Since these experiments seem to raise questions that are fundamental in the problem of chemotherapy, it is important to determine whether they can be explained as merely surface reactions upon the trypanosomes or whether one must have recourse to other more abstruse processes of metabolism or vital phenomena.

We have therefore attempted to determine whether a similar interference could be demonstrated upon the growth and $CO_2$ production by yeast in the test-tube. Our curves of $CO_2$ production by ordinary baker's yeast grown in a sucrose solution show that yeasts which have been definitely stained by methyl violet or by brilliant green in the test-tube, in solutions too weak to affect the $CO_2$ production, are less sensitive to acriflavine than are normal yeast cells. Vice versa, yeast cells stained with acriflavine in concentration too low to affect $CO_2$ production, are rendered less sensitive to methyl violet and brilliant green. This effect is not noticeable with basic fuchsin.

These experiments represent a complete parallelism *in vitro* to Browning's and Schnitzer's "interference phenomenon" *in vivo*, and render it probable that the latter can be explained as a simple surface reaction.

## 4518

## Ultramicroscopic Studies Upon Colloidal State of Antiseptics and Arsenicals in Relation to Their Actions.*

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As Voegtlin[1] and others have shown that the action and toxicity of arsphenamine is closely related to their viscosity and colloidality, and as the action of antiseptics is greatly diminished by the presence of protein and of lipoids (Hirschfelder and Decherd[2]) we have studied the appearance of solutions of a number of these substances under the Szigmondy slit ultramicroscope. Solutions of arsphena-

* The experiments reported in this paper form the basis for a part of a Thesis presented by Harold N. Wright in partial fulfillment of the requirements for the degree of Doctor of Philosophy at the University of Minnesota (May, 1929).

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[1] Voegtlin, C., *U. S. Pub. Health Rep.*, 1924, xxxix, Part I, 179.

[2] Hirschfelder, A. D., and Decherd, G. M., PROC. SOC. EXP. BIOL. AND MED., 1928, xxv, 824.

mine and neoarsphenamine show the soap-bubble-like appearance of hydrated lyophillic colloids, the micellae being smallest between pH 7 and 9, and again from 11 to 13. In the presence of proteins they aggregate to form stellate, highly refractive micellae. Rivanol is fluorescent, lyophillic, soap-bubble-like and aggregates with proteins. Triphenyl methane dyes are crystalloidal, but aggregate with proteins. Quinine and the hydrocuprein series (optochin, eucupin and vuzin) are fluorescent, crystalloid and aggregate with proteins. Metaphen is crystalloid and produces little change in the proteins. Mercurochrome and acriflavine show fluorescence, but no visible particles; the micellae formed by mercurochrome and protein appear to be quite small; with acriflavine the protein aggregates are somewhat larger.

These colloidal phenomena are probably associated with the toxicity and pharmacological action of the drugs, especially in intravenous injection.

## 4519

## Determination of Oxyhemoglobin by Means of the Duboscq Colorimeter.

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In the determination of oxyhemoglobin by the Dare method the glass standard is never of the same color as oxyhemoglobin and therefore a color match is impossible. A better color match has been obtained by determining acid hematin as in the Sahli and Newcomer methods. The color match is not perfect, however, and an hour wait is required for all of the hemoglobin to be changed to acid hematin. If monochromatic light is used the difficulty of matching colors is eliminated but for practical reasons the wavelength should be one in which the blood pigment shows considerable absorption. The Wratten color filter 74, epsilon, shows a high transmission at 540 mμ and the center of one of the absorption bands of oxyhemoglobin is at 541.7 mμ. Furthermore, the transmission of this Wratten filter is in so narrow a band as to appear monochromatic to the eye. Hence the Newcomer glass standard may be used for determining oxyhemoglobin if this Wratten filter is placed in the eyepiece of the colorimeter. A slight change in the spectrum of the Newcomer glass as has been made by Bausch and