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The SCIENTIFIC AMERICAN SUPPLEMENT, we would here take occasion to state, was started, as its prospectus intimated, partly as an experiment, and without definite intention on the part of the publishers regarding its continuance after the present Centennial year.

Those who have taken the papers through newsdealers are recommended to continue to do so, and those in the habit of procuring their papers weekly from the stands will find them there as of old; and those who neither subscribe for nor buy the SCIENTIFIC AMERICAN nor its SUPPLEMENT may peruse them both on file in any working men's reading room in the country, or in the library of any institution of learning in the world.

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PROSPECTS OF AERONAUTICS.

Though failure more or less signal and complete has been the fate of every attempt thus far made to navigate the air by mechanical devices, the problem has by no means been given up as hopeless. Better still, sufficient progress has been made of late toward a right understanding of the conditions and requirements of flight to justify the belief that the obstacles to be overcome are purely mechanical, and sure, sooner or later, to be successfully surmounted.

The problems to be solved before aerial navigation takes its place among human achievements are consequently these two—the invention of an apparatus to accomplish the work of the bird's wings and tail, and an engine capable of developing great power with comparatively little weight of machinery and fuel.

It is quite possible that aerial rafts, supported by balloons, may sometimes be useful in regions favored with winds which blow steadily in a fixed direction for months at a time; but in ordinary climates, they cannot but be as useless for commercial purposes as log rafts in a sea everywhere as vexed by conflicting currents as Hell Gate was in its worst days.

After many experiments and no small amount of costly investigation, the Aeronautical Society of Great Britain, so long presided over by the Duke of Argyll, has pronounced decisively against the balloon as incapable of being made useful for the purpose of locomotion, except in the way of waftage; and in a recent report, the secretary of the society declares that the sole improvement of which the balloon is

capable is the invention of some means to secure its ascent and descent without the expenditure of gas or ballast.

Suppose we have, for example, a balloon so weighted that it would float on the discharge of 35 lbs. of ballast, or on receiving an additional thousand cubic feet of gas. It is plain that, if some mechanical means (say a screw acting vertically) were added, capable of exerting a lifting force of 35 lbs. more than its own weight—a light two horse power would drive it—the voyager would be able to rise without discharging ballast, or sink without discharging gas; and so be able to avoid obstacles while drifting over the surface, or to rise above adverse currents to such as might be more favorable.

But for the purposes of real aerial navigation, such drifting is wholly inadequate. The work to be accomplished is not the floating of a relatively light body in more or less favorable air currents, but the propulsion of a heavy body with a force sufficient to overcome all aerial resistance, and with velocity enough to make the inevitable driftage relatively unimportant.

This has not yet been achieved, though the efforts toward it have shown some very encouraging results. Certain experiments made at the expense of the Aeronautical Society, to determine the exact lifting pressure of air currents against a plane inclined at different angles, obtained results which are especially promising. The plane used was a steel plate a foot square, and the substitute for wind or the resistance, occasioned by the passage of a body at high speed through the air, was the blast of a powerful fan blower. Placed at right angles to this blast, the pressure on the plate was 3 1/2 lbs., indicating a wind velocity of about twenty-five miles an hour. Inclined at an angle of 15°, the plate received a direct pressure of only one third of a pound, while the lifting pressure amounted to 1 1/2 lbs. In other words, a plane of 1 square foot, held at an angle of 15° against a current of air having the velocity of twenty-five miles an hour, will carry four times as much weight as it meets resistance. A less angle than 15° could not be tried, owing to some obstruction to the action of the apparatus. The experiments showed, however, that the ratio of the lift to the thrust greatly increased as the inclination of the plane diminished, and also that the lifting power of the current, per square foot of plane, increased with the extension of the sustaining surface, probably on the same principle that makes a large sail on a ship so much more efficient than an equal area of small sails.

