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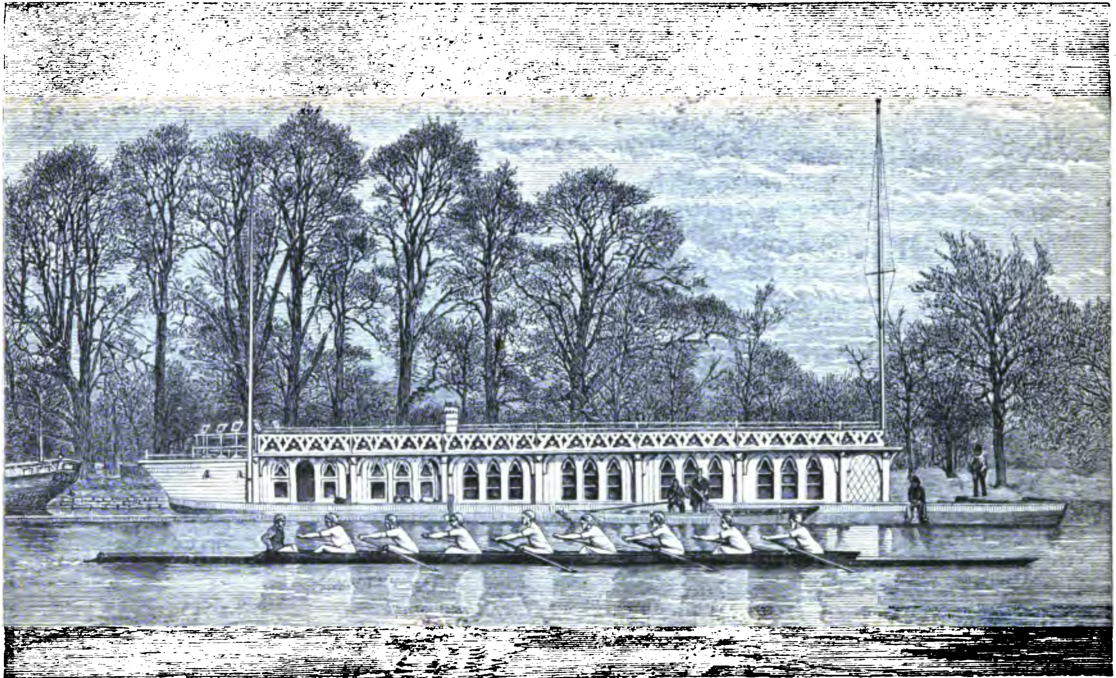

Drawn on wood by A. Mac Donald. *Photographed by Hills and Saunders.*

THE UNIVERSITY EIGHT, OXFORD, 1866.

TRAINING,

IN

THEORY AND PRACTICE.

BY

ARCHIBALD MACLAREN.

SECOND AND ENLARGED EDITION,

WITH ILLUSTRATIONS.

London:

MACMILLAN AND CO.

1874.

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PREFACE.

SINCE the first publication of this treatise some important changes have taken place in Training: many of the points at that time recommended are being adopted, many of the customs then condemned are being abandoned, and altogether a more rational and common-sense view of the subject is being gradually entertained. The nature and the *modus operandi* of the several agents of health are now freely discussed; the value of fresh air and the plentiful use of fresh water is on all hands admitted; adequate ventilation in bed-rooms and sitting-rooms is, as a rule, provided; and the morning ablution is as regular as the morning meal. The mischievous habit of amateur physicking is being abandoned, and the dangerous custom of forced perspirations, undertaken to exorcise the demons of 'internal fat' and 'loose flesh,' may be said to be discarded. In diet also valuable improvements are being made; the importance of vegetables as an ingredient in wholesome diet is acknowledged, and greater variety in animal food is allowed. Indeed the subject of diet might now, comparatively speaking, be considered satisfactory, were it not for the fanciful importance with which certain articles of food are still invested,—the virtues which some are supposed to possess, and the evils which are supposed to lurk in others. Misconceptions on this, as on other subjects, have often an influence beyond that with which they are directly connected; and so long as men believe that the qualities which they covet are to be obtained from mere dietary regulations, they will neglect the real agencies which can alone bestow them. This is emphatically the case in the present instance; Exercise, the one agent which gives, which *can* give, these qualities,—both from its own nature and from the influence which it exerts upon all the other agents of health,—is in a great measure neglected, nay avoided, and to the imaginary virtues of Diet men look for the longed-for acquisitions. They have yet to learn, they have yet to know, and to themselves realise, that power of muscle in trunk and limb, that freedom and capacity of heart and lung, that energy, stamina, strength and endurance are not to be obtained from what they *eat* but from what they *do*.

