years can still be received up to the date of publication.

W. T. Calman,
Secretary of the Ray Society

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QUOTATIONS

THE NEW CHEMISTRY

The service, at once scientific and humanitarian, of Dr. Charles Baskerville, who died last week, is illustrative of what the science of chemistry is undertaking for the alleviation of human suffering. Dr. Baskerville's special researches had to do with the causes and prevention of occupational diseases and with the purifying of ether as an anesthetic. These are, however, but suggestive of the innumerable researches in which his brother chemists of every land in this new age of their science are seeking not only to heighten industrial productivity, but to promote and conserve the health and strength of human bodies.

During the war, when it became necessary to use poison gas to fight poison gas, the ablest American research chemists were called to the country's defense. The recent action of the Washington conference gives hope that choking and wasting vapors will not again sweep over fields or stain the skies, and that such another service as these chemists were called upon to give will never again be asked of a benign science that will now have freedom to devote its entire attention to benefiting men, women and children.

That this is more than a vague, visionary hope is intimated by the recent report of a committee of the American Chemical Society, under the chairmanship of Dr. Charles H. Herty. It is a clarion summoning of the chemists to come to the battle against disease. In the war the development of means of defense was not left to haphazard discoveries by isolated chemists. The best-trained workers in systematic research were brought together and were kept in daily—almost hourly—conference, where they were joined by pharmacologists and experimental pathologists, until the problems upon which the fate of nations depended were solved. But while war claimed its sacrifice in millions of lives, "disease each year claims its tens of millions." The new problems give this science a more urgent, poignant call. And the committee, contemplating the ravage of disease, puts this question: "Can we not bring to these problems the same methods so successfully employed in the solution of the means of making war?"

Several centuries ago the chemist and the physician cooperated. Then they separated, the chemist turning toward industrial production. Now it is being realized that, though the bacteriologists and pathologists have accomplished wonders, they have "definitely reached a point where they must turn to the chemists for the solution of many of their most important problems." Not only are the chemists' medicaments needed for the cure or alleviation of certain specific diseases, but their advice is needed as to the acceleration or retardation of chemical reactions that take place in the body. The myriad battles with avoidable or preventable disease there go daily on. The lesson of the war intimates what victories may be expected in these battles from the cooperation, under ideal conditions of time and research, on the part of those whose science touches these very issues of life.

Dr. Baskerville, not only by his own researches, but also and especially by developing and equipping what was perhaps the best series of chemical laboratories in the United States and by organizing a department which has given tuition to hundreds of young men for service in this science, made his lasting contribution, though his studies and researches and teaching here are over. It will be remembered, however, that but a few weeks before his death, after years of intimate study of the atom, he said that "there is something that cannot be explained on a purely materialistic hypothesis." So the quest goes on.—The New York *Times*.

SPECIAL ARTICLES

A CONVENIENT METHOD OF DETERMINING THE BRIGHTNESS OF LUMINESCENCE

Having recently had occasion to measure the brightness of various fluorescent substances I tried out for this purpose an optical pyrometer.

The instrument was of the type based upon the well known "thermo-gauge" devised by the late E. F. Morse for controlling the temperature to which metals are heated in tempering. It consists of a telescope of short focus, low power and relatively large aperture, having a tungsten lamp in the focal plane. The filament of this lamp is superimposed upon the image of the surface the brightness of which is to be measured. With a screen in the eye piece so selected as to give a fair color match with a minimum of absorption it is easy to adjust the current through the lamp until the filament merges in the surface with which it is to be compared. The lamp may be compared for temperature as in ordinary optical pyrometry or directly for brightness, using an illuminated matte surface subject to known fluxes of light.

While this scheme becomes rigorous only in the comparison of non-selective radiation, the departures are not troublesome. Nearly all fluorescence colors, on account of the broad-banded character of their spectra, may be regarded as modified whites. They are in general of diluted rather than of saturated hue. Again, in dealing with very low intensities, as in the study of luminescence, slight color differences become quite inappreciable. All that is demanded of the color screen is to give a ruddy, greenish or bluish tone respectively so as to avoid strong contrasts.

Fortunately, as in all photometric processes involving the distinguishing of a pattern, the sensibility of the determination does not fall off seriously with the diminution of the field of view until it becomes difficult to distinguish outlines.

With this apparatus the breaking down occurs at very low intensities. Any surface against which the unlighted filament can be seen as a black line can be measured as to brightness with surprising consistency. In searching for a white surface devoid of luminescence, for example, it was easy to detect traces of fluorescence in a variety of substances usually deemed inactive. Thus Becquerel,[1] more than sixty years ago, noted that viewed in his phosphoroscope nearly everything non-metallic glowed. The only point here is that by this simple method these traces are found to be measurable.

[1] Becquerel: La Lumière, Vol. 1, p. 256.

Because of its availability at very low intensities this instrument is likewise adapted to the determination of persistent phosphorescence. One has only to find a suitable screen, focus the pyrometer on the phosphorescent body, note the cessation of excitation on a chronograph and record thereafter the times at which the phosphorescence matches the filament which is set successively to a diminishing series of predetermined brightnesses.

