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PUBLISHERS' NOTICE.

New subscriptions to the SCIENTIFIC AMERICAN and the SCIENTIFIC AMERICAN SUPPLEMENT will, for the present, be entered upon our books to commence with the year, and the back numbers will be sent to each new subscriber unless a request to the contrary accompanies the order.

Instead of a notice being printed on the wrapper, announcing reached subscription is about to end, the time of expiration is subscriber in the printed address each week, so that the subscriber may see when the period for which he has prepaid is about to expire.

SCIENCE PROPHESIES THE FUTURE OF THE RACE.

M. Alphonse de Candolles is to be credited with the strikingly original idea of applying the principle of the Darwinian theory to determine, not the past, but the future of the human race. That principle he defines as "the forced adaptation of organized beings to surrounding circumstances of every kind, the result of which is that the modifications preserved are sometimes good, sometimes bad, that is, according to our human conception of what is good or bad." Reasoning from the truths determined as to the past history of the world as demonstrated by geology, and from the known records of the origin and progress, extinction or growth, of the various types of mankind which have existed or now exist upon the earth, he deduces a logical conception of life on our planet centuries hence.

The argument presented is based on these premises; first, that organized beings endowed with will and the faculty of locomotion always seek to adapt themselves to their environment, and none do so more effectually than man, because of his superior intelligence. Secondly, that those individuals least able thus to accommodate themselves are most likely to perish, and hence populations are principally recruited by individuals that possess the qualities best adapted to the circumstances of the country and the age in which they live. Thirdly, that the violent contests between nations and individuals accelerate modifications and adaptations to new circumstances. It will be evident that, in considering the subject, two possible conditions of the race at once present themselves, or rather two questions are before us to answer: What will be the state of mankind one thousand years hence, during which period it is reasonably certain that the physical conditions which affect the species will remain stable? And what will be the state of mankind several hundred thousand years in the future, when vast cosmical changes may possibly have occurred?

The period of one thousand years is an extremely short one in the earth's history. We have historic documents dating even further back; and since their origin, no material change in climate has taken place, nor have the configurations of the globe altered. The supposition of a continuation of present physical conditions during several generations of man is thus presumable; and such being the case, two phenomena may be foreseen, namely: The land will be more thickly inhabited, for everywhere the population is increasing and seeking new places of abode; and as a consequence, there will be more frequent mingling of races. Conformably to the doctrines of natural selection and survival of the fittest, the weaker races must then either be destroyed or absorbed by the stronger ones. This is already taking place with the Indians, the Australians, the Hottentots, and other aboriginal tribes. There are three great races, however, endowed with admirable qualities for invasion, which will mix with the inferior races more or less, according to circumstances. These are the white race, represented by the Europeans and their American descendants, the yellow race or Chinese and Japanese, and the negroes. The whites have the advantage of intelligence and ability to bear cold climates; but they cannot endure tropical heats. Negroes possess physical vigor; but as regards bearing cold and heat, they are the reverse of the whites. The Chinese can exist in all latitudes, but they lack courage and progressiveness. The mingling of the three races will therefore never be complete; and although, ten centuries hence, hybrid peoples of every degree will be found in Africa, in China, and in the north of Europe and America, the primitive races will predominate.

Before the far more remote period designated in the second question shall arrive, great changes may, as we have already intimated, occur. The entire habitable surface of the globe may be altered by the depressions and elevations of its surface, constantly, though slowly, in progress. New diseases may sweep off whole nations, or the race itself. The accumulation of ice at the poles may produce changes in winds, in currents, eventually in climate; and another glacial period may supervene, the effect of which would be to drive all organized beings toward the equator; and this change in habitation would result in the extinction of many species. Our entire solar system is moving with great rapidity in a certain direction. It may enter a warmer or colder part of the Universe, or the sun may blaze up and be destroyed, as did that other sun in the constellation of the Swan quite recently. But setting aside these hypothetical cases, let us see what Science predicts as absolutely certain:

