Electricity; and we have the same warrant to consider Electricity as some modification of Heat. In fact the term "Radiance" would be a more distinctive appellation than "Radiant Heat."

As to trust in authorities, of course we must trust in them as long as their explanations seem most in accordance with facts, but no longer. Well-established facts are the only trustworthy data of Science. No theory can be sustained against the pressure of unconformable facts. In short, every theory is in danger while a single fact remains unexplained. For the facts of nature are so closely linked that each in some way bears upon all, and all upon each. And yet it is by no means advisable to stop theorizing, for correct theories are themselves facts of science—facts concerning forces and relations as deduced from facts concerning things. And every partially correct theory is a footstool through which higher levels of conception may be reached; while every theory proved incorrect is a warning board, advising all future scientists not to waste time in following a path that leads nowhere.

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BOOKS RECEIVED.

TEXT-BOOK OF EXPERIMENTAL ORGANIC CHEMISTRY for Students, by H. CHAPMAN JONES. D. Van Nostrand. New York, 1881.

Although termed a text-book, the author admits that this little volume will be found of greater use as a companion for the student in the laboratory, who wishes to study organic chemistry both practically and theoretically.

We recommend this volume to those who have a limited time at their command for study, and are not overburdened with cash, the author having wisely restricted the number of experiments, and suggested only such as are available in a laboratory of the humblest pretensions, and the use of expensive chemicals is altogether avoided. The author has shown considerable judgment in arranging this work, the plan of which is excellent, because while the subject has been reduced to its simplest form, the instructor will find all that is necessary for teaching the elementary stages of practical organic chemistry, and it will serve as a reliable guide to the average student who relies on his own resources for instruction.

CONTRIBUTIONS TO METEOROLOGY: being results derived from an Examination of the Observations of the United States Signal Service, and from other sources. By ELIAS LOOMIS, Professor of Natural Philosophy in Yale College.

A pamphlet reprinted from the *American Journal of Science*, being the subject matter of a paper read before the National Academy of Sciences. Washington, April 19, 1881.

ON THE GROUP "*b*" ON THE SOLAR SPECTRUM. By WILLIAM C. WINLOCK. From the proceedings of the American Academy of Arts and Sciences. Presented by Professor Wolcott Gibbs. June 9, 1880.

The most complete charts of the solar spectrum now available are Kirchhoff's, which were published in 1861, and Angström's, published in 1869. Kirchhoff employed a battery of four flint-glass prisms, with a collimator and observing telescope each of about 4 centim. aperture and 49. centim focal length; while Angström used telescopes of about 4.6 centim. aperture, and 36.3 centim. focal length, and a diffraction grating made by Nobert, containing about 133 lines to the millimetre.

Such great advances have been made very recently in the construction of optical instruments, and more especially in the ruling of diffraction gratings, that it would now be possible to enlarge Angström's great chart almost as much as he improved upon Fraunhofer's first maps. But it would be an almost endless undertaking for a single observer to attempt a map of the whole spectrum, from the ultra-violet to the invisible red, brought to light by our most powerful instruments, and accordingly most physicists who have paid especial attention to solar spectroscopy have devoted themselves to a careful study of detached portions which appear of unusual interest. As a contribution to this work, the following observations upon the group of dark lines "*b*," of the solar spectrum, were undertaken by Mr. Winlock, at the suggestion of Dr. Gibbs, and carried on under his immediate supervision.

A PRACTICAL TREATISE ON THE MANUFACTURE OF STARCH, STARCH-SUGAR AND DEXTRINE, based on the German of Ladislaus Von Wagner and other authorities, by JULIUS FRANKEL. Edited by Robert Hutter. Illustrated by 58 engravings, covering every branch of the subject. Henry Carey Baird & Co., 810 Walnut street, Philadelphia, 1881. Price, $3.50.

The increased manufacture of Glucose and the prospect of this substance becoming a staple article of produce in the United States, makes this volume a welcome addition to the excellent series of technical works published by this house.

Those about to engage in the manufacture of Glucose will find this treatise an indispensable guide, and, as we understand, it is the only work in the English language describing in detail the processes and machinery made use of in this important class of industry.

It is stated in the preface that this subject has been heretofore surrounded by more or less mystery than any other manufacture of recent years, and that access to factories has been barred to all but workmen, and that inventors and manufacturers of the necessary machinery have refused to furnish drawings of the machines. It is therefore evident that the present work, which has been prepared with care, intelligence and zeal by one who is a master of the subject, must be a valuable acquisition to those interested in this industry.

Mr. Frankel introduces the subject by describing the Chemistry of Starch, its technology and methods of manufacture. The Chemistry of Starch-sugar is then taken up and its manufacture in all its branches explained in detail. The author concludes with an exhaustive description of Dextrine and its manufacture.

