

gebra by one of the leading American experts, gives an authoritative account of linear associative algebras which have been the center of interest in algebra for over sixty years. The book is the first in English to utilize fully the new methods introduced by Emmy Noether and her pupils to refine and extend the theory. The preliminary knowledge necessary for its understanding may be found in the Survey reviewed above, or in the author's own text, "Modern Higher Algebra."

The book begins by giving in less than fifty pages all the classical structure theorems. The remaining three quarters of the book are devoted to the numerous new results obtained in the last fifteen years due in the main to Emmy Noether, Richard Brauer, Hasse and Albert himself. Particularly noteworthy are the

chapters on the representation theory expounding the methods Albert developed in the theory of Riemann matrices and on the structure of rational division algebras where Albert has been able to avoid the complicated arithmetic of integral sets of an algebra. A final chapter, in which numerous unsolved problems are stated, and an excellent bibliography of the recent literature enhance the value of the book for the student.

The book is written with great clarity and precision and more than fulfils the author's stated purpose in the introduction: to provide "a text on the theory of linear associative algebras . . . (and) a source book for young algebraists." No mathematician at all interested in algebra can afford to miss it.

MORGAN WARD

SPECIAL ARTICLES

A NOTE ON THE HYGROSCOPIC PROPERTIES OF CLOTHING IN RELATION TO HUMAN HEAT LOSS

QUITE recently we have noted in studies of heat loss from clothed subjects that the thermal effect of moisture changes in clothing can be of large order in relation to human heat production. Such effects may produce confusing results in studies of heat loss under conditions of widely different relative humidity. In changing a clothed subject from a low to a high relative humidity at the same temperature, the effect appears as a plus error in the subject's heat balance. In short, the subject appears to produce more heat than can be accounted for by his metabolic rate. This process is the reverse of evaporation and is due to the absorption of moisture by the clothing with a resulting evolution of heat. In the reverse change, loss of moisture from clothing produces a greater cooling than can be accounted for by the temperature of the environment. Both efforts are transient, and disappear under conditions of equilibrium.

Loss or gain in textile weights due to hygroscopic properties has received extensive study from the standpoint of the industries concerned. The relative humidity of the ambient air has been considered as the critical factor involved and standard regain tables are available which give the weight of moisture picked up (or regained) by 100 parts of a given dry material at equilibrium in an atmosphere of a given relative humidity. These tables show that between 30° and 100° F. air temperature has a minor effect on the ultimate state of equilibrium. In industry attention is given to moisture regain because of its technical importance in spinning and its bearing on true weight of yarn sold or received.

This factor has importance at present because of

the interest of physiologists, biophysicists and engineers in developing highly efficient garments for human protection under extraordinary conditions of climatic exposure. In attempting to deal with this problem in our own laboratory we have found no satisfactory references reporting the time curves of these adjustments in textile moisture content. This is the important factor, since it is obvious that the evolution of 100 calories of heat in a garment over a period of 48 hours is of little practical consequence. On the other hand, if a considerable fraction of this heat is released, under certain conditions, over a period of one, two or three hours, the practical effect may be considerable.

For the benefit of others who are concerned with this field, we are reproducing data which will be of assistance in roughly estimating the order of this effect in time. The results apply to a man's woollen garment weighing 1.86 kilos when dry at 70° F.

A temperature and humidity controlled room was available for this study. A Sauter balance of 20 kilo capacity and sensitive to 50 milligrams was used. The garment was originally allowed to come to equilibrium at 70° F and 25 per cent. relative humidity. It was then weighed and packed in an air-tight metal container, while the temperature and relative humidity were being adjusted to a new level. The garment was then unpacked and hung on the balance. Weight gain or loss was recorded continuously at set intervals until full equilibrium was reached (Curve 1). This procedure was repeated, using a new temperature and relative humidity setting for the last half of the operation. The garment was tested over a temperature range from 45° to 90° F. At each temperature a high and low relative humidity was established (77 per cent. and 30 per cent. approximately). The re-

sults of nineteen different exposures are shown in Fig. 1. The graph represents gains and losses of weight in the suit for the first six hours. Final equi-