Through the oxidizing action of the air and by human labor, the quantity of metals and coal on the surface of the earth is constantly being diminished. Undoubtedly as this occurs, new ways of working mines to great depth and of utilizing natural metallic oxides will be discovered; but these resources can never be so advantageous as those we now enjoy. As they become rare, so will population diminish and industries decrease; and this result will be the more marked in countries depending upon such resources. We know that the terrestrial surface is constantly diminishing, and elevated regions are being lowered through the incessant action of water, ice, and air. The earthy matter, washed or ground away, is carried to the sea, which is thus filling up. The result, however, will be a total submersion of the land as it now exists, and the destruction of all organized beings which live thereon or in fresh water. But the human species, because of its intelligence, will survive longest; and perhaps the last man will yield up his life on some isolated coral reef in the vast waste of water. Before this extreme period is reached, however, as the treasures of the earth disappear in certain localities, people will seek them elsewhere; and thus the races will congregate in masses on smaller areas of terrestrial surface. This concentration will be enforced by other causes, as, combustibles and metals being scarce, intercommunication will be difficult; through the depression of mountain chains diminishing the condensation of aqueous vapors, now fertile countries will become sterile, and populations will accordingly diminish. Then, as the continents deprived of mountains become partial deserts or archipelagoes, the people will become more and more maritime. They will draw their sustenance from the sea, which will form a barrier to the mingling of races. The whites who will avoid equatorial regions will suffer most from ice invasions from the poles; and the colored races in the central archipelagoes, remaining pure as at present, on account of natural selection during their long isolation, will probably be the survivors of the race.

To recapitulate, M. de Candolles believes that our period and that which will follow for the next thousand years will be characterized by a great increase in population, a mingling of races, and a prosperity more or less marked. Then will probably follow a long period of diminution of population, of separation of the peoples, and of decadence.

A GOOD POLICY.

A very handsome compliment has just been paid to the United States by the Secretary of the Geological Society of Edinburgh, Scotland. Writing under date of January 20, to announce the election of Professor F. V. Hayden as Foreign Corresponding Fellow, the secretary justifies the defence of American science by Dr. Draper (see SCIENTIFIC AMERICAN, page 360, vol. xxxv.) and says: "I am glad to take this opportunity of stating that, in the opinion of myself and my scientific friends in this city, no government in the world equals that of the United States in the liberality, importance, and, I may add, magnificence of its donations to scientific societies throughout the civilized globe. Beside it the liberality of the British Government, even to British societies, sinks into insignificance."

This is as it should be. It is the very best policy of a government like ours to favor Science in every legitimate way. As a people, our indebtedness to Science at home and abroad is simply immeasurable. It has furnished the true basis of our national culture. It has made our agriculture what it is—the source of national wealth and strength. It has enabled us to become the great manufacturing country of the world, and has done more to further the speedy development of our mineral and other material resources than any other agency. We do well therefore to deal liberally with Science at home and to be lavish rather than niggardly in distributing abroad the results of our scientific surveys and experimental investigations.

This policy is particularly worthy of encouragement at this present time. Hitherto no effort has been spared to aid and encourage emigration: with what success and profit may be seen in our rapid increase in wealth and population, and in the rapid conquest of vast areas lately a wilderness, now overspread by fertile farms, dotted with thrifty towns and rising cities, knit together by railways and telegraph lines. The time has come, however, when our need is not so much empty handed emigrants, however stout and willing to work, as men of a higher intellectual and financial grade, men with capital to invest, men capable of taking a more important part in the discovery and development of our material resources. The old world is full of men of this sort, men of culture and enterprise, with money to sustain both, who are on the outlook for opportunities for the exercise of their talents. There is no better way to reach such men, and give them a favorable impression of our country and people, than to be well represented at all the local centers of activity and culture. Our government publications are replete with matter of great interest and value; and it is a wise policy which secures their distribution among the libraries of the world, particularly among those of the scientific societies. There is that scattereth, and yet increaseth: and the converse is equally true, as the same ancient experience discovered. There is that withholdeth more than is meet, but it tendeth to poverty.

It is to be hoped that the ostentatious economy (?) that broke out in Washington awhile ago will pass away before this relatively inexpensive yet profitable policy, in dealing with Science at home and abroad, is completely reversed.

PROTECTION OF BUILDINGS FROM LIGHTNING.

Under this head, the English journals publish an abstract of a paper by Professor J. Clerk-Maxwell, which is likely, on account of the high reputation of its author as a scientist, to disturb the minds of many who have no very clear conception of the nature of electricity. The Professor states first that it appears to him that the extension of a lightning conductor above the highest part of a building, connected at its lower extremity with conducting strata underground, and thus tapping the electricity, is calculated rather to protect the surrounding country, and to relieve the clouds, than to protect the building.