That this point also will soon be understood and fully acted on I have neither doubt nor fear.

In the present edition I have added a Practical

Course of Training for the several kinds of boat-races practised at the university, giving detailed directions for Exercise, Diet, Bathing, &c., from day to day for the whole course laid down; and also some remarks on the disputed question of the dangers of boat-racing to University crews.

A valuable paper in the Appendix on the subject of the Sliding Seat, contributed by the Rev. T. H. T. Hopkins, M.A., Magdalen College, Oxford, will be read with interest by rowing men. The illustrations shewing the difference in action and position of the stroke in rowing with the fixed and sliding seats, are taken from photographs from the life, and drawn on wood by Mr. A. Macdonald of the University School of Art.

I have also to tender my sincere thanks to the Press for the invaluable assistance which it has given me in this work.

ARCHIBALD MACLAREN.

THE GYMNASIUM, OXFORD,

February 1, 1874.

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TRAINING,

IN THEORY AND PRACTICE.

IN writing on the subject of Training, I propose to select one single exercise with which to connect my remarks, and to limit these in a great measure to the mode in which that exercise is practised at our Universities and Public Schools. I do so for two reasons: first, because it will enable me to keep together my observations upon each separate part of the subject; and, secondly, because the principles of Training, as a system of bodily preparation for special exertion, are the same for all exercises, differing only in the mode of their application. Even this difference of application is virtually limited to the administration of but one of the agents of health—Exercise; and this chiefly because it is capable of being locally as well as generally applied, all the other agents being addressed to the whole body, and with the view of promoting the strength of all the bodily powers.

For this purpose I select ROWING, as, in my

2t

opinion, the exercise most susceptible of being influenced by a judicious system of bodily preparation; being at once an art of considerable intricacy, demanding long and assiduous practice; and an exercise of considerable difficulty, involving the possession—although not in an equal degree—of both muscular and respiratory power, to promote which is the object of all training.

PART I.

Rowing is the chief of all our Recreative Exercises; no other can enter the lists against it; in fact it has collected and concentrated in itself all the attractions and all the emulative distinctions of all others: just as the boat-race admits of more amicable rivalry and friendly competition than all our other national pastimes put together. The *physique* of the men forming the crews; their enthusiasm, so generous and so contagious; the crowds of spectators who go to witness the races with enthusiasm no less strong, and certainly no less demonstrative, than that of the rowers; the flag distinctions, colours and costumes; the barges, music, and the beautiful river itself, all tend to give an *éclat*, an importance, to this exercise, unapproached by any other, and to give to it the first place in the front rank of Recreative Exercises.

The numbers who come down to the river-side, to witness the sport in the summer evenings, testify to the extent to which the enjoyment is shared; and there is not a man on river-bank or barge whose eye does not kindle, nor a lady whose cheek does not mantle up, when the hoarse continuous roar comes on and on, and the crowd sways to and fro, and the boats rush by.

To the spectators it is all enjoyment, while seen and when remembered, without alloy, drawback, or danger. Is it less so to the actors in the scene? There are a hundred and fifty oars flashing through the water, worked by as many pairs of hands, aye, and by as many pairs of lungs too, and by as many throbbing hearts; and the excitement that stirs the crowd, and sends the blood tingling to the finger-ends, is shared by the rowers as they sit straining at the oars. Is it all as well with the actors as with the spectators of the scene? Has the work no draw-back or alloy for them[1]?

Rowing-men have thoughtfully asked themselves the same question, and practically have answered it. They have seen the drawback, have in a great measure comprehended its nature; and without laying claim to special scientific knowledge on the subject, and guided mainly by the observation of results, they have organized a protective code of rules and regulations, in spirit well planned to meet the ends

[1] See Part IV, page 162.

desired; and where failing, failing from the over-zeal which has carried certain details to extremes. This code is embodied in the word TRAINING.

To the question 'What is Training, and what is it meant to do?' I would answer, 'It is to put the body, with extreme and exceptional care, under the influence of all the agents which promote its health and strength, in order to enable it to meet extreme and exceptional demands upon its energies.'

The ordinary agents of health are Exercise, Diet, Sleep, Air, Bathing, and Clothing. I put them here in the order of their importance, as I conceive, to rowing men. I propose to examine each of these agents somewhat in detail, and from two different points of view. First, as to the manner in which it is, or should be, administered under ordinary circumstances; and, secondly, in what manner and to what extent this mode of administration is, or should be, altered for purposes of training, according to the preceding definition of the term.