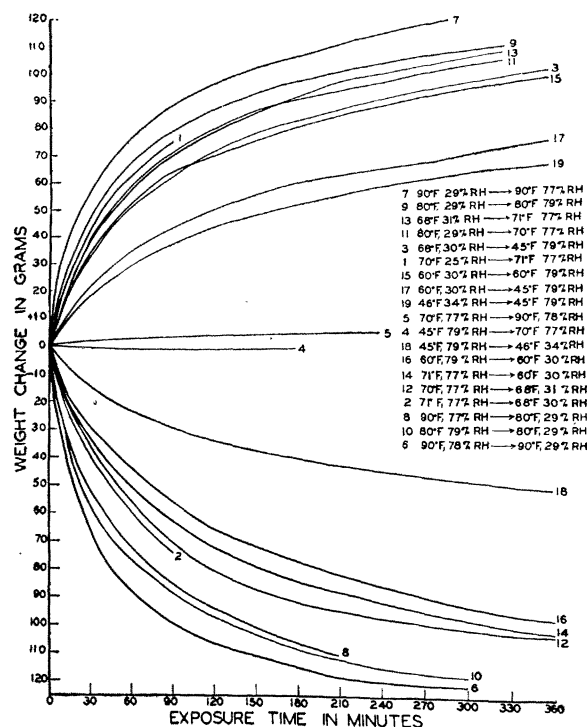


Fig. 1

librium was reached in most cases within twenty-four hours. The legend referring to each curve indicates the condition at which the suit was in hygroscopic equilibrium when exposure started, and the exposure condition which resulted in a given weight gain curve. For example, the legend for Curve No. 7 reads 90° F, 28 per cent. R.H. → 90° F, 77 per cent. R.H. This means that when the suit was in equilibrium at 90° F and 28 per cent. relative humidity and was then exposed to a condition of 90° F and 77 per cent. relative humidity, it gained weight as described by this time curve.

The significant effect of garment moisture gain or loss on skin temperature and heat balance may be illustrated from the magnitude of the weight changes in the first hour of exposure. For example, in Curve No. 7 again: In the first hour the garment picked up 76 grams of moisture which has a heat gain equivalent of about 44 calories.¹ This value is 50 to 60 per cent. of the resting hourly heat production of an adult man. If one started with a heavy garment of 3 to 4 kilos dry at moderate temperatures, the total heat evolution in the first 2 or 3 hours would obviously be at least equal to the physiological heat production at rest. All

¹ The calorie equivalent of a 10-gram change in weight is about 5.8 calories.

curves indicate that more than half the total change in weight takes place in the first two hours of exposure. Another conclusion to be drawn from the figure is that relative humidity influences the weight change far more than temperature, although the effect of 10° rises in temperature is observable for comparable relative humidities. Finally, it may be of some interest to note a hysteresis effect. At a fixed temperature, in varying relative humidity from a given low to a given high value and back to the original low again, the garment gained more moisture before reaching equilibrium at the high humidity than it lost in returning to equilibrium at the original low humidity.

A thorough knowledge of the hygroscopic properties of different materials as well as the thermodynamic implications inherent in the body-clothing system is of considerable importance in designing protective garments for optimum comfort under extreme conditions.

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TREATMENT OF RENAL OSTEODYSTROPHY WITH DIHYDROTACHYSTEROL (A.T.10) AND IRON

RENAL osteodystrophy is a generic name for osseous disorders simulating rickets, osteomalacia or osteitis fibrosa cystica, but originating from chronic renal insufficiency. The most important metabolic defect is poor calcium absorption due to large phosphorus excretion by the bowel as a result of renal insufficiency. Yet vitamin D, specific in promoting calcium absorption in rickets and osteomalacia, is singularly ineffective in renal osteodystrophy. This is true in a series of 5 cases in which detailed metabolic studies were made in this clinic. Vitamin D in ordinary therapeutic doses for prolonged periods orally or intramuscularly or in single massive dose by mouth failed to elicit any significant clinical or metabolic response.

This led us to the use of dihydrotachysterol (A.T.10), an irradiation product of ergosterol, first introduced by Holtz¹ in the treatment of hypoparathyroid tetany. Our experience with A.T.10 in 3 cases of osteomalacia² indicates that this compound promotes calcium and phosphorus absorption by the intestine and deposition in the bones, contrary to the earlier view³ that A.T.10 was not anti-rachitic. In

¹ F. Holtz, H. Gissel and E. Rossmann, *Deutsche Ztschr. f. Chir.*, 242: 521, 1934.

² H. I. Chu, S. H. Liu, H. C. Hsu and H. C. Chao, "Calcium and Phosphorus Metabolism in Osteomalacia." XII. A Comparison of the Effects of A.T.10 (Dihydrotachysterol) and Vitamin D. To be published.

³ F. Albright, *et al.*, *Jour. Clin. Invest.*, 17: 317, 1938; 18: 165, 1939.