microscopist, versed in physiology, cytology and histology. He should be conversant with the chemistry of the coal-tar compounds, not so much from the viewpoint of the maker of dyes as from that of the broad-minded chemist, freed from the economic domination of the dye industry, for, as before remarked, fugitive dyes, and even colorless compounds, are possible factors in such investigations as are here under discussion. He should have a working knowledge of nemas.

ILLUMINATION

In order to distinguish with accuracy among *intra-vitam* color reactions it is necessary to be very particular about illumination. The most perfectly corrected lenses must be used, both as condenser and objective, and the light used must be as nearly white as possible. The best source of light known to me for these researches is bright sunlight reflected from a plane matte white reflector. The reflector should be several feet across, and placed at a distance from the microscope several times its own diameter. It should be universally adjustable, so that it can be set to reflect a maximum of light to the mirror of the microscope —all the better if heliostatic. A good surface for the screen is made by whitewashing a rather finely woven cotton cloth.

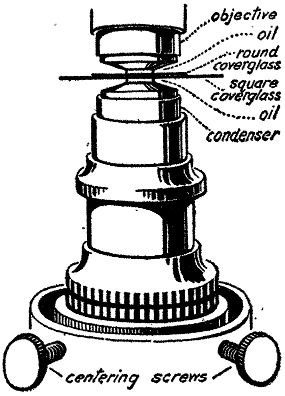

Fig. 1.

The best optical arrangement I have tried is the use of one apochromatic objective as a condenser for another apochromatic objective. I have been using with success a 2 mm. apochromatic as a condenser for a 2 mm. or 1.5 mm. apochromatic objective. These precautions are necessary if fine color distinctions are to be made with the greatest possible accuracy. If these precautions are taken it will be found that fine distinctions can be made with such precision as to dispel all doubt as to the existence, side by side, in the same cell of definite structures of varying character that it would otherwise be impossible or exceedingly difficult to distinguish from each other.

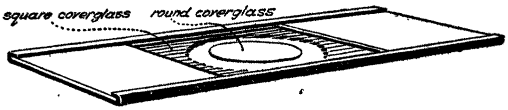

Fig. 2.

The use of an ordinary apochromatic objective as a condenser necessitates the use of a special object slide, consisting essentially of a carrier and two cover glasses. The object is mounted between the cover glasses. Such a slide is shown in the accompanying illustration. The substage of the microscope should have a centering arrangement and a rack and pinion or screw focusing adjustment. A little experience with an apparatus of this sort, in which all known precautions are taken to remove color from the optical system, leads one to distrust the ordinary Abbé substage condenser where fine distinctions are to be made between colors, especially if the colors are of similar character.

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THE AMERICAN CHEMICAL SOCIETY

DIVISION OF PHYSICAL AND INORGANIC CHEMISTRY

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The positive and negative specific heat of saturated vapors: F. P. Siebel. A vapor expanding from a temperature T to the temperature $T-1$ reversibly, yields the maximal work W due to the latent heat of vaporization H introduced at the higher temperature in accordance with the second law expressible in equivalent calories as

$$W = H\frac{T-(T-1)}{T} = \frac{H}{T} \text{ calories.}$$

This amount of work is in many cases greater than the difference in the total heat of the vapor L between the temperatures T and $T - 1$ degrees absolute, viz., $L - L_0$ and in this case an amount of heat equal to $H/T = (L - L_0)$ must be added to maintain the vapor in a saturated condition, and it is therefore called the "negative specific heat" at the temperature T. If $L - L$ is greater than H/T the difference of heat must be added and it is then called "positive specific heat." The examples show that all the numerical values in this respect determined by Clausius on a somewhat different basis agree perfectly with those obtained after the above formula, which agreement, however, is not found with other results obtained by other authors on a similar basis, apparently due to errors of judgment so liable in the application of the calculus. Moreover, it is argued that instead of the heat quantity H/T which represents the net work when the expansion takes place in a reversible cycle, the heat quantity W_e representing the maximax work in reversible expansion should be used, which changes the values of positive and negative heat slightly.

The separation of erbium from yttrium: B. S. Hopkins and Edward Wichers. The erbium-yttrium material used in the investigation was obtained by fractional crystallization of the bromates. Methods recommended by Drossbach and Wirth could not be duplicated with the success obtained by these workers. Cobalticymide precipitation as recommended by James, was found to give a good separation, but offered practical difficulties. Precipitation with sodium nitrite as used by Hopkins and Balke found to give a rapid separation when used with material which was predominantly yttrium.

A study of the ratio of $Er_2O_3 : 2\ ErCl_3$*:* C. W. Balke and Edward Wichers. A brief discussion of other ratios used in determining the atomic weights of the rare earth elements was given and the constancy of composition of the rare earth sulphates questioned. The method of applying the oxide-chloride ratio to erbium was described and data given which give an atomic weight approximately one unit higher than the present value.

A thermal study of some members of the system $PbO - SiO_2$*:* L. I. Shaw and B. H. Ball. Many mixtures of PbO and SiO_2 varying in composition from 40 per cent. to 90 per cent. PbO were melted in an electric furnace and the records of their thermal conduct plotted on time-temperature diagrams. (In some cases PbO_2 was used instead of PbO and its behavior is noted.) The significant temperatures of these graphs were then combined into a composite temperature and it was concluded that the system is a case of solids in solid solution. Two maxima corresponding to the composition $PbO - SiO_2$ and $2\ PbO - SiO_2$ were found and another $2\ PBO - 5\ SiO_2$ was clearly indicated. Two eutectics are indicated, though the lower one may be a transition point of the one of the higher melting point. As noted by previous investigators, a transition point of SiO_2 was found at 540°–580° C. All mixes sintered at 690° ± 10° C.

A study of the change of conductivity with time in the system methyl alcohol-iodine-water: L. I. Shaw and John P. Trickey. Conductivities of solutions of iodine in methyl alcohol of various boiling points have been measured. It was found that the conductivity increased much more rapidly in the case of the solutions in alcohol of higher boiling points; also, that the conductivity reached a higher value in the case of the solutions from the higher boiling point alcohols. It was suggested that this was probably due to the water content of the alcohol. It was found that a smooth curve could be drawn through the points at which the conductivity of the various solutions became constant. Suggestions as to the probable reaction were given.

The solubility of pure radium sulfate: S. C. Lind, C. F. Whittemore and J. E. Underwood. The solubility of $RaSO_4$ in water and other solutions is of practical interest since all processes for the recovery of radium from its ores involve, at some stage, the precipitation of radium together with barium as sulfate.

Studies in pseudo-isotopy—Part I: S. C. Lind. Experiments of the author and others have shown that when radium and barium are partially precipitated from a solution containing a mixture of the two, no change in relative concentration takes place. This is true for sulfate, oxolate, carbonate, and perhaps all other difficulty soluble salts, and bears an exact analogy to the inseparability of the isotopic elements. The fact that radium and barium are only *pseudo*-isotopic, however, is shown from the great divergence of their atomic numbers, and their ready separation by recrystallization of the chlorides or bromides. It has been shown in the preceding paper that the assumption of identical solubility of $RaSO_4$ and $BaSO_4$ in analogy to their pseudo-isotopic action in precipitation reactions, is far from the truth. Conversely, this must raise the question, from the purely experimental side, as to the truth of the assumption generally made of identical solubility of true isotopes.