

## THE HEAT OF THE SUN

### THEORIES OF THE ORIGIN OF THE BLAZING ORB OF DAY.

#### The Principle of Meteoric Formation by Mutual Gravitation Not Contradictory. Scientists Contend, to Known Physical Laws.

The sun being assumed to be an incandescent liquid, now losing heat, the question naturally occurs, how did this heat originate? It is certain that it cannot have existed in the sun through an infinity of past time, since as long as it has so existed it must have been suffering dissipation, and the finiteness of the sun precludes the supposition of an infinite store of heat in his body.

The sun must therefore either have been created as an active source of heat at some time of not immeasurable antiquity by an overruling decree, or the heat which he has already radiated away and that which he still possesses must have been acquired by a natural process following permanently established laws.

Without pronouncing the former supposition to be essentially incredible, we may safely say that it is in the highest degree improbable if we can show the latter to be not contradictory to known physical laws.

And we do show this and more by merely pointing to certain actions going on before us at present, which, if sufficiently abundant at some past time, must have given the sun heat enough to count, for all we know, of his past radiation and present temperature.

It is not necessary at present to enter at length on the details regarding the meteoric theory, which appears to have been first proposed in a definite form by Mayer and afterward independently by Waterston, or regarding the modified hypothesis of meteoric vortices, which the writer of the present article showed to be necessary in order that the length of the year, as known for the last 2,000 years, may not have been sensibly disturbed by their sessions which the sun's mass must have had during that period, if the heat radiated away has always been compensated by heat generated by meteoric influx.

We may now believe that all the theories of complete or nearly complete contemporaneous meteoric compensation must be rejected, but we may still hold that "meteoric \* \* \* is \* \* \* not only proved to exist as a cause of solar heat, but it is the only one of all conceivable causes which we know to exist from independent evidence."

The form of meteoric theory which now seems most probable, and which was first discussed on true thermodynamic principles by Helmholtz, consists in supposing the sun and its heat to have originated in a coalition of smaller bodies falling together by mutual gravitation and generating, as they must do, according to the great law demonstrated by Joule, an ex-

act equivalent of heat for the motion lost in coalition.

That some form of meteoric theory is certainly the true and complete explanation of solar heat can scarcely be doubted when the following reasons are considered:

First.—No other natural explanation, except by chemical action, can be conceived.

Second.—The chemical theory is quite insufficient, because the most energetic chemical action we know, taking place between substances amounting to the whole sun's mass, would only generate about 3,000 years' heat.

Third.—There is no difficulty in accounting for 20,000,000 years' heat by the meteoric theory.

It would extend this article to too great length and would require something of mathematical calculation to explain fully the principles on which this last estimate is founded.

It is enough to say that bodies, all much smaller than the sun, falling together from a state of relative rest, at mutual distances all large in comparison with their diameters, and forming a globe of uniform density equal in mass and diameter to the sun, would generate an amount of heat which, accurately calculated according to Joule's principle and experimental results, is found to be just 20,000,000 times Pouillet's estimate of the annual amount of solar radiation.

The sun's density must, in all probability, increase very much toward his center, and therefore a considerable greater amount of heat than that must be supposed to have been generated if his whole mass was formed by the coalition of comparatively small bodies. On the other hand, we do not know how much heat may have been dissipated by resistance and minor impacts before the final conglomeration, but there is reason to believe that even the most rapid conglomeration that we conceive to have probably taken place could only leave the finished globe with about half the entire heat due to the amount of potential energy of mutual gravitation exhausted.

We may therefore accept as a lowest estimate for the sun's initial heat 10,000,000 times a year's supply at the present rate, but 50,000,000 or 100,000,000 as possible in consequence of the sun's greater density in his central parts.

The considerations adduced above regarding the sun's possible specific heat, rate of cooling and superficial temperature render it probable that he must have been very sensibly warmer a million years ago than now, and consequently, if he has existed as a luminary for 10,000,000 or 20,000,000 years, he must have radiated away considerably more than the corresponding number of times the present year's amount of loss.

It seems, therefore, on the whole, most probable that the sun has not illuminated the earth for 100,000,000 years and almost certain that he has not done so for 500,000,000 years.

As for the future, we may say with equal certainty that inhabitants of the earth cannot continue to enjoy the light and heat essential to their life for many million years longer unless sources now unknown to us are prepared in the great

storehouse of creation.—Essays in Astronomy," by Lord Kelvin (Appleton & Co.).

