INAUGURAL ADDRESS OF THE PRESIDENT, THOMAS H. HUXLEY, LL.D., F.R.S., ETC., BEFORE THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

[Concluded from page 225].

To sum up the effect of this long chain of evidence:

It is demonstrable, that a fluid eminently fit for the development of the lowest forms of life, but which contains neither germs nor any protein compound, gives rise to living things in grea abundance, if it is exposed to ordinary air; while no such development takes place if the air with which it is in contact is mechanically freed from the solid particles which ordinarily float in it, and which may be made visible by appropriate means.

It is demonstrable that the great majority of these particles are destructible by heat, and that some of them are germs, or living particles, capable of giving rise to the same forms of life as those which appear when the fluid is exposed to unpurified air.

It is demonstrable that inoculation of the experimental fluid with a drop of liquid known to contain living particles, gives rise to the same phenomena as exposure to unpurified air.

And it is further certain that these living particles are so minute that the assumption of their suspension in ordinary air presents not the slightest difficulty. On the contrary, considering their lightness and the wide diffusion of the organisms which produce them, it is impossible to conceive that they should not be suspended in the atmosphere in myriads.

Thus, the evidence, direct and indirect, in favor of *Biogenesis* for all known forms of life, must, I think, be admitted to be of great weight.

On the other side, the sole assertions worthy of attention are, that hermetically sealed fluids, which have been exposed to great and long continued heat, have sometimes exhibited living forms of low organization when they have been opened.

The first reply that suggests itself is the probability that there must be some error about these experiments, because they are performed on an enormous scale every day, with quite contrary results. Meat, fruits, vegetables, the very materials of the most fermentable and putrescible infusions are preserved to the extent, I suppose I may say, of thousands of tuns every year, by a method which is a mere application of Spallanzani's experiment. The matters to be preserved are well boiled in a tin case provided with a small hole, and this hole is soldered up when all the air in the case has been replaced by steam. By this method they may be kept for years, without putrefying, fermenting, or getting moldy. Now this is not because oxygen is excluded, inasmuch as it is now proved that free oxygen is not necessary for either fermentation or putrefaction. It is not because the tins are exhausted of air, for *Vibriones* and *Bacteria* live, as Pasteur has shown, without air or free oxygen. It is not because the boiled meats or vegetables are not putrescible or fermentable, as those who have had the misfortune to be in a ship supplied with unskillfully closed tins well know. What is it, therefore, but the exclusion of germs? I think that Abiogenesists are bound to answer this question before they ask us to consider new experiments of precisely the same order.

And in the next place if the results of the experiments I refer to are really trustworthy, it by no means follows that Abiogenesis has taken place. The resistance of living matter to heat is known to vary within considerable limits, and to depend, to some extent, upon the chemical and physical qualities of the surrounding medium. But if, in the present state of science, the alternative is offered us, either germs can resist a greater heat than has been supposed, or the molecules of dead matter, for no valid or intelligible reason that is assigned, are able to rearrange themselves into living bodies, exactly such as can be demonstrated to be frequently produced in another way, I cannot understand how choice can be, even for a moment, doubtful.

But though I cannot express this conviction of mine too strongly, I must carefully guard myself against the supposition that I intend to suggest that no such thing as abiogenesis ever has taken place in the past, or ever will take place in the future. With organic chemistry, molecular physics, and physiology yet in their infancy, and every day making prodigious strides, I think it would be the hight of presumption for any man to say that the conditions under which matter assumes the properties we call "vital" may not, some day, be artificially brought together. All I feel justified in affirming is, that I see no reason for believing that the feat has been performed yet.

