been totally annihilated. The true difference in the mean time between the two points has not yet been fully announced.—*Scientific American*

—*Warmth From The Stars*—It would scarcely be thought by most persons that the stars supply the earth with an appreciable amount of heat.

Even on the darkest and clearest night, when the whole heavens seem lit up by a multitude of sparkling orbs, the idea of heat is not suggested by their, splendour. It will therefore, seem surprising to many that men of science should assign no inconsiderable portion of our terrestrial heat-upply to those distant twinkling lamps. It is not many years since Professor Hopkins, of Cambrige, went even farther, and expressed his belief that if the earth's atmosphere were but increased some 13,000 yards in height, so as to have an increased power of retaining the warmth poured upon it from outer space, we might do without the sun altogether so far as our heat-supply is concerned. As a glass house collects the sun's heat and renders it available during the time that the sun is below the horizon so he held that the additional layer of air would serve to garner the warmth of the stars in quantities sufficient for all our requiments.

But until lately all these views, however plausible they might have seemed, had not been founded upon facts actually observed. It has been reserved for these days in which discoveries of the most unexpected kind are daily rewarding the labours of our physicists, to see that established as a certainty which had before been founded merely upon considerations of probability. Mr. Huggins, the physicist and astronomer, has just published the results of a series of inquiries addressed to the actual measurement of the heat which we receive from the leading brilliants of the nocturnal sky. The instrument called the galvanometer, which has been made more or less familiar to many of us by the researches and lectures of Mr. Tyndal, was made use of by Mr. Huggins in these investigations.

We need not consider the construction of this instrument, or the manner in which heat acts upon it through the agency of what is called the thermo-electric pile; all that is necessary to be known is the fact that the qualities of the instrument as a measurer of delicate heat-effects, are thoroughly established, so that no doubt can exist as to the significance of its indications. The instrument was fixed to Mr. Huggins's large refractor, so that the image of a star formed by the 8-inch object-glass might fall upon the surface of the thermopile. It will give some token of the care required in researches of the sort to mention that the apparatus had to be left attached to the telescope for hours, sometimes for days, until the needle whose motions mark the action of heat had come to perfect rest. When the time came for making an observation, the shutter of the dome which covers the telescope was opened, and the telescope was turned upon a part of the sky near to some bright star, but not actually upon the star when the needle was watched to determine whether the change of position had produced any effect. For clearly it is necessary, in a case of this sort, to see that no cause except the one to be examined is exercising any influence. If in four or five minutes, no signs of change were shown, the telescope was moved over the small distance necessary to bring the image of the star directly on the face of the pole. Almost always, the needle began to move as soon as the image of the star fell upon it. The telescope was then moved slightly away again from the star; the needle was then seen to return to its place. In this way, from twelve to twenty observations would be made upon the same star, so that no doubt might remain as to the motion of the needle being really due to the star

In this way it was found that the bright Arcturus moved the needle three degrees in about a quarter of an hour. So did Regulus, the leading brilliant of Leo, the constellation at present adorned by the splendour of ruddy Mars. Pollux gave a deflection of 1¼ degree; but, singularly enough, his twin brother Castor produced no effect at all upon the needle. The splendid Sirius gave a deflection of only two degrees: but as the star is always low down, and so shines through a greater proportion of the denser atmospheric strata, it is not surprising that its heat should not be proportioned to its brillancy.

These inquiries are singularly interesting, the more so when we remember that the full moon, which outshines so many fold the stellar glories of the heavens, gives us either no warmth whatever, or so little that no experiments have ever certified us that we receive any from her. Mr. Huggins has tried the moon with his powerful galvanometer, with results which are not by any means satisfactory or accordant, but which are sufficient to show that we receive scarcely a trace of heat from the pale faced orb.—*Express.*

—*Comets' Tails.*— Theories by scores, and wild enough to make a philosopher's hair stand on end, have been proposed to account for the formation of comets' tails. Herschels, and Airys are pestered with them, whenever a bearded star makes its appearance; and almost invariably the proposers are in a state of utter ignorance regarding the working of physical laws. It will be a treat to the astronomers to discuss a hypothesis which, if it should not eventually prove true, is at least philosophical, and based upon data acquired by experiment. Professor Tyndall has developed a cometary theory out of his late researches upon the actinic power of light. It will be remembered, says *Once a Week*, that he has found that a beam of light is capable of forming a bright glowing cloud in its course through a space containing a modicum of vapour, the said cloud being first reduced by the chemical action of the light, and then rendered visible by illumination of the condensed particles.