First, then, what is Exercise? We have some notion of what Food is, and of the manner in which it nourishes and sustains the body; we see it, and taste it, and swallow it, and we feel even while doing so that it is essential to life and health and strength. We need no reminder of the necessity for Air, we experience this every moment of our lives, and our senses take note of its purity or impurity, delighting in the one and loathing the other;

just as other senses delight in or reject articles of food: and, indeed, air is food in the highest sense of the word. Nightly we feel that Sleep is a necessity also to life and health; and if the precise nature of its action and influence are unknown, the results are so evident that its value is never questioned. The same may be said of Bathing, as a cleanser and bracer of the skin, stimulating it to functional vigour, and relieving it of a burden which we feel creates discomfort. And we all know how Clothing affects health by preventing the too rapid escape from the body, into the surrounding atmosphere, of the heat which it has generated; or by excluding from it external heat when in excess of its requirements. But what does Exercise do towards the life, health, and strength of the body? How do lifting and carrying, pushing and pulling, running and jumping, do us good? In fine, what is Exercise? what does it do? and how does it do it?

Exercise may be defined as *muscular movement*[1]; indeed, every motion of the living organism is produced by muscular contraction. This property of contractility, with which muscular fibre is endowed, and which, so far as we know, is shared by no other

[1] Muscle is *flesh;* or what in animals is called *meat.* It may seem unnecessary to state this, but it is with me a matter of daily occurrence to hear men talking of such and such an one, who 'has not an ounce of flesh upon him—nothing but muscle;' or, 'he must get rid of all his spare flesh;' or, 'he must sweat down all his superfluous flesh;' 'work off all his loose flesh,' &c.—A. M.

constituent of the body, is to some extent described in the term, being the power of *contracting* or shortening the space between its two extremities [1].

The entire muscular system has been primarily divided into *voluntary* and *involuntary* muscles. The first, comprising all those which are subject to the will, form the bulk of the muscular system. They are mainly distributed over the framework of the bones, their office being to move the part or parts to which they are attached. The second comprise those over which the will has little or no control, but which are stimulated to action by some other agency, each muscle or class of muscles having its proper stimulus; these are placed chiefly within the cavities of the body, and are employed in the vital processes of respiration, digestion, circulation, &c. It is with the voluntary muscles that we have now particularly to deal.

Exercise I have defined as muscular movement, but it must be movement of force sufficient to engage the energetic contraction of the muscles employed. Here we are touching upon the most important principle in the entire subject under consideration, namely, the destruction and renovation of the tissues of the body, which it is the object of Exercise to accomplish.

Our material frame is composed of innumerable atoms, and each separate and individual atom has

[1] See Appendix M.

its birth, life, and death, and then its removal from 'the place of the living.' Thus there is going on a continuous process of decay and death among the individual atoms which make up each tissue. Each atom preserves its vitality for a limited space only, is then separated from the tissue of which it has formed a part, and is resolved into its inorganic elements, to be in due course eliminated from the body by the organs of excretion. These processes are greatly influenced by the activity of the bodily functions. Every operation of the muscles or nerves involves the disintegration and death of a certain part of their substance. We cannot lift a finger, we cannot perform the slightest movement, without causing a change in certain of the atoms which compose the muscles executing the movement, in those of the nerves conveying the stimulus which directed them to contract, or in those composing the nerve centres in which the stimulus originates; and this change involves their decay and death.

The loss then of the body, and of each part of the body, being in relation to its activity, a second process is necessary to replace the loss, otherwise it would rapidly diminish in size and strength, and life itself would shortly cease. This reparative process is performed by the Nutritive System, the organs of which convert our food into blood—liquid flesh (*chair coulante*) as it has been called—which in itself contains, and in its never-ending circulation bears to each tissue, the material for the replacement of all waste and for the building up of all additions. And as this material is borne along through channels permeating every part of the organism, each part, by a law incomprehensible but unerring, selects from it and appropriates that particular *pabulum* which is fit for its special use, and that only. At every point of the human body is this law in unceasing operation—activity, a loss of vital power, disintegration, decay, and removal; to be met by a replacement of substance, and a renewal of vital power. And as the disintegration of any part is hastened by its activity, so by an equally unerring law is the flow of blood, bearing the renewing material, increased in that part; and again by a law equally unerring and ever operative, the worn-out particles are cast into this current in its backward course, and conveyed to organs whose function it is to