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## SUNLIGHT AND DISEASE.

By Dr. C. W. SALEEBY.

[A good many readers have suggested to us to publish the lecture which Dr. C. W. Saleeby delivered on February 15th under the auspices of the Nouvelle Société Helvétique and the Swiss Mercantile Society. The lecturer has obligingly placed the following article at our disposal for publication in our columns.—S.O.]

"In the beginning, God said, Let There Be Light." In or before the eighth century B.C., Zoroaster, foremost among many sun-worshippers in many ages, taught the cult of the sun and the green leaf and thrift, in place of pillage and murder. In the beginning of medicine, Hippocrates, practising at Cos in the temples of Esculapius—son of Phœbus Apollo, god of the sun and medicine and music—practised the sun-cure. In the beginning of our era, Galen and Celsus used the sun. In the Dark Ages, by a pitiful misconception, the cult of the sun fell into desuetude as a species of pagan Nature-worship, and ill persons were treated alike in physical and in intellectual night. Tuberculosis and other ills were treated by the Sovereign touch, reputed to cure the "king's evil."

In the second half of the nineteenth century, we find certain heralds of the dawn. In 1856, Florence Nightingale vigorously but vainly protested against the orientation of Netley Hospital, observing that no sunlight could ever enter its wards. In 1876, Sir Benjamin Ward Richardson praised sunlight in his "Hygeia, The City of Health." In 1877, Downes and Blunt showed that sunlight will kill anthrax bacilli. In many writings at this period, John Ruskin upheld sunlight and declaimed against the "plague-cloud" of smoke above our cities. In 1890, Dr. Theobald Adrian Palm (*nat.* 1848), who still practises medicine at Aylesford, in the Garden of England, showed by the geographical method that lack of sunlight is the chief factor in the causation of rickets, and added an admirable series of recommendations accordingly. His paper was entirely ignored, and I found it in America, thanks to an American bibliographer. Robert Koch and others showed that sunlight kills tubercle bacilli. In 1893, Niels Finsen began to cure lupus, a form of cutaneous tuberculosis, by the local use of sunlight, and Sir James Crichton-Browne made observations to the same effect in this country. In 1900, on May 1, the London Hospital began the cure of Lupus by the local use of sunlight, thanks to the really effective Sovereign touch of Queen Alexandra, who was instrumental in bringing her young fellow-countryman's idea from Copenhagen.

In 1903, Dr. A. Rollier opened at Leysin, in the Alpes Vaudoises, the first clinic for the treatment of so-called surgical tuberculosis by sunlight; and in 1910 he applied his idea to prevention by the establishment of the "school in the sun," at Cergnat, just below Leysin. In 1914, he published his book, "La Cure de Soleil," but the world catastrophe of that year caused it to be overlooked. In this country his methods have been followed recently by Sir Henry Gauvain, at the Treloar Hospital at Alton and Hayling Island, where very simple sheds and solarium serve to achieve results never approached by Netley, the pretentious and misplaced architecture of which exists in the same county to point the contrast between its century—the last of the ages of darkness—and the dawn in our own. In a very few other places, also, such as the Queen Mary's Hospital for Children at Carshalton, under Dr. Gordon Pugh—photographs of which from the air show a series of three-sided solariums—leasantly resembling the health temple at Cos,—at Leasowes near Liverpool, at Perrysburg near Buffalo in the United States, and, following a recent lecture of mine, at the Heritage Craft Schools, Chailley, Sussex, the sun-cure is employed. At several others, which I have visited, the sun-cure is said to be employed, but is not, the elements of the matter being unknown to the persons in charge.

The results of heliotherapy, as seen in person, or recorded in Rollier's radiographic and clinical atlas of 1914, or shown by means of illustrations, are unapproached, for certainty, safety, ease, beauty, restoration of function, and happiness during and after treatment. No explanation of them, to be called intelligible or adequate, is offered by any of its practitioners. Being myself without patients or laboratories, I have used only the geographical method, and have found, at each place studied, a tendency to believe that the various factors there present are essential for the results obtained. In the mountains, altitude is insisted upon; at the sea, the argument for "helio-Alpine" is replaced by an argument for "helio-Marine." In high latitudes, the Mediterranean is described as impossible for sun-cure; on visiting the Mediterranean, I found the sun-cure gloriously successful on the French and Italian Riviera, and there are similar reports from Spain. The fundamental bases were lacking for a superlatively successful empirical practice, conducted by various clinicians under widely varying conditions and in ignorance, for the most part, of each other's methods. No rational statement of the scope of heliotherapy could be obtained, some strongly denying, while Rollier strongly

averred, that tuberculosis is amenable to the treatment when it happens to be situated in the lungs, as it is amenable when situated elsewhere. In his volume of 1914, Rollier mentioned certain other conditions besides tuberculosis, such as rickets, a non-bacterial disease, but the only explanation of the sun-cure that he offered was based on the antiseptic action of sunlight, while Gauvain explicitly regarded the sunlight as only an adjuvant in his method.