It was Professor Kirchhoff, of St. Petersburg, Russia, who made the important discovery in 1811, that starch boiled in diluted sulphuric acid is transformed into sugar, but the origin of glucose manufacture dates from the time of Napoleon I., when the English were blockading the Continent. At the time it caused a great and general sensation, as it was then thought that grape sugar was identical with cane sugar, and hence could in every respect be substituted for that product. This new branch of industry was, therefore, pursued with energy, and immense quantities of starch-sugar were manufactured, but subsequently, when it was proved that this material was by no means identical with cane sugar, being less soluble, of less sweetness, and not at all suitable to serve as a substitute for the former, then for a number of years the demand ceased. Of late years a revival has taken place in this industry, and in 1876 Germany alone produced in her 47 glucose, starch-sugar and syrup factories 100 million pounds, and as we stated in a recent article 500 tons a day of glucose are now produced in the United States.

It is singular to observe that such substances as Starch, Grape-sugar and Cane-sugar, which have such opposite properties in some respects, are almost chemically alike. If starch absorbs two molecules of water, it becomes transformed into glucose (grape or starch sugar), while cane sugar contains one molecule more than starch and one molecule less than the starch sugar. The chemical

composition of these substances may be compared by arranging their formulæ in the following manner:

C_{12} H_{20} O_{10}, or C_{12} H_{10} O_{10} = Starch.
C_{12} H_{22} O_{11}, or C_{12} H_{11} O_{11} = Cane Sugar.
C_{12} H_{24} O_{12}, or C_{12} H_{12} O_{12} = Grape Sugar.

Grape-sugar is largely diffused throughout the animal kingdom, and is found in most of the sweet tasting fruits. It is contained in the honey of the bee, and is separated in large quantities in the urine of those unfortunates who suffer from that disease of the kidneys called *diabetes mellitus*. Grape-sugar is not only found in nature but can be produced chemically. Thus it is formed as a result of the action of diluted acids, diastaste, gluten, saliva, etc. on starch, and for this reason starch is used for its production on a large scale.

The fullest directions are given in this work for the manufacture of glucose from starch, and we congratulate the publishers on producing a book at a moment so *apropos*, and we regret we cannot devote more space to the subject; we advise, however, all interested in this new and rising industry to obtain a copy of the work, for it apparently presents all the facts bearing on the manufacture of glucose, in a very convenient form.

REPRODUCING DRAWINGS, DESIGNS, &c.

The following method of reproducing drawings, &c., in any desired color, has been patented by M. M. Tilhet, of 18 Rue de la Paix, Paris. The paper upon which the design is to be reproduced in order to prepare a negative copy is first passed through a bath composed of the following materials in about the proportions given: White soap, 30 parts by weight; alum, 30 parts; Flanders glue, 40 parts; the white of eggs or albumen beaten up, 10 parts; glacial acetic acid, 2 parts; alcohol at 60 degrees, 10 parts; water, 500 parts. The paper, after having been removed from this bath, is passed through a second bath composed as follows: Burnt umber, ground in alcohol, 50 parts by weight; black pigment, 20 parts; Flanders glue, 10 parts; water, 500 parts; bichromate of potash, 10 parts. The paper having been thus treated must be kept when dry in a dark place. In order to prepare positive paper for the prints, a bath is used similar to the last, but without the umber, for which black pigment is substituted. Or, if it is desired to obtain colored proofs instead of black ones, the black pigment is replaced by a pigment of red, blue, or any other desired color. To prepare the copies, the design or drawing is placed in an ordinary photographic printing frame, the back of the design being next to the glass, and a sheet of negative paper prepared in the way first described is placed in contact with it. The frame is then exposed to light, two minutes exposure being sufficient in good weather. The sensitive paper is then removed from the frame in a dark place and is placed in water, when the design becomes visible in white, and the paper is then allowed to dry. In order to obtain positive pictures from the negative thus prepared, the latter is placed in the printing-frame with a sheet of the positive paper prepared in the manner above described in contact with it, and after exposure to light for a sufficient time, that is to say, about two minutes, the positive paper is removed in a dark place, and is plunged into water, which removes the part of the pigment which has not been affected by the light, without its being necessary to touch it. Any number of copies of the design or drawing may be produced by the novel method described upon any kind of paper, and in any color or colors. The proportions of the different materials used to prepare the baths as above described may be varied to suit varying circumstances, such as the weather and the character of the design or of the paper.

METEOROLOGICAL REPORT FOR NEW YORK CITY FOR THE WEEK ENDING JULY 23, 1881.

Latitude 40° 45′ 58″ N.; Longitude 73° 57′ 58″ W.; height of instruments above the ground, 53 feet; above the sea, 97 feet; by self-recording instruments.