The chief thing that remains to be done for the successful solution of the problem of flight is therefore this: To drive a sufficiently broad-bottomed car, say from forty to sixty miles an hour, by means of apparatus acting on the air. With this velocity the resistance of the air would support the car, at the cost of a relatively small part of the driving force. A number of experiments have been made in this direction, perhaps the nearest to success being one in which a small engine drove a plane, carrying, with its weight, a load of 214 lbs. around a circular course (planked) at the rate of twelve miles an hour, by means of two wheels working in air and having a driving surface of 60 square feet. A speed three times as great would have been required to lift the apparatus from the ground.

Other experiments have shown that, by direct acting vertical screws, a constant force of three horse power will support 100 lbs.; and inasmuch as a one horse power engine has been made weighing no more than 13 lbs., the possibility of an engine's lifting itself in that way is clear. In another experiment made to ascertain what lifting power could be got from planes moving in horizontal orbits, an engine weighing 186 lbs. was prove capable, under very unfavorable conditions, of lifting itself with 40 lbs. additional weight.

If the results obtained by the fan blast and inclined plane are to be depended on, an engine used for propulsion ought to succeed even better than those employed direct in lifting.

ENGLISH DEALINGS WITH FOOD ADULTERATIONS.

If there is any one subject on which the British public is extremely sensitive, it is the quality and purity of its food and drink. No country, we believe, has such stringent legislative enactments against adulterations; and the legal formalities for their enforcement are made so few and simple that the aggrieved consumers now waste no time in vain denunciations, but summon the offending grocer or butterman forthwith before the nearest magistrate to answer for the fraud.

An excellent instance, showing how persistently warfare against spurious materials is waged, is found in attacks now being made in England on artificial butter. It is a well known fact that, until recently, attempts to produce even a moderately palatable artificial butter have failed; and although the product has been made of fair savor while fresh, a day or two's keeping has turned it into mere tallow. In England, however, the fraud has not ended at this. Conscienceless individuals have sold as butter, it is said, horrible concoctions of old lubricating tallow, and even old tallow candles minus the wicks, which an official analyst describes as "supplied to the poor in the last stages of rottenness." One factory was detected making this delectable product at the rate of two tons a day. This and many other like cases being well known, it is but natural that the British public should cordially detest "grease butter." The London Grocer has lately printed long reports of trials of sellers of the adulterated material; and to show how rigidly the penalties against the adulterations are enforced, we note that a retailer who purchased grease butter, innocently supposing it to be genuine cream butter, and who sold it to a customer as

the latter, was nevertheless fined \$50, and further proceedings were ordered to be taken against the wholesale merchant from whom he obtained his supply.

We have frequently remarked this same severe dealing in England with every other species of food fraud. At the same time, no one need remain in ignorance as to what constitutes fraud, because the parliamentary reports on the subject, even in respect to tobacco and other unnecessary luxuries not classified as food, contain reliable and full information relating thereto. The whole matter is a suggestive one for us in this country. Here a prosecution of a retailer by a private citizen, because of the former selling  $\frac{1}{4}$  lb. of grease for 1 lb. genuine butter, as in the above cited instance, would be considered extraordinary. Our main reliance for protection is in the vigilance of health boards, whose jurisdiction is local and limited in authority. Hence, in most cities, we may look in vain for either frequent prosecutions or reports of adulterations prepared under official auspices, although the possibility of such reports being compiled is plainly indicated by the admirable yearly work of the Massachusetts State Board of Health. Reports, however, can merely warn us of evils in the shape of food adulterations, under which we shall probably continue to suffer until penalties are enforced, as rigidly here as they are in England, against each and every retailer who wittingly or unwittingly sells a spurious article.