This idea is in direct conflict with experience, which has taught us that buildings protected by well constructed lightning rods are never damaged, but that the surrounding buildings have often been struck; and hence we have the well established maxim that the protecting influence of a lightning rod extends around it in a radius of 50, 100, 150, or more feet, according to the height of the rod, and other incidental circumstances sometimes difficult to define. Whenever a house provided with a lightning rod has been

struck, it has invariably been proved that the rod was in defective condition; and defects in this regard are more common than is generally suspected. Professor Maxwell goes on to state what, according to his ideas, would be required to prevent the possibility of a discharge within a certain region. Take for instance a gunpowder manufactory. He says that it would be sufficient to surround it with conducting material, to coat the roof, walls, and ground floor with thick sheet copper, and make no earth connection. He even proposes to isolate the building and its contents with a layer of asphaltum. He says that if the building were struck it would remain charged, and that a person standing on the ground outside, and touching the wall, might receive a shock, but that no electrical effect would be perceived inside the building. We need hardly say that the execution of such a proposal would be so expensive as to make its practical application objectionable on account of the cost; but we must point out that the arrangement would lack one of the main virtues of a good lightning rod, namely, the gradual and silent discharge of atmospheric electricity, and also that from thunderclouds, thus making explosive discharges less destructive, if not preventing them entirely. It would appear that Professor Maxwell wishes to prevent this discharge, and desires to charge the isolated gunpowder magazine with the electricity of the cloud; but he forgets the vicinity of the conducting earth under the layer of asphaltum. The surface of the earth always becomes charged by induction when an electrically charged cloud is over it; and if, according to Professor Maxwell's proposition, the powder magazine were isolated, and charged from the cloud, it would only serve to make the induced charge of the earth's surface stronger in proportion as the powder magazine is nearer to the earth than to the cloud, of which, electrically speaking, the powder magazine would become a part. If there were no connection between the cloud and the magazine, layers of dry air intervening, the powder magazine, being placed between the negative earth and the positive cloud, would not have its charge equally distributed, but its floor would have an excess of positive electricity, and its roof an excess of comparatively negative electricity. If a better communication, by means of moist air, were established with the cloud, so as to neutralize the negative electricity and charge the whole powder magazine with positive electricity, the danger would be of a different nature. Having the same charge as the cloud, and being, as we have stated, a part of the same, its antagonist is now the earth; and a discharge between the gunpowder mill and the earth, through or along the asphaltum isolater, is now to be feared, changing suddenly the electric condition of the magazine. We ask if this may not be undesirable, or even dangerous? Certainly, if this be considered an open question, it will be more safe not to run the risk.

Professor Maxwell goes further on to state that it is unnecessary to connect large masses of metal, such as engines, tanks, etc., in the building. But if any conductors communicating with outside objects, such as gas or water pipes, telegraph wires, etc., enter, they must be connected. This is a very curious statement. What now becomes of the isolation, on which, according to Professor Maxwell, the safety principally depends? If the gunpowder mill be connected with the earth, it can no more be charged like the cloud, but will, by induction, possess the opposite electricity, and the chances of explosive discharge will be made much greater. The greater or less danger from such explosive discharges depends entirely on the degree of perfection of the ground connections; these may be good enough to draw slowly the negative electricity from the ground, induced by a positively charged cloud floating over the building, which would also charge the building strongly by induction; but these very connections may be utterly inadequate to discharge suddenly a large quantity of electricity flashing from the cloud to the building: in which case the current is not confined to the lightning rod, but takes an additional path, any that it can find, and so does the damage. Professor Clerk-Maxwell says, further, that no telegraph wire from without should be connected with nor enter a powder mill, as it would make the telegraph useless; we would add another important reason—namely, that sparks of atmospheric electricity entering the mill by telegraph wire, as they often do telegraph offices, would be dangerous visitors.

In order to avoid the expense of covering a whole powder mill with sheet copper, the Professor finally suggested surrounding it with a network of copper rods, one fourth of an inch in diameter, the rods passing round the foundation and up each of the corners and gables, and along the ridges. He also proposes to build the copper wire in the wall to prevent theft, and recommends that it be connected with all metals on the outside of the house, such as sheet lead, rainwater pipes, etc., and also with the gas and water pipes in the building; but if these be not present, he says that there is no necessity to take any pains to facilitate an escape of the electricity into the earth; neither is it, he thinks, advisable to erect a tall conductor with a sharp point, to relieve the thunderclouds of their charges.