The accompanying table gives estimates of the brightness of a number of fluorescent materials determined in this way. The excitation was approximately the same for all, excepting in the case of luciferin. For a sample of this interesting substance, made from marine light-giving organisms, I am indebted to Professor E. N. Harvey. The luciferin was activated by wetting the powdered material and stirring vigorously to hasten oxidation. In all other cases an iron spark was used at a distance of about ten centimeters. The spark was obtained by means of the convenient step up transformer designed by Mr. W. C. Andrews for that purpose.

THE BRIGHTNESS OF FLUORESCENT SUBSTANCES

SUBSTANCES	BRIGHTNESS IN MILLILAMBERTS
Dyestuffs in dilute solution:	
Rhodamin 6 G	4.2 to 12.0 m. l.
Rhodamin B	5.2
Fluorscein	4.2 to 5.2
Tetrachoreosin	4.2
Resorufin	3.0
Luciferin (prepared by Professor Harvey)	14.5 to 16.0
Uranyl salts (solid):	
Potassium uranyl sulphate	35.2
Ammonium uranyl sulphate	23.0
Rubidium uranyl chloride	8.11
Potassium uranyl nitrate	7.53
Uranyl nitrate	6.61
Cæsium uranyl nitrate	5.71
Uranyl acetate	5.39
Potassium uranyl fluoride	4.69
Cæsium uranyl acetate	4.56
Lead uranyl acetate	3.75
Miscellaneous solids:	
Synthetic willemites	12.5 to 14.0
Natural willemite (Franklin Furnace)	5.31
Sidot Blendes	3.08 to 10.9

Calcium sulphide (Balmain)	1.26
Canary glass	7.31
Calcite (red) from Langban	0.132
Cadmium phosphate (red)	0.0182

Since to most of us the millilambert conveys no very definite meaning in terms of a familiar visual sensation, I may add that according to the measurements of Coblentz a tungsten filament at 2000° C., which is not far from the temperature of our ordinary incandescent lamps of the vacuum type, has a brightness of *630,000 millilamberts.*

Since our various fluorescent substances vary in color it should be further stated that the brightness in each case is such that the intensity of the maximum region in the fluorescent band equals the brightness of the corresponding region in the spectrum of a neutral matte surface of the specified number of millilamberts.

In general, according to these measurements our known luminescent materials are of the order of a few millionths in brightness compared with an illuminant such as the ordinary electric lamp.

E. L. NICHOLS

PHYSICAL LABORATORY
OF CORNELL UNIVERSITY,
DECEMBER, 1921

THE AMERICAN SOCIETY OF ZOOLOGISTS

THE American Society of Zoologists held its nineteenth annual meeting at the University of Toronto in conjunction with Section F of the American Association and in association with other biological societies on December 28, 29 and 30, 1921. President C. A. Kofold and Vice-president A. L. Treadwell presided at the various sessions.

William Bateson, director of the John Innes Horticultural Institution, Merton Park, Surrey, England, was elected honorary fellow of the society.

The following were elected to membership:

Edward F. Adolph, University of Pittsburgh; Charles P. Alexander, University of Illinois; William R. Allen, University of Akron; Horace B. Baker, University of Pennsylvania; Frank N. Blanchard, University of Michigan; Joseph H. Bodine, University of Pennsylvania; Robert H. Bowen, Columbia University; Alfred E. Cameron, University of Saskatchewan; William H. Cole, Lake Forest College; Mary E. Collett, University of Buffalo; Rheinart P. Cowles, Johns Hopkins University; Alden B. Dawson, Loyola University Medical School; Hoyt S. Hopkins, Baylor Medical College; Carl L. Hubbs, University of Michigan; George W. Hunter, Knox College; Donald E. Lancefield, University of Oregon; James W. MacArthur, University of Toronto; Robert S. McEwen, Oberlin College; Peter W. Okelberg, University of Michigan; Charles L. Parmenter, University of Pennsylvania; Mary E. Pinney, Lake Erie College; Franklin P. Reagan, University of California; Robert C. Rhodes, Emory University; Franz Schrader, Bryn Mawr College; Gotthold Steiner, University of Berne; Horace W. Stunkard, New York University; Tage Ellinger, University of Illinois; Lewis H. Weed, Johns Hopkins University; Alvalyn E. Woodward, Amherst College; Benjamin P. Young, Cornell University; Hachiro Yuasa, University of Illinois.

After the election the membership roll of the society contained 357 names of members in good standing.

The report of the treasurer showed a probable balance for January 1, 1922, of $808.20, a loss for the year of $81.71, although there are fewer members in arrears than at any time in the last four years. The attention of the society was called to the fact that the present plan of operating on a basis of fifty cents per member per year must in time deplete the accumulated surplus of the society.

The constitution and by-laws were amended to permit the separation of the office of secretary-treasurer.

The nominating committee, composed of M. F. Guyer, S. J. Holmes and J. H. Gerould, reported the following nominations:

President—H. H. Wilder.

Vice-President—B. M. Allen.

Secretary—W. C. Allee.

Treasurer—D. H. Tennent.

Member of the Executive Committee—C. A. Kofoid.

Member of the National Research Council—H. S. Jennings.

Three associate editors of the *Journal of Morphology*—L. L. Woodruff, G. A. Drew and H. V. Neal.

Membership in Council of the American Association for the Advancement of Science—Charles Zeleny and H. E. Crampton.