JULY.	BAROMETER. MEAN FOR THE DAY. Reduced to Freezing.	BAROMETER. MAXIMUM. Reduced to Freezing.	BAROMETER. MAXIMUM. Time.	BAROMETER. MINIMUM. Reduced to Freezing.	BAROMETER. MINIMUM. Time.	THERMOMETERS. MEAN. Dry Bulb.	THERMOMETERS. MEAN. Wet Bulb.	THERMOMETERS. MAXIMUM. Dry Bulb.	THERMOMETERS. MAXIMUM. Time.	THERMOMETERS. MAXIMUM. Wet Bulb.	THERMOMETERS. MAXIMUM. Time.	THERMOMETERS. MINIMUM. Dry Bulb.	THERMOMETERS. MINIMUM. Time.	THERMOMETERS. MINIMUM. Wet Bulb.	THERMOMETERS. MINIMUM. Time.	MAXI'M In Sun.
Sunday, 17--	29.579	29.618	0 a. m.	29.508	5 p. m.	73.6	66.6	81	2 p. m.	72	2 p. m.	64	12 p. m.	60	12 p. m.	131.
Monday, 18--	29.523	29.596	0 a. m.	29.446	4 p. m.	69.3	61.3	74	4 p. m.	63	4 p. m.	62	6 a. m.	59	6 a. m.	126.
Tuesday, 19--	29.611	29.690	12 p. m.	29.542	0 a. m.	74.7	65.0	84	3 p. m.	68	4 p. m.	66	6 a. m.	60	6 a. m.	130.
Wednesday, 20 --	29.686	29.742	9 a. m.	29.632	12 p. m	77.3	68.0	83	5 p. m.	71	5 p. m.	69	6 a. m.	65	6 a. m.	123.
Thursday, 21--	29.553	29.638	12 p. m.	29.500	2 p. m.	78.3	69.3	87	3 p. m.	72	2 p. m.	69	12 p. m.	64	12 p. m.	135.
Friday, 22--	29.596	29.638	0 a. m.	29.546	6 p. m.	73.3	66.0	77	3 p. m.	69	6 p. m.	66	5 a. m.	62	6 a. m.	127.
Saturday, 23--	29.646	29.722	12 p. m.	29.586	3 a. m.	72.0	65.7	79	3 p. m.	68	3 p. m.	65	5 a. m.	61	5 a. m.	139.

			Dry.	Wet.
Mean for the week	29.599 inches.	Mean for the week	74.0 degrees	65.9 degrees.
Maximum for the week at 9 am., July 20th	29.742 "	Maximum for the week, at 3 pm. 21st	87. "	at 2 pm 21st, 72. "
Minimum " at 4 pm., " 18th	29.446 "	Minimum " " 6 am. 18th	62. "	at 6 am 18th, 59. "
Range	.296 "	Range " "	25. "	13. "

JULY.	WIND. DIRECTION. 7 a. m.	2 p. m.	9 p. m.	VELOCITY IN MILES. Distance for the Day.	FORCE IN LBS. PER SQR. FEET. Max.	Time.	HYGROMETER. FORCE OF VAPOR. 7 a. m.	2 p. m.	9 p. m.	RELATIVE HUMIDITY. 7 a. m.	2 p. m.	9 p. m.	CLOUDS. CLEAR, 0 OVERCAST, 10. 7 a. m	2 p. m.	9 p. m.	RAIN AND SNOW. DEPTH OF RAIN AND SNOW IN INCHES. Time of Beginning.	Time of Ending.	Duration. h. m.	Amount of water	OZONE. 1 10
Sunday, 17	w. n.w.	w. n.w.	n. n.w.	217	6	4.40 pm	.537	.663	.495	71	63	70	3 cir.cu	2 cir. cu.	0	-----	-----	-----	--	4
Monday, 18	n. w.	w. n.w.	w. n.w.	238	9½	11.40 am	.433	.429	.449	73	51	61	1 cir.	7 cir.cu.	0	-----	-----	-----	--	2
Tuesday, 19	w. n.w.	n. w.	w.	219	6½	1.50 pm	.457	.460	.554	69	42	64	0	1 cir. cu.	0	-----	-----	-----	--	1
Wednesday, 20	w.	w. s. w.	s. w.	156	2¼	1.30 pm	.537	.534	.612	71	49	62	4 cir.cu	3 cir.cu s	10	-----	-----	-----	--	1
Thursday, 21	w. s. w.	n. w.	n. n. w.	227	4¾	3.20 pm	.614	.609	.568	68	51	67	3 cir.cu	4 cir. cu.	0	-----	-----	-----	--	8
Friday, 22	n. w.	n. n.w.	n. n. e.	82	1½	8.50 pm	.495	.564	.568	70	61	67	2 cir.	9 cu.	0	-----	-----	-----	--	8
Saturday, 23	n.	n. e.	n. n. w.	140	2	2.30 pm	.489	.564	.595	74	61	76	8 cir.cu	4 cir. cu.	1 cir. s.	-----	-----	-----	--	1

Distance traveled during the week	1279 miles.	Total amount of water for the week	0 inch.
Maximum force	9½ lbs.	Duration of rain	0 hours 0 minutes.

DANIEL DRAPER, Ph. D.
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