Now with all respect to Professor Maxwell, we must remark that all this is a mere rehash of a very old discussion on a question which was thoroughly ventilated and disposed of some seventy-five years ago, as will be found on reference to Gilbert's "Annalen der Physie," volumes VIII. and IX., wherein is described a controversy between Professors Wolf, of Hanover, and Reimann. Professor Wolf attacked the then increasing notion that tall conductors with sharp points were needless and even dangerous; the latter defended their use, and attempted to prove their effectiveness on the basis of experience and observation, as well as on theory. In reading over this instructive discussion, we cannot help being struck by the fact that, with all our progress in the science of dynamic electricity, and its applications to telegraphy, electro-plating, artificial light, etc., we know little more of static electricity than we did seventy-five years ago: while our forefathers' heads were clear on the subjects of static and atmospheric electricity, more so than those of our present professors, and much more so than the heads of our modern lightning rod men, who, by their lamentable ignorance, have done much to bring lightning rods into disrepute among many classes.

THE BLUE GLASS DECEPTION.

In our last issue, we reviewed the alleged capabilities of sunlight filtered through blue glass, in causing plants to grow, etc.; and by reference to numerous experiments, we reached the conclusion that the light transmitted through the violet-blue glass is nothing more than normal sunlight diminished in intensity. We propose in the following to finish our discussion by examining into the effects of light and darkness upon organisms. And we may especially here recall the fact that General Pleasonton claims that not only does the blue light stimulate growth, but that it is a positive remedial agent for such severe ailments as spinal meningitis, nervous irritation and exhaustion, rheumatism, hemorrhage of the lungs, deafness, partial paralysis, shock due to severe contusion, and others, of all of which he cites cases.

The theory that various colored lights exercise different effects on the human system is an old one. In 1831, Dr. Newbery of this city asserted that yellow light stimulates the nervous, pink the nutritive, and blue the locomotive temperament; and recently Dr. Ponza, an Italian physician, has asserted that lunatics are greatly affected by being placed in different colored rooms. Red light, Dr. Ponza says, removes feelings of depression, blue induces calmness; and by violet light a crazy person was in one day cured.

It is a thoroughly demonstrated fact that light is an important vital stimulant; and that, if its operation be excluded, the development of the healthy bodily structure is arrested. Naturalists tell us that in the absence of light the transformation of a tadpole into a frog is stopped, and the reptile remains a tadpole. Plants in darkness become blanched and stunted in growth; the process of fixing the carbon in their tissues is arrested, a modification of the coloring principle takes place, and they appear white instead of green. The sad effects of deprivation of sunlight are especially observable among those who live in crowded alleys or cellars, or who work in mines, where the light of the sun seldom or never penetrates. The total exclusion of the sun's beams produces an impoverished and disordered state of the blood, emaciation, muscular debility, and the diseases due to imperfect nutrition.

On the other hand, it is known that for certain purposes darkness or shaded light is advantageous to the bodily condition. Fowls, for instance, may be fattened much more rapidly in the dark, and it would seem that the absence of light exercises a very great influence over the power possessed by food in increasing the size of animals. It likewise seems to exercise a soothing and quieting influence, increasing the disposition of animals to take rest, making less food necessary, and causing them to store up more nutriment in the form of fat and muscle. Now, if the organism to be treated is subjected to light, all of which is filtered through blue violet glass, then, as we have previously demonstrated, it is in light which is considerably shaded. And very probably to this cause—and not at all to the peculiar hue of the light—is to be attributed the quieting influence on nervous and insane people which Dr. Ponza has remarked.

But General Pleasonton does not use blue-violet glass alone. On the contrary, he employs a combination of blue light and pure sunlight, the latter very much preponderating. In his grapery, for example, only every eighth row of panes is blue. The mingled light consequently is merely pure sunlight, very slightly shaded; and the animal or plant exposed simply takes a sun bath—the *solarium* of the ancients, who, knowing the vivifying influence of the sunbeams, had terraces built on the tops of their houses so that they might bask in them. This sun treatment is now frequently recommended by physicians for nervous diseases. Dr. Hammond, in one of his lectures, says: "In convalescence from almost all diseases, it acts, unless too intense or too long-continued, as a most healthful stimulant, both to the nervous and physical systems. * * * The delirium and weakness, by no means seldom met with in convalescents kept in darkness, disappear like magic when the rays of the sun are allowed to enter the chamber."