Clearly the need was for a properly co-ordinated scientific inquiry into the action of sunlight upon the body in health and disease. We were using it as we used digitalis for the heart before pharmacology (to compare a great thing with one relatively trivial); we needed a true physio-pharmacology of this incomparable medicament. My demands (*e.g.* in *Nature*, December 8, 1921, p. 466; January 5, 1922, p. 11) for such an inquiry were met, after six months, by the Medical Research Council, early in 1922, and from the date of the appointment of the Special Committee, under the chairmanship of Sir William Bayliss, a new chapter in clinical and preventive medicine, I believe, will be seen to begin, its provisional opening being the new and largely rewritten translation into English of "La Cure de Soleil," on which I resolved immediately after my first visit to Leysin.

Already we have at least made it clear to all critics that the action is due to the sun's light and not to its heat. So long ago as 1779, Ingenhousz showed that the dissociation of carbon dioxide by the green leaf is due to the sun's light and not to its heat. Yet, in several instances, the sun-cure has been tried, with calamitous results, by clinicians who, making no inquiry into the matter, have exposed the unaccustomed chests of phthisical patients to the mid-day sun, perhaps for an hour or two, with natural results in fever and hæmoptisis. Already, also, the idea that the light is less valuable in killing the infective agent than in raising the bodily resistance to it—an idea to which I invited attention nearly twenty years ago, at the death of Finsen—has come into the clinical mind. Since last August in the Light Department of the London Hospital—which has done such splendid though limited work on the older hypothesis, since 1900—the general light bath has been used as well as the local treatment, and cases which resisted the latter have been completely cured by general exposure of the nude skin to the electric arc lamp, without local irradiation. We must use a combination of light and cold, which I have been commending for some time on the evidence of visits to Canada, where a magnificent childhood, free from rickets, thrives in extreme cold, thanks, as I believe, to a brilliant sun.

In various American laboratories the subject is now being advanced: notably in Columbia University, New York, under Dr. Alfred F. Hess and his fellow-workers. They attribute the major part of the action of the sun to the ultra-violet rays, by which, in experimental animals and also in infants, they are able to cure rickets with great speed, ease, and certainty, and to increase very markedly the phosphorus in the blood of infants on a constant diet. When I saw this experimental and clinical work in New York last December, the result had already been reached of demonstrating an annual curve, from month to month, of phosphorus in the blood of infants, with a maximum in June-July, and a minimum in March, corresponding with the monthly height of the sun in New York. By radiographic study of the bones of infants, it had also been shown that no new cases of rickets occur in New York in June-July, and the maximum number occur in March. Dr. Hess now informs me that the calcium content of the blood follows the same curve as the phosphorus content. Among earlier noted seasonal effects of sunlight, quoted by Hess in his latest paper, are the presence of increased iodine in the thyroid of cattle from June to November, and the greater resistance of guinea-pigs to aceto-nitrile poisoning in summer.

Hess and his workers have also begun the study of various clothing materials in this connection, and find that they vary in their power of permitting or obstructing the action of light. Specimens of a mercerised cotton, one white and the other black, otherwise identical, the former allowing light to act and the latter interfering with it, have been examined by me, and I find no difference, due to the black dye, in the spacing between the fibres of the material. But I understand that the Department of Applied Physiology of the Medical Research Council has found, in a series of observations as yet unpublished, that the biological action of light can be graded by temperature. I am in hope that these specimens of material may be studied by the delicate methods associated with the name of Prof. Leonard Hill, and that it may be found that the black material produces a higher temperature than the white of the subjacent skin, thus prejudicing those unknown and beneficent chemical reactions which appear to need light and cold for their development.

The belief grows upon me that the asserted futility of heliotherapy in phthisis is due to the overheating of the patients in the sun. I think that a new chapter will open in the treatment of that disease when practitioners acquaint themselves with the principles and practice of heliotherapy

before exposing their patients to the sun.