#### Just Like a Man.

Mrs. Stocks—If we move into that cheap house, we'll lose caste.

Mr. Stocks—Don't care if we do. It's the best we can afford without running hopelessly into debt, and, besides, it's a comfortable place, anyhow.

Mrs. Stocks—Hub! Just like a man! Only so you can be comfortable and pay every little bill as quick as it comes in you don't care what the world thinks!—New York Weekly.

#### PIOUS FRAUDS.

##### Memorials of German Traders of the Hanseatic League.

Facing the lower harbor of Bergen, at the end of a long row of quaint old warehouses, stands a venerable building more than 700 years old, called the Finne-gaarden, one of the counting houses of the league, which has been preserved intact and is now a museum filled with interesting relics of that celebrated corporation. They show how its managers and employees lived and conducted business. The league owned the harbor and a considerable portion of the city and controlled not only its manufacturing, mercantile trade and foreign commerce, but also its fisheries, which have always been its most valuable industry. Bergen then, as now, was the greatest fish market in the world.

The management of the business of the league was intrusted only to Germans, who were imported for that purpose, and were not allowed to marry lest their wives should learn its secrets. The managers and clerks were housed in colonies of fourteen, each colony having control of certain interests and keeping separate accounts of its transactions. The men slept in cupboards built into the walls in a curious manner. They did their own cooking. They had their own church, with priests imported from Germany. They were pious scoundrels, as the evidence shows, for along with their crucifixes and prayer books and pictures of the saints are records showing that they kept two sets of scales—one for buying and one for selling—and the attendant will show you a parchment book in which the manager notes for the edification of his employers that he cheated a fisherman out of 200 vogs of fish—a vog being thirty-six pounds—and invokes "the blessing of God upon this small profit." The inscription over the door of the counting house reads, "Without God's blessing all is vain."

The money was kept in an immense ironbound chest, divided into compartments of various sizes, some of them holding a bushel, in which were deposited the various kinds of coin until the collector came to make his periodical settlement. At the bottom and in the sides of the chest are secret compartments for concealing contracts and other papers of value.—W. E. Curtis in Chicago Herald.

There are 3,000 words used alike in French and English without variation in spelling.

#### WASTE IN RESTAURANT DISHES.

##### Reckless Extravagance in Serving Portions to Customers.

"My wife being out of town, I have been dining around of late," said a gentleman who likes to get about a bit among men and see how others live. "The thing that struck me most forcibly was the enormous waste there is in the better class of restaurants and why managers should permit it when it could just as well be avoided. Take this as an example: I dined at a big hotel on Wednesday night. That being 'fish day,' I thought I could get some first class fish and tried it. I got what I wanted—a bit of sheephead that was superbly cooked, finely served and as good a piece of fish as I ever put in my mouth. I had celery with it. The charges were moderate enough, I thought, for the quantity of food I was given. There was fish enough for four persons and celery enough for three at least. No half portions were served. Now, I would as soon have paid the same price for half the quantity of either dish and would then have thought I was abundantly served. More than half my order went back to the kitchen, and I felt as if I were in a measure responsible for a part of that waste in consequence."

"Of course it was none of my business to philosophize that there were hundreds of persons who would have been made happy could they have had that which I could not eat. Neither is it any business of the hotel people. But why in the world whoever has charge of serving the food should give one man so much more than he can possibly eat is a question in the economy of running hotels and restaurants that bothered me then and bothers me still. It is a custom in all first class places, and the reason for it is a puzzle that seems beyond solution. Two men could not have wanted what I had in one portion of fish if they had anything else, and there was hardly a man dining at this particular place that evening but had either soup or oysters to begin with and followed his fish course with some other food—either a solid meat or a sweet of some sort."

"It would seem as if economy were one of the things never thought of in the management of restaurants. Yet it strikes the average man, I fancy, as one of the first things that would naturally be considered if a place is run for the profit there is in it. I am not yet convinced that restaurants are conducted solely for the fun of feeding the public."—Hotel Register.

#### CULINARY CAPERS.

Add a pinch of salt to coffee to give it tone.

When making bread in cold weather, first warm the bread pan, the flour and the kneading board.

A tough piece of meat can be nicely stewed in a double broiler. It will take twice as long, however, as if cooked directly over the fire.

When pan broiling chops, always stand them for a minute on their ends that the fat edge may be cooked crisp and brown

instead of remaining pale and unsightly.

If you want cake to be very light, it is best to sift the flour three or four times. Everything should be as light as possible, but too prolonged stirring after the eggs are added may make the cake soggy.