#### WHAT NEW YORK MIGHT DO WITH THE GREAT FRENCH STATUE.

Some time ago a number of enthusiastic Frenchmen, admirers of the United States, conceived the idea of presenting some monument to the people of this country, in commemoration of the ancient friendship of the two republics. Meetings were held in Paris, a subscription list was opened, and finally it was decided that the monument should be an immense statue, over 200 feet high, to be erected on Bedloe's Island, New York Harbor. The design is "Liberty Illuminating the World;" and in harmony therewith, the hand of the figure holds a torch with a gilded flame, while at night a halo of electric light surrounds the head, so that the statue becomes a lighthouse. M. Bartholdi, a celebrated French sculptor, was commissioned to execute the work, and his operations have progressed as far as the completion of one hand and fore arm, at present erected in the Centennial grounds. Now, however, there is a hitch in the money matter; and unless the citizens of New York manifest a greater interest in the enterprise than they have hitherto done, it is feared that the project will meet the fate of the proposed colossal Washington monument, the corner stone of which was laid by Governor Young, in this city with impressive ceremonies some thirty years ago, but of which even the site is almost forgotten. It appears that it has been left to the people of New York to erect the pedestal and also to pay part of the expense of making the statue; but probably for the reasons that our harbor is already brilliantly lighted, and that a statue for ornamental purposes is not particularly needed among the shipping, and that the sum to be subscribed is quite large, our citizens have thus far failed to respond to the call upon their purses. Meanwhile, in Philadelphia it has been proposed that, if New York thus virtually declines the gift, Philadelphia shall secure it for her inland harbor.

We are not among those who favor letting the project die or be transferred to our sister city for want of pecuniary help here, first, in consideration of the donors' munificence, and second, because New York is rather deficient in works of art, and therefore the more we can get of them the better. We think, however, that a much superior site to the low-lying island might be selected, and that, if a proper situation were chosen, our citizens would view the matter much more favorably. Our idea is that the Battery is the place for the statue, and we would erect it there in lieu of on the place assigned to it.

#### AMMONIUMNITRODIPHENYLAMIN.

This remarkable compound, the chemical name of which is rather long, but scientifically correct, is manufactured in Switzerland; and it was, in the year 1874, introduced into trade, for dyeing silk and wool with a most magnificent orange color. But it produced the most alarming poisonous symptoms among the workmen who handled it; the use was therefore soon discontinued, and the manufacture abandoned. Dr. C. A. Martins, director of the Berlin anilin manufactory, found that the poisonous properties were not constantly inherent in the pure article, and that they were due either to impurities or to certain methods of manufacture; and he succeeded in making a harmless ammoniumhexanitrodiphenylamid, which is now sold under the more convenient name of aurantia. The longer name is, however, the proper one, as it gives the chemical composition and derivation, which, for the benefit of non-chemical readers, we will now explain.

Amin is a derivation of ammonium, the formula of the latter being  $NH_3$ , while that of amin is  $NH_2$ . This base, combined with phenylic acid, or rather with phenyl alcohol,  $C_6H_5(OH)$ , forms phenylamin,  $C_6H_5(NH_2)$ , which is sold under the name of anilin,  $C_6H_5N$ . Diphenylamin contains two molecules of phenyl, and is represented by the formula  $2(C_6H_5)(NH_2)$ . Nitro-diphenylamin is a combination of the latter substance (as a base) with nitric acid, the formula being  $N O_2, 2(C_6H_5)(NH_2)$ . *Hexa* means six; and six molecules of nitric acid can be combined with the base, as the latter is a hexad, with the formula:  $6(N O_2)2(C_6H_5)(NH_2)$ . This is the hexanitrodiphenylamin; and finally, this substance being an acid salt, it is neutralized with ammonium, making an ammoniumnitrodiphenylamin, of which the for-

mula is  $NH_3, 6(N O_2)2(C_6H_5)(NH_2)$ , which is equivalent by contraction to  $C_{12}H_{12}O_{12}N_8$ , the formula for aurantia.

The latter formula only shows the ultimate sum total of atoms, and not the nature of the compound, which is shown in the former formulæ: but it is well known that the same number of atoms can be combined in various ways, producing compounds of the same ultimate composition, although they differ in all their chemical and physical properties, so that the simplest formulæ cannot always be trusted as the true one.