And, looking back through the prodigious vista of the past, I find no record of the commencement of life, and, therefore, I am devoid of any means of forming a definite conclusion as to the conditions of its appearance. Belief, in the scientific sense of the word, is a serious matter, and needs strong foundations. To say, therefore, in the admitted absence of evidence, that I have any belief as to the mode in which the existing forms of life have originated, would be using words in a wrong sense. But expectation is permissible where belief is not; and if it were given me to look beyond the abyss of geologically recorded time to the still more remote period when the earth was passing through physical and chemical conditions, which it can no more see again than a man can recall his infancy, I should expect to be a witness of the evolution of living protoplasm from not living matter. I should expect to see it appear under forms of great simplicity, endowed, like existing fungi, with the power of determining the formation of new protoplasm from such matters as ammonium carbonates, oxalates, and tartrates, alkaline and earthy phosphates, and water, without the aid of light. That is the expectation to which analogical reasoning leads me; but I beg you once more to recollect that I have no right to call my opinion anything but an act of philosophical faith.

So much for the history of the progress of Redi's great doctrine of Biogenesis, which appears to me, with the limitations I have expressed, to be victorious along the whole line at the present day.

As regards the second problem offered to us by Redi, whether Xenogenesis obtains, side by side with Homogenesis; whether, that is, there exist not only the ordinary living things, giving rise to offspring which run through the same cycle as themselves, but also others, producing offspring which are of a totally different character from themselves, the researches of two centuries have led to a different result. That the grubs found in galls are no product of the plants on which the galls grow, but are the result of the introduction of the eggs of insects into the substance of these plants, was made out by Vallisnieri, Reaumur, and others, before the end of the first half of the eighteenth century. The tape-worms, bladder-worms, and flukes continued to be a stronghold of the advocates of Xenogenesis for a much longer period. Indeed, it is only within the last thirty years that the splendid patience of Von Siebold, Van Beneden, Leuckart, Küchenmeister, and other helminthologists, has succeeded in tracing every such parasite, often through the strangest wanderings and metamorphoses, to an egg derived from a parent actually or potentially like itself; and the tendency of inquiries elsewhere has been in the same direction. A plant may throw off bulbs, but these, sooner or later, give rise to seeds or spores, which develop into the original form.

A polype may give rise to Medusæ, or a pluteus to an Echinoderm, but the Medusa and the Echinoderm give rise to eggs which produce polypes or plutei, and they are therefore only stages in the cycle of life of the species.

But if we turn to pathology it offers us some remarkable approximations to true Xenogenesis.

As I have already mentioned, it has been known since the time of Vallisnieri and of Reaumur that galls in plants and tumors in cattle are caused by insects which lay their eggs in those parts of the animal or vegetable frame of which these morbid structures are outgrowths. Again, it is a matter of familiar experience to everybody that mere pressure on the skin will give rise to a corn. Now the gall, the tumor, and the corn are parts of the living body, which have become, to a certain degree, independent and distinct organisms. Under the influence of certain external conditions, elements of the body which should have developed in due subordination to its general plan, set up for themselves and apply the nourishment which they receive to their own purposes.

From such innocent productions as corns and warts there are all gradations to the serious tumors which, by their mere size and the mechanical obstruction they cause, destroy the organism out of which they are developed; while, finally, in those terrible structures known as cancers the abnormal growth has acquired powers of reproduction and multiplication, and is only morphologically distinguishable from the parasitic worm, the life of which is neither more nor less closely bound up with that of the infested organism.

If there were a kind of diseased structure, the histological elements of which were capable of maintaining a separate and independent existence out of the body, it seems to me that the shadowy boundary between morbid growth and Xenogenesis would be effaced. And I am inclined to think that the progress of discovery has almost brought us to this point already. I have been favored by Mr. Simon with an early copy of the last published of the valuable "Reports on the Public Health," which, in his capacity of their medical officer, he annually presents to the lords of the Privy Council. The appendix to this report contains an introductory essay "On the Intimate Pathology of Contagion," by Dr. Burdon Sanderson, which is one of the clearest, most comprehensive, and well reasoned discussions of a great question which has come under my notice for a long time. I refer you to it for details and for the authorities for the statements I am about to make.