The application of this principle to the explanation of cometary phenomena is as follows:— A comet is held to be a mass of vapour decomposable by the solar light, the visible head and tail being an actinic cloud resulting from such decomposition. The tail is not matter projected from the head, but matter precipitated on the solar beams which traverse the cometary atmosphere; nothing being carried from the comet to form the tail, but something being deposited from the interplanetary space through which the body is coursing. But this explanation supposes that the sunlight has a different power when it has passed through a vapoury comet to that which it possesses when it has traversed no such medium; otherwise all space would be lit up like a comet's tail. To account for such a peculiar property, Professor Tyndall assumes that the sun's heating and chemical powers are antagonistic, and that the calorific rays are absorbed more copiously by the head and nucleus than the actinic rays. This augments the *relative* superiority of the actinic rays behind the head and nucleus, and enables them to bring down the cloud which constitutes the tail. Thus the caudal appendage is in a perpetual state of renovation as the comet moves through space; the old tails being dissipated by the solar heat as soon as they cease to be screened by the nucleus. Nearly all the phenomena observed in those mysterious bodies are accounted for by Dr. Tyndall. One, however, he has not mentioned: I allude to the peculiar luminous envelopes, familiar to comet-gazers, which surround the nucleus like a series of cloudy glass cases. No theory can be called complete which does not account for those remarkable and evidently important features.

—*Absorption of Light by the Air.*— Professor H. Wild has continued his interesting investigations upon this subject in Germany, and the conclusion at which he has arrived is highly remarkable. The *Scientific Review* states, he finds that dry air is rather more transparent than damp air, though common observation of the clearness of the atmosphere after a shower, or in dry weather without fog would induce a contrary belief. He gives for the coefficient of dry air, quite exempt from dust in suspension, and seen through thickness of one meter at 10° C., and 719 millimètres of pressure $a=0.99178$. In air likewise deprived of dust, at 13° C. and 719 m. m. pressure, but saturated with damp, $a=0.99030$. It is therefore evident that in ordinary circumstances, dust in suspension in the air diminishes its transparency in a very marked manner, and that if the atmosphere appears more transparent after a shower, it is because it is cleansed of this dust, and not, as some have thought, because it is saturated with damp.

Professor Tyndall delivered his fourth lecture on "Light." last week, at the Royal Institution. He said that the fluid luminiferous ether was the principle of light and heat. Of the seven colours composing the solar spectrum, red was the warmest, and violet the coldest. Red was the slowest of all in producing impressions on the vision, and violet the swiftest. The eye as an optical instrument was useless—it was the brain which formed the vision. Magnesium light could be made capable in its intensity of setting fire to the whole of the metropolis; it would reduce to ashes instantly all substances exposed to its foci, yet it had no injurious effect upon the human eye. Any individual primitive colour was capable of counteracting the light of the other and had the greatest sympathy with substances of its own hue.

—The Royal Geographical Society has given graceful testimony to the value of Mrs. Somerville's labour in the field of Science, by awarding to her the Victoria Medal of the Society, for her Treatise on Physical Geography.

—*Padre Secchi,*—It is announced that P. Secchi intends to sum up, in a work which is already announced, his latest discoveries with regard to the spots on the sun. The conclusions of the learned Jesuit are, that the maximum appearance of the number of spots occurs once in nearly every ten years; that the spots are cavities filled with heavy metallic vapors forming the solar atmosphere; that the quality of these substances being the same as that of the general mass of the more subtle atmosphere which we see above on a level with the cavities, the difference of appearance proves the diversity of density; that the most brilliant photosphere is composed of matter held in suspension in the gaseous solar atmosphere, in a state of precipitation, solid or liquid, as we see vapor remain suspended in the air; that the degrees of luminous intensity, observed in different regions, of the spots and their nuclei, can be explained by the greater or less number of the strata of vapor, which lie one above the other at different heights.

—*The Age of Writings in Common Ink*—Mr. F. Carré has communicated to the French Academy remarks on an approximate determination of the age of writing made with ink having like those in common use an iron base. He says, that writing, eight or ten years old may be copied with an ordinary press, if the copying paper is moistened with water to which one twelfth of hydrochloric has been added.

In this case the copying is almost as easy, as when it is done upon fresh writing in the usual way. The facility of the copying process diminishes