We give these details to show to the uninitiated that the apparently unnecessary long chemical names, often used in these days, are not a mere fancy of the chemists, but are based on elementary principles, combined according to a well considered practical system

#### SILENCE AND HASTE AT DINNER.

There is probably not one among the readers of this paper who would not assent to the general proposition that habitual haste in eating is hurtful to digestion. Everybody knows that food hurriedly eaten is very likely to be insufficiently masticated, and not properly mixed with those salivary secretions which are essential to the perfect digestion of many kinds of food, particularly breadstuffs and other starchy preparations. Everybody knows, further, that food hastily swallowed is very apt to carry with it more air than is good for the stomach. Each bolus fills the bore of the œsophagus, and pushes before it all the air that tube contains; the successive charges fill the stomach to distention, often paralyzing its action for a time, and always favoring fermentation of the food rather than its proper solution. All this, and much more of equal physiological importance, is well known to every intelligent reader, and we may safely assume that all our readers belong to that class.

It is therefore no easy task which a fair correspondent has set us in a well written communication just received. The gentlemen of her family, she tells us, have long been subscribers to the SCIENTIFIC AMERICAN, and they hold its utterances in high esteem. Consequently she appeals to us to read them a lesson on the evils of hasty eating, hoping that our advice will be heeded, to the benefit of their health and the material enhancement of her enjoyment of the dinner hour.

She writes: "It has become the custom of our gentlemen to devour a newspaper with their breakfast, which, being light, we must permit; but when the meal of the day, dinner, is eaten, it is surely as unwholesome as it is disagreeable to all present to have the head of the house sit with absorbed look, eating as if for a wager, and impatiently watching the servant hand around and clear away the dishes. I am one of five suffering wives, who never eat our dinner without feeling that we are taking time from some business which our husbands long to return to. We have therefore resolved to appeal to you to address from your editorial chair these men who are seeking dyspepsia and making our tempers sour by the trying ordeal of dinner."

If any word of ours could arrest so suicidal a course on the part of any of our readers, our petitioners may be sure that it would be spoken with all emphasis. But here's the rub: the evil complained of is in many cases one of habit, and not amenable to correction through reason; in more cases, probably, it is one of necessity, under conditions for which the offender is not morally responsible; very rarely, we fear, is it the result of deficient or defective information. And since we know nothing of the circumstances of the present case, any suggestion we may make must necessarily be of the most general character, as likely to miss as to hit.

For example, we might enlarge upon the horrors of dyspepsia, its disastrous influence upon character, its power to acidify and eclipse all the sweetness and light of living, even where it does not put an end to life outright: only to receive the crushing reply from five, or five thousand, suffering husbands: "We know all that, probably as well as you do. But how can we help ourselves? If we were independent of the duties and responsibilities of active life, we might, and certainly would, very gladly eat our dinners with leisurely enjoyment; but the demand upon our time and thoughts are such that we cannot do as we would; we are parts of a great machine, and are driven to sacrifice our pleasure, our health, may be: and possibly, what we regret still more, the good temper of our wives, because of the rights and requirements of those with whom we have to do business."

This is very largely the case where dinner is eaten before the day's work is done. And when it comes in the evening, physical fatigue and nervous exhaustion from the conflicts of the day are not unseldom equally fatal to the social enjoyment of dinner. It is easy to say that men should lay aside their business schemes and anxieties at such a time, and we admit that it is both the moral and the physiological duty of men to try to do so: still men, as a rule, have not yet reached a stage of moral development at which duty perceived is equivalent to duty done. When the penalty for wrong-doing is apt to be indefinitely deferred, as in the case of silent and hasty eating, and when the reward for right-doing is not always immediately apparent, right-doing is likely to depend upon incidental conditions; and here the truth compels us to observe that the ladies are often quite as much to blame as the gentlemen for the unsocial and unsanitary habits of eating which the latter so frequently acquire.

For our own part, we approve of the morning paper at breakfast. Generally it is the only means of securing deliberate eating at that hour. It is easy enough for those who have little to do to enjoy a social breakfast at ten or eleven o'clock in the morning; but earlier—and especially if the bat-

tle of business is to follow at once—humanity is not social, and conversation, except with regard to the morning's news, is all but impossible. The morning paper therefore is in most cases not only a sanitary brake upon the jaws at breakfast, but a real blessing to the family as well as to the reader's stomach.