The next time a creamy rice pudding is made, one of the sort that is without eggs and compounded only of rice and milk, with slow cooking, try adding a teacupful of blanched and finely chopped almonds.

Cold lamb or mutton made into a mince or hash with boiled rice and finely chopped green peppers is a dish to remember. The peppers are used raw, getting the little cooking needed for the tiny pieces when they simmer with the meat and rice.

#### A Reminder System.

The Philadelphia Record thus quotes a business man: "Unless a man has specially schooled himself memory is bound to be treacherous sometimes. I don't trust mine at all any more. It has gone back on me too often. Besides, a postal card only costs a cent, and I always carry a lot of them around with me. My end of the business calls me away from the store a great deal, and no matter where I may be—riding on a street car, walking or in one of the numerous places of business which I frequent—when an idea occurs to me that requires my attention I jot a memorandum of it down on a postal card, address it to myself and drop it in the nearest letter box. Some days I will send a dozen postal cards to myself, and the next morning they are on my desk awaiting me. I have been doing this for two or three years, and I think it's a pretty good system."

#### A Hard Question.

When I was quite a lad, long before I became a preacher, I had some very difficult questions put to me, one especially so, as I considered it. The Sunday school was rather a new thing in the section where I lived, and it put a great many to asking and answering questions. A little girl came to me one day as on a mission of great importance and began to ply me with questions, I answering them, of course, the best I could. She asked me who made me, why God made me and a number of other questions, and then, pausing for awhile as if in a deep study, she said, "Why did God make you so ugly?"

That was a very hard question for me. I was obliged to ask for time and have never answered it yet.—Homiletic Review.

#### Swedish Politeness.

In Sweden it is a common custom to hold the hat in the hand while talking to a friend in public. At the same time to avoid the dangers of colds in winter it is not unusual to see announcements in the daily papers informing the friends of Mr. So-and-so that he is unable through the doctor's orders to conform to this polite usage.

#### Lots of Water.

"And what is this?" asked the visitor. "This is Wall street. It is the most celebrated of all our American watering places."—Our Dumb Animals.

#### A DAY OF SCRUBBING.

##### The Real Thing in Housecleaning in Dutch Homes.

It was understood generally, says Mary A. Peixotto, writing in Scribner's on household ways in Holland, that our models would not pose on Saturday, that day being devoted exclusively to housecleaning within and without. Early in the morning every stick of furniture is rubbed and wiped carefully and taken out of the house. Then the women, with their skirts tucked up, entirely flood the rooms with bucket after bucket of water brought up from the canal by means of the shoulder yoke. With broom and brush they scour and scrub the red tiled floor and finally pull up a plug in one corner to let the water flow out, let us hope, into the canal.

While the floor is drying a great polishing goes on in the street. Quaint old brass lamps and candlesticks, tobacco boxes and ash trays, huge milk cans—all are burnished until, like golden mirrors, they reflect the red cheeked, white capped faces bent over them.

The lacquer man is busy on Saturday. He goes from house to house painting the bread trays and honey cake boxes with designs of gaudy birds and wondrous leaves and flowers.

The street is in a turmoil until noon, when order is partially restored and the scant midday meal partaken of. In the afternoon washing is resumed. The exteriors of the cottages are scrubbed from roof to pavement and every trace of mold removed, for in this low, wet air the green moss gathers quickly. Then the brick pavements are drenched and carefully dried, and I have even seen the women slip off their sabots and tiptoe to their doorways in their woolen chaussons so as not to soil the immaculate sidewalk.

Lastly toward evening the entire village goes to the canal, and all the sabots are washed and whitened with pumice stone, spotless for the morrow. On Saturday evening all the pickets of the low black fences are decorated with rows of dripping footgear carefully graduated in size from the big wooden shoes of the father down to the tiny sabots of the youngest born.

#### Stockholm Impregnable.

There are a lot of picturesque old castles and fortresses on the coast of Sweden in which garrisons are still maintained, but they would not last an hour if attacked by modern guns and projectiles. They are re-enforced, however, by earthworks, with the very best of artillery. Swedish guns rank among the highest, and several Swedish patents in ordnance have been already adopted by the fortification board of the United States. All the harbors are protected by torpedoes, and Stockholm is absolutely impregnable from the sea, being situated upon a fiord or bay that cannot be entered except through passages that are narrow and easily defended.

When a screen in a room has caused callers to wonder what is concealed behind it, it has served its entire purpose.—Atchison Globe.