The power of sunlight and of cod-liver oil in rickets has suggested to Prof. Harden that the may cause the skin to produce vitamin A for itself—though no instance of the synthesis of a vitamin by the animal body is known. The most recent work at the Lister Institute shows that light is unable to replace vitamin A completely, but appears to make a small quantity more effective. Miss Coward's work shows that vitamin A is present in the parts of flowers which contain carotin. Sir William Bayliss has suggested to me that the production of this vitamin in green plants is a function of the carotin rather than of chlorophyll, and that probably the carotin acts as a sensitiser for ultra-violet rays. In this connection we must remember that pigmentation of the skin is a marked feature of the sun-cure, and that patients who do not pigment well do not progress well. No one who has seen and touched the typical pigmented skin of a heliotherapeutic patient can doubt that very active chemical processes are there occurring. Perhaps we should regard the skin less as a mere integument than as an organ of internal secretion. The pigmented skin under the sunlight is surely that; and we may ask whether it contributes, as Sheridan Delépine suggested, to the making of hæmoglobin. I owe also to Sir William Bayliss the information that Dr. H. H. Dale, a member of his committee, has shown that smooth muscle can be made to contract by ultra-violet rays.

Aerial and other photographs of Manchester, and the Potteries, and of Sheffield, taken at successive hours on Sunday and Monday, demonstrate the obstruction of sunlight by our urban smoke, the industrial and the domestic chimney being both responsible; but while Sheffield deprives itself of more than half its sunlight, Essen is absolutely smokeless, and Pittsburg, which I have visited for the purposes of this inquiry, has abolished 85% of its smoke. Sections of the lungs of an agricultural labourer and a typical urban inhabitant of our country, the latter being heavily infiltrated with smoke, illustrate a cognate aspect of our subject.

Yet another point is illustrated by recent work of Hess, which shows that the milk of cows fed on pasture in the sunlight maintains the growth and health of young animals, whereas the milk of cows fed in shadow and on vitamin-free fodder will not maintain life. Our children are thus disadvantaged in winter by light-starvation, and by the defect of the milk of light-starved cows.

Photographic study of houses and housing on both sides of the Atlantic illustrates the problem of urban light-starvation. Finding New York smokeless in 1919, I later made investigations with the aid of Dr. Royal S. Copeland, the Health Commissioner of that city, and found that the death-rate from pulmonary tuberculosis had been reduced by one-half in the period, 1905–1919, of the operation of the sanitary regulation against smoke. The restoration of sunlight to our urban lives is the next great task of public health in this country.

"There is no darkness but ignorance," as Shakespeare said. In every sense we need "more light." Then we must apply our knowledge, less for heliotherapy than heliohygiene, until we have banished what I call the diseases of darkness, and it may be said of us that "The people that walked in darkness have seen a great light, and they that dwell in the land of the shadow of death, upon them hath the light shined."

## Notre Croix, bonne à tout faire.

Il y a longtemps que l'on s'occupe de la question de la protection — ou de la profanation — des armoiries nationales. On n'est pas encore parvenu à trouver une combinaison juridique satisfaisant notre amour-propre national et interdisant chez nous et à l'étranger la mercantilisation de la croix blanche sur fond rouge.

On sait que nos armoiries sont surtout employées comme marque de fabrique de produits sanitaires, avant la guerre, les crachoirs des chemins de fer allemands portaient notre emblème national!

Cet emploi mercantile de la croix fédérale, écrit M. P. Grellet dans la "Gazette de Lausanne," est une conséquence indirecte de la fondation de la Croix-Rouge. Tandis que l'emblème de la charité internationale est protégé par la convention du 6 juillet 1906 pour l'amélioration du sort des blessés et des malades de guerre et par sa loi d'application suisse du 14 avril 1910, l'emploi de la croix blanche sur fond rouge est entièrement libre, non seulement à l'étranger, mais aussi dans notre pays.

Une des raisons essentielles de cette protection internationale accordée à la Croix-Rouge provient précisément des abus commerciaux qui en avaient été faits. Privés d'un moyen efficace de réclame, des industriels et des négociants peu scrupuleux se sont avisés de spéculer sur l'ignorance du public étranger en remplaçant tout simplement, sur leurs marchandises ou sur leurs officines, la croix rouge sur fond blanc par la croix blanche sur fond rouge. Le calcul doit être bon, puisque cette duperie leur a été plus belle avec la reprise générale des affaires.

C'est un fait devant lequel l'opinion ne peut rester indifférente. Pour nous, la question est