At the midday meal, business is pressing and time brief. As a rule, whatever a business man eats at such a time must be taken hurriedly. The effect is bad, it is true: but it is a choice of evils, either to eat quickly or go without. For this reason it is, whenever possible, the custom to take the main meal of the day after the business hours are over. It is with reference to this meal, we take it, that the just protest against haste and silence has been uttered.

The pestilent heresy, moral as well as sanitary, that it is unbecoming an immortal being to enjoy his dinner is well nigh extinct; we trust the once prevalent insanity of self-immolation upon the altar of business push and worry is also dying out. Active men are learning that the human machine can be run to death; that moderation pays best in the long run; and that no time is more wickedly wasted than that which is unduly saved (?) from the hours of rest and recreation—including in the latter the dinner hour. In the scientific code of conduct, deliberate and enjoyable eating is one of the fundamental virtues. It ranks with justice in the moral code. It is a virtue, too, which can be, and ought to be, cultivated by all, most of all by those who are doing the world's best work.

But, generally speaking, it is a virtue, the cultivation of which calls for effort on the part of the ladies as well as self-restraint on the part of the gentlemen. No sensible man will willingly hurry through a meal when he is keenly enjoying the food and its accompaniments; and it depends chiefly upon the ladies to secure such conditions at the family table. How they can do so, it is not for us to say. There can be no general rule for their attainment any more than a single specific for all diseases. The special conditions and requirements of each household and the idiosyncrasies of its members must chiefly determine the course to be pursued.

There is one point, however, a very important point, which ladies very often overlook. It is this: Civilization and hunger are incompatible. All the virtues and graces of humanity—certainly of male humanity—fly before an empty stomach. It may be possible for a man to be hungry and amiable at the same time, but it is not safe for any wife to presume upon so unlikely an occurrence habitually. Ignorance of their physiological truth has been the ruin of many an otherwise happy household. And we may set it down from both observations and experiences—premising that our experience in this respect has been exceptionally happy—that prepaudial discretion is the severest test of a good wife. Just before dinner is the worst possible time to bother a husband with questions or complaints, or even with efforts to be aggressively agreeable. There is the time above all others when social silence should grace the home, and make it seem to the tired man the most delightful and restful place on earth. Half an hour of quiet just then is the best possible preparation for the social enjoyment of the coming meal, for then the nervous tension and mental strain of business care and anxiety can be gradually relaxed, and the entire system brought into conditions for enjoying food and the amenities of social life. Yet how frequently does the wife choose that particular time to speak of her own trials and troubles, the misconduct of servants or children, the petty requirements of the household, or other things trivial or disagreeable, and then marvel that her husband's temper is not so sweet as it ought to be! The offense is worse even than introduction of such topics at meal time.

Another physiological fact is often overlooked by well meaning wives who have to complain of the husband's haste or taciturnity at table: that is, the softening influence of a little savory and easily assimilated food to begin with, something calculated to allay the irritating cravings of hunger while stimulating the appetite: this especially when the gentlemen are mentally or physically exhausted by the labors of the day. At such times soup is even more conducive to sociability than wine.

This is perhaps not at all what our correspondent asked for, still it seems to us the most practicable way to cure the evil complained of. The kindness, tact, and skill of the ladies before and during dinner can, in our opinion, do infinitely more to correct their husbands' unphysiological habits in eating than any amount of scientific disquisition. Let the ladies recognize the physiological conditions of the offence and the offenders, and—while trying to prevent or correct them—study to make the dinner hour so agreeable that their husbands will not be in haste to have it over, and the desired reform will most probably come as a natural consequence, if any reform is possible.

**HOT WATERPROOF CEMENT.**—The following is a valuable cement which, if properly applied, will be insoluble even in boiling water: Gelatin, 5 parts; soluble acid chromate of lime, 1 part. Cover the broken edges with this, press lightly together, and expose to the sunlight: the effect of the latter being to render the compound insoluble.

**A HARMLESS glaze for earthenware,** destined to replace the lead glazes hitherto employed, has lately been devised by M. Constantin. One recipe is 100 parts silicate of soda, 15 powdered quartz, and 25 Meudon chalk. Another is the same with the addition of 10 parts of borax. The articles glazed can be colored by copper for green, and manganese for brown.