To recapitulate in brief, General Pleasonton's claims, of any superior powers for blue glass on account of the color which it produces in transmitted light, are, when tested by the result of previous investigations, unfounded. In some instances, where it is desirable to reduce the intensity of the light, blue glass may be used; but any other mode of shading the light, as by ground glass, thin curtains, etc., would without doubt serve equally as well. The cures produced are ascribable to two causes: first, to the healthy influence of the sun bath, and secondly, to the very powerful influence of the patient's imagination. There are abundant cases known where imagination has so powerfully affected the body as to cause death.

Experiments upon criminals have shown that in one instance, where a person was placed in a bed which, he was informed, had just been vacated by a cholera patient (but which had not), he exhibited all the symptoms of that disease. Another person is reported to have shown all the signs of collapse from loss of blood, from the suppositious idea that he was bleeding to death. As regards the animals fattened under the glass, all the circumstances go to show that the result was due to their enforced quiescence, their shelter from the weather, and their free exposure to the sun.

It is hardly necessary to add that in our opinion the use of blue glass, as advocated by General Pleasonton, is devoid of benefit.

HOW WE ARE ABLE TO DO IT.

Hitherto the price of technical publications, especially in the departments of mechanics, engineering, and the chemical arts, has been relatively very high, and for good reasons. The original cost of such matter is usually many times greater than for matter of a purely literary character; the tables and engraved illustrations are expensive; the market for technical works is limited, and their sale for the most part very slow. Consequently it has been impossible for publishers to offer such works at anything like the price at which ordinary works of the same size would afford a profit.

The actual cost of each copy of an edition of a technical treatise may be, say, ten dollars, four fifths of which will have gone for composition, engravings, etc., before the work is put upon the printing press; the other fifth will cover the cost of paper, printing, binding, and the author's pay. If the sale of the work is at all slow or doubtful, the publisher will have to charge from fifteen to twenty dollars a copy to get his money back. But if, instead of an edition of a thousand copies, it is possible to sell promptly ten, twenty, or fifty thousand copies, the cost of each volume will be very materially reduced. While the smaller element of the cost remains substantially unchanged, the larger will be distributed over ten, twenty, or fifty times as many copies, the share for each being proportionately reduced. In other words, the first cost of each copy will be not two dollars *plus* eight dollars, but two dollars *plus* eighty cents, forty cents, twenty cents, or even less, according to the number sold. Hence the publisher can afford to sell the work for very much less than fifteen dollars—perhaps for half what each book would have cost him in an ordinary edition. The same conditions hold good in all cases, whether the first cost be ten dollars or one dollar, the essential factors in determining cheapness being large editions and a ready sale.

Still another and often very important reduction in the cost of printed matter, technical or other, can be effected by choosing a form economical for printing, and a more compact yet still legible type; and by dispensing with cloth or other binding, a further very considerable saving can be made. Given, then, a form of publication like the SCIENTIFIC AMERICAN and a large circulation, it is easily possible to furnish, as we do each year, an amount of valuable and timely matter, many times greater than could be afforded for the money through the usual channels of the trade.

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Thanks to the co-operation of the thousands who subscribe for the SCIENTIFIC AMERICAN and the SUPPLEMENT, we are able to do what many have dreamed of but despaired of accomplishing, and that is to lay before an increasingly intelligent public, valuable scientific matter at a price which rivals that of the cheap story paper. Relatively, the readers of Science are yet few in comparison with those who content themselves with trash; but their number is increasing, and with them the possibility of printing Science for the million at a price within the means of all.

Our readers will bear witness that, from year to year, as the range of scientific readers has widened, there has been a corresponding improvement in the scope and value of the reading matter and illustrations given in this paper. It is our purpose to maintain the same progressive character in the future, giving our readers the full benefit of the cheapening effect of increased circulation by furnishing, so far as possible, more and better matter for the same subscription price. Thus we make it for the personal advantage of each and every reader to do what he can to enlist the interest of other readers.

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We beg to inform our patrons that the Chicago concern has no connection with the SCIENTIFIC AMERICAN or the publishers of this paper.