *quantitative amount* by which any given pedigree excels the average of all other pedigrees; *i.e.* it is a quantitative means of comparing the ability of a given pedigree to produce quinine with the average ability of all pedigrees. The figures are consequently free of all personal bias or favoritism and reflect the experience gained at 7 different estates, each directed by different individuals. On the basis of the tabulation it is now possible to select those pedigrees which are the best or the worst with respect to quinine content, size, and survival.

The reliability of the data presented is indicated by the number of individuals upon which the many figures are based. In some instances there are evidently too few observations to give any but the most preliminary indications of the true or probable performance of a given clone. Additional sampling will be necessary to determine the usefulness of certain plant material.

The results of a detailed statistical analysis of the data by the author are in the form of a manuscript entitled *Cinchona in Guatemala*. Cinchona growers in Latin America as well as in other countries would greatly benefit by its publication.

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Scientific Book Register

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