You are familiar with what happens in vaccination. A minute cut is made in the skin, and an infinitesimal quantity of vaccine matter is inserted into the wound. Within a certain time a vesicle appears in the place of the wound, and the fluid which distends this vesicle is vaccine matter, in quantity a hundred or a thousand fold that which was originally inserted. Now, what has taken place in the course of this operation? Has the vaccine matter by its irritative property produced a mere bliste, the fluid of which has the same irritative property? Or does the vaccine matter contain living particles which have grown and multiplied where they have been planted? The observations of M. Chauveau, extended and confirmed by Dr. Anderson himself, appear to leave no doubt upon this head. Experiments, similar in principle to those of Helmholz on fermentation and putrefaction, have proved that the active element in the vaccine lymph is non-diffusible, and consists of minute particles exceeding $\frac{1}{20000}$ of an inch in dimeter, which are made visible in the lymph by the microsope. Similar experiments have proved that two of the most destructive of epizootic diseases, sheep-pox and glanders, ae also dependent for their existence and their propagation upon extremely small living solid particles, to which the title of *microzymes* is applied. An animal suffering under either of these terrible diseases is a source of infection and contagion to others for precisely the same reason as a tub of fermenting beer is capable of propagating its fermentation by "infecion" or "contagion" to fresh wort. In both cases it is the solid living particles which are efficient; the liquid in which they float, and at the expense of which they live, being altogether passive.

Now arises the question, are these microzymes the results of *Homogenesis* or *Xenogenesis*; are they capable, like the *Torulæ* of yeast, of arising only by the development of pre-existing germs, or may they be, like the constituents of the nut gall, the results of a modification and individualization of the tissues of the body in which they are found, resulting from the operation of certain conditions? Are they parasites in the zoological sense, or are they merely what Virchow has called "heterologous growths"? It is obvious that this question has the most profound importance, whether we look at it from a practical or from a theoretical point of view. A parasite may be stamped out by destroying its germs, but a pathological product can only be annihilated by removing the conditions which give rise to it.

It appears to me that this great problem will have to be solved for each zymotic disease separately, for analogy cuts two ways. I have dwelt upon the analogy of pathological modifications, which is in favor of the xenogenetic origin of microzymes; but I must now speak of the equally strong analogies in favor of the origin of such pestiferous particles by the ordinary process of the generation of like from like.

It is, at present, a well established fact that certain diseases, both of plants and animals, which have all the characters of contagious and infectious epidemics, are caused by minute organisms. The smut of wheat is a well known instance of such a disease, and it cannot be doubted that the grape disease and the potato disease fall under the same category. Among animals insects are wonderfully liable to the ravages of contagious and infectious diseases caused by microscopic *Fungi*.

In autumn it is not uncommon to see flies motionless upon a window pane, with a sort of magic circle in white drawn round them. On microscopic examination the magic circle is found to consist of innumerable spores, which have been thrown off in all directions by a minute fungus called *Empusa muscæ*, the spore-forming filaments of which stand out like a pile of velvet from the body of the fly. These spore-forming filaments are connected with others which fill the interior of the fly's body like so much fine wool, having eaten away and destroyed the creature's viscera. This is the full-grown condition of the *Empusa*. If traced back to its earlier stages in flies which are still active and to all appearance healthy, it is found to exist in the form of minute corpuscles which float in the blood of the fly. These multiply and lengthen into filaments, at the expense of the fly's substance; and when they have at last killed the patient, they grow out of its body, and give off spores. Healthy flies shut up with diseased ones catch this mortal disease and perish like the others. A most competent observer, M. Cohn, who studied the development of the *Empusa* in the fly very carefully, was utterly unable to discover in what manner the smallest germs of the *Empusa* got into the fly. The spores could not be made to give rise to such germs by cultivation; nor were such germs discoverable in the air or in the food of the fly. It looked exceedingly like a case of Abiogenesis, or, at any rate, of Xenogenesis; and it is only quite recently that the real course of events has been made out. It has been ascertained that when one of the spores falls upon the body of a fly it begins to germinate, and sends out a process which bores its way through the fly's skin; this, having reached the interior cavities of its body, gives off the minute floating corpuscles which are the earliest stage of the *Empusa*. The disease is "contagious," because a healthy fly coming in contact with a diseased one, from which the spore bearing filaments protrude, is pretty sure to carry off a spore or two. It is "infectious," because the spores become scattered about all sorts of matter in the neighborhood of the slain flies.

The silkworm has long been known to be subject to a very fatal contagious and infectious disease called the *Muscardine*. Audouin transmitted it by inoculation. This disease is entirely due to the development of a fungus *Botrytis Bassiana*, in the body of the caterpillar; and its contagiousness and infectiousness are accounted for in the same way as those of the fly disease. But of late years a still more serious epizootic has appeared among the silkworms; and I may mention a few facts which will give you some conception of the gravity of the injury which it has inflicted on France alone.

The production of silk has been, for centuries, an important branch of industry in Southern France, and in the year 1853 it had attained such a magnitude that the annual produce of the French sericulture was estimated to amount to a tenth of that of the whole world, and represented a money value of 117,000,000 of francs, or nearly five millions sterling. What may be the sum which would represent the money value of all the industries connected with the working up of the raw silk thus produced is more than I can pretend to estimate. Suffice it to say that the city of Lyons is built upon French silk, as much as Manchester was upon American cotton before the civil war.

Silkworms are liable to many diseases; and even before 1853, a peculiar epizootic, frequently accompanied by the appearance of dark spots upon the skin (whence the name of Pébrine" which it has received), had been noted for its mortality. But, in the years following 1853 this malady broke out with such extreme violence that in 1856 the silk crop was reduced to a third of the amount which it had reached in 1853; and, up till within the last year or two it has never attained half the yield of 1853. This means not only that the great number of people engaged in silk growing are some thirty millions sterling poorer than they might have been; it means not only that high prices have had to be paid for imported silkworm eggs, and that, after investing his money in them, in paying for mulberry leaves and for attendance, the cultivator has constantly seen his silkworms perish and himself plunged in ruin—but it means that the looms of Lyons have lacked employment, and that for years enforced idleness and misery have been the portion of a vast population which in former days was industrious and well to do.

In 1858 the gravity of the situation caused the French Academy of Sciences to appoint commissioners, of whom a distinguished naturalist, M. de Quatrefages, was one, to inquire into the nature of this disease, and, if possible, to devise some means of staying the plague. In reading the report, made by M. de Quatrefages, in 1859, it is exceedingly interesting to observe that his elaborate study of the Pébrine forced the conviction upon his mind that, in its mode of occurrence and propagation, the disease of the silkworm is, in every respect, comparable to the cholera among mankind. But it differs from the cholera, and, so far, is a more formidable disease in being hereditary, and in being, under some circumstances, contagious as well as infectious.

The Italian naturalist, Filippi, discovered in the blood of the silkworms affected by this strange disease a multitude of cylindrical corpuscles, each about $\frac{1}{1000}$ of an inch long. These have been carefully studied by Lebert, and named by him *Panhistophyton;* for the reason that, in subjects in which the disease is strongly developed, the corpuscles swarm in every tissue and organ of the body, and even pass into the undeveloped eggs of the female moth. But are these corpuscles causes or mere concomitants of the disease? Some naturalists took one view and some another; and it was not until the French Government, alarmed by the continued ravages of the malady, and the inefficiency of the remedies which had been suggested, despatched M. Pasteur to study it, that the question received its final settlement, at a great sacrifice, not only of the time and peace of mind of that eminent philosopher, but, I regret to have to add, of his health.

But the sacrifice has not been in vain. It is now certain that this devastating, cholera-like Pébrine is the effect of the growth and multiplication of the *Panhistophyton* in the silkworm. It is contagious and infectious, because the corpuscles of the *Panhistophyton* pass away from the bodies of the diseased caterpillars, directly or indirectly, to the alimentary canal of healthy silkworms in their neighborhood; it is hereditary, because the corpuscles enter into the eggs while they are being formed, and, consequently are carried within them when they are laid; and for this reason, also, it presents the very singular peculiarity of being inherited only on the mother's side. There is not a single one of all the apparently capricious and unaccountable phenomena presented by the Pébrine but has received its explanation from the fact that the disease is the result of the presence of the microscopic organism, *Panhistophyton.*

Such being the facts with respect to the Pébrine, what are the indications as to the method of preventing it? It is obvious that this depends upon the way in which the *Panhistophyton* is generated. If it may be generated by Abiogenesis or by Xenogenesis within the silkworm or its moth, the extirpation of the disease must depend upon the prevention of the occurrence of the conditions under which this generation takes place. But if, on the other hand, the *Panhistophyton* is an independent organism, which is no more generated by the silkworm than the mistletoe is generated by the oak or the apple-tree on which it grows, though it may need the silkworm for its development, in the same way as the mistletoe needs the tree, then the indications are totally different. The sole thing to be done is to get rid of and keep away the germs of the *Panhistophyton.* As might be imagined from the course of his previous investigations, M. Pasteur was led to believe that the latter was the right theory; and, guided by that theory, he has devised a method of extirpating the disease which has proved to be completely successful wherever it has been properly carried out.

There can be no reason, then, for doubting that, among insects, contagious and infectious diseases of great malignity are caused by minute organisms which are produced from pre-existing germs, or by Homogenesis; and there is no reason that I know of for believing that what happens in insects may not take place in the highest animals. Indeed, there is already strong evidence that some diseases of an extremely malignant and fatal character to which man is subject are as much the work of minute organisms as is the Pébrine. I refer, for this evidence, to the very striking facts adduced by Professor Lister in his various well known publications on the antiseptic method of treatment. It seems to me impossible to rise from the perusal of those publications without a strong conviction that the lamentable mortality which so frequently dogs the footsteps of the most skillful operator, and those deadly consequences of wounds and injuries which seem to haunt the very walls of great hospitals, and are, even now, destroying more men than die of bullet or bayonet, are due to the importation of minute organisms into wounds, and their increase and multiplication, and that the surgeon who saves most lives will be he who best works out the practical consequences of the hypothesis of Redi.

I commenced this address by asking you to follow me in an attempt to trace the path which has been followed by a scientific idea in its long and slow progress from the position of a probable hypothesis to that of an established law of nature. Our survey has not taken us into very attractive regions; it has lain, chiefly, in a land flowing with the abominable, and peopled with mere grubs and moldiness. And it may be imagined with what smiles and shrugs practical and serious cotemporaries of Redi and of Spallanzani may have commented on the waste of their high abilities in toiling at the solution of problems which, though curious enough in themselves, could be of no conceivable utility to mankind.

Nevertheless, you will have observed that, before we had traveled very far upon our road, there appeared, on the right hand and on the left, fields laden with a harvest of golden grain, immediately convertible into those things which the most sordidly practical of men will admit to have value—viz., money and life.

The direct loss to France caused by the Pebrine in seventeen years cannot be estimated at less than fifty millions sterling; and if we add to this what Redi's idea, in Pasteur's hands, has done for the wine grower and the vinegar maker, and try to capitalize its value, we shall find that it will go a long way towards repairing the money losses caused by the frightful and calamitous war of this autumn.

And, as to the equivalent of Redi's thought in life, how can we over-estimate the value of that knowledge of the nature of epidemic and epizootic diseases, and, consequently, of the means of checking or eradicating them, the dawn of which has assuredly commenced?

Looking back no further than ten years it is possible to select three (1863, 1864, and 1869) in which the total number of deaths from scarlet fever alone amounted to 90,000. That is the return of killed, the maimed and disabled being left out of sight. Why, it is to be hoped that the list of killed in the present bloodiest of all wars will not amount to more than this! But the facts which I have placed before you must leave the least sanguine without a doubt that the nature and the causes of this scourge will one day be as well understood as those of the Pébrine are now, and that the long-suffered massacre of our innocents will come to an end.

And thus mankind will have one more admonition that "the people perish for lack of knowledge;" and that the alleviation of the miseries and the promotion of the welfare of men must be sought, by those who will not lose their pains, in that diligent, patient, loving study of all the multitudinous aspects of nature, the results of which constitute exact knowledge or science.

It is the justification and the glory of this great meeting that it is gathered together for no other object than the advancement of the moiety of science which deals with those phenomena of nature which we call physical. May its endeavors be crowned with a full measure of success!

COSTUME AND ART.

[From The Building News.]

Costume may be usefully divided into *three* kinds or modes of clothing the "naked animal man." The first may be typified by the old Greek dress, where the evident object was to hide the figure as little as possible, *i.e.*, to so clothe and fit the human frame as not to hide or smother, but to show the form. The next other mode was the precise reverse of this, and was well typified in the magnificent costume of the ancient Mede, in whom the whole figure was clothed in flowing drapery, the object being to exhibit the splendor of the dress, and to add to the dignified presence of the wearer by its shape and folds. These two modes of dress may be said to represent the two opposite ways of clothing the human form, both equally good in their way, and obviously equally suitable for different people and avocations. It must be observed in passing that under these two heads there are a vast number of costumes and modes of dress all the world over, and in all ages, which will equally well typify the two systems; and a work of no small interest might be written on the subject if thus simply divided. The third mode we would venture to call the mode of *quaint* costume—the word quaint being used for want of a better. It may be represented by the dress of the Japanese, where the object would seem to be neither of the two above mentioned—neither to show the form of the wearer nor the grace of the dress, nor even folds of drapery, but simply to cover the body with some quaint device, almost like the strange figures on a common playing card. It is, perhaps, the very strangest costume that was ever invented by man; the patterns, the colors, and the odd cut of the several parts making up a gorgeous show, not a little strange and quaint, and unlike everything else. There are, under this head, too, a number of different costumes from different countries and in different ages; and much of the costume of the middle ages is of this type, and has come down to us in the glass painting in the windows of cathedrals and on the walls of churches. To this class of dress belongs that of the end of the last century and of the days of Hogarth, where a sort of odd quaintness redeemed it in a great measure from contempt. Indeed, as we see it in the paintings and prints of Hogarth, it is impossible not to be struck with its oddity; and the wig and great horseman's coat, long waistcoat, short breeches, and heavily buckled shoes, make up together at least an harmonious whole, and the word quaint seems to be the only one which can well characterize it.

It is from this strange idea of a human dress that our modern costume of to-day comes by regular descent; and it of right must come under the same general heading, for it certainly does not belong to the Greek idea of dress, nor to the Median robe order of costume, nor, indeed, if the truth must be told, to the quaint, but is truly a thing by itself. It is simply the very stupdest thing ever yet invented by the ingenuity or perverseress of man. It comes under neither of those two leading principles which should regulate all costume, viz., either to show the form and actions of the human frame, or to exhibit the form and folds of the dress with which it is clothed; or, to go to the third and only other way, to show mere "quaintness," as we have ventured to call it, where neither of the two first requirements of dress are aimed at. It would seem, indeed, absolutely impossible to conceive anything more ungainly and inconvenient than the present system of modern fashionable male attire—the "sustained splendor" of Mr. Disraeli—for it does not allow of the form to be seen; it is nothing in itself, there being no folds or drapery, and there is in it no sort of quaint interest to make up in any way for the loss of the two prime ideas in all dress. To confine our remarks to the ordinary fashionable male costume, we may take it for granted that the dress-up of a smart waiter at a big hotel or club may be taken as fairly typical of it. The arms and legs of the old Greek were left bare, for not living under Mr. Gladstone's rule they knew nothing of the "anthropomorphic element" in fine art: so that when they wanted to draw the human arm they were content, poor, simple, ignorant souls, to look at one, and the old Greek dress allowed of it. In our improved modern system of clothing, this it is clear cannot be done, for the climate, it will be urged, compels the covering of legs and arms. Be it so. Neither, again, does the form of the dress allow of the dress to show itself, and to become a thing of beauty *per se*, or even one of convenience; for what can possibly be more ugly or awkward than the semi-tight fitting sleeve of a common coat, or the still worse and more fashionable trousers? Quaintness will not surely be charged upon them, so that neither form, comeliness, nor oddity belongs to it or to them, and certainly not mere and simple utility. Fashion does all the work.

It would be useless to go into the merits of the world-renowned swallow-tailed coat—that pride of the smart waiter, and last hope of those who glory in being dressed. Of its convenience or beauty, no one perhaps did ever yet boast, any more than they have done or do of the tight-fitting boot or tall chimney-pot and so dearly fashionable hat. They are all things which the tyrant fashion compels everybody to wear and to be perpetually inconvenienced by. It really all seems to be typical of the art of the time of this latter part of the nineteenth century, when all real and genuine art has disappeared and given place to machinery and manufacture. It would be impossible to sink lower than we now are sunk in this country—at least, in all matters appertaining to art, whether high or low; and one means of rescuing things from this most deplorable state would be, as we take it, some improvement, or say merely change, in costume; and it would seem that the only channel through which any such change or improvement is at all likely or possible is in that of our army, and in the dress and appointments of soldiers.

The tremendous and disastrous failure of that gallant and so perpetually victorious army of France has been so sudden and unexpected that no man has had time to think anything about it, or how it has ever come to pass that so magnificent a body could have suffered and lost as they have done. May it be allowed us in this place to suggest *one* cause of it—the excessive neatness, primness, and fit of the clothes of the men; everything bran new, and of the brightest and gayest colors. The man was lost in his smart tailoring. The course of the war has been so rapid that there has been no time for any one to grow shabby enough to work, or do anything, or to think of his own personal and bodily self. In the old Italian wars of the first Napoleon, the soldier wore off the smartness of his smart attire before he found himself on the battle-field, was ready for work, and thought of himself and not of his dainty clothing—all so tight, and awkward, and inconvenient, and unfit for its stern purpose. What more important subject, then, can there be than that of art combined with utility in costume, more especially in the dress of the soldier? In it most surely there ought to be combined the two prime requisites—utility and convenience, and ease of movement with sightliness and artistic beauty, and appropriateness and harmony of colors. Cobden used to say that the French were so artistic a nation, and so clever in making the most of what other people would despise and throw away as useless, that they levied a sort of tax on the whole world in the matter of setting the fashions and showing the rest of the world how to make a dress, and then how to wear it after it was made; not, by the way, so easy a feat as one might be disposed to think; but it is to be feared that they have paid a fearful price for their artistic superiority, for what with this world-taxing smart dressing and Hyde Park generalship, the nation itself is all but well nigh lost, and their Emperor quite. It cannot be amiss, therefore, to draw attention to the art of costume, and to the best possible way in which the human body may be clothed so as not to impede its movements, and yet that this costume shall be at the same time beautiful in form and harmonious in color. In military dress these two principles are fundamental requisites, as no soldier will be, or ought to be, satisfied unless he looks like a soldier. The old Greek went out to battle with his limbs as free as possible, and with a dress allowing of the utmost ease and freedom of action and movement; and may it not be a good and useful question, in case of any radical change of costume, either in the regular army or in the volunteer force, or in the formation of any new regiment, to depart a little from the conventional and fashionable type of clothing, and aim at something better and more workable and appropriate? Humanity itself is, as things now are, absolutely blotted out by the unsightly costume it is compelled to wear; and pictorial art is impossible all the time there are no living exemplars to keep the artist's eye and hand to the work he has to do. In either of the three systems of costume-making we have named there is to be found abundance of precedent and examples to go by; and the difficulty, if any there be, will be in the number, and not in the paucity of examples. Of course it will be understood that all that has been said of a required change in military costume applies equally—nay more—to civil costume; and it is in the hope of seeing some speedy change in the dress of the soldier, now generally admitted as desirable, that these few hints on the subject of costume, and the need of beauty and harmony in it, have been written.

BRONZING COPPER URNS.—The surface, first made thoroughly clean and bright, is covered with a thick coat of rouge and water; when dry, the article is placed in a clear hollow fire (say a chamber of bricks, red hot) for a short time until the rouge has turned to the desired shade of color. Then the article is placed on a suitable stand, and polished with a soft brush and rouge powder and afterwards with soft leather. The tinning and soldering are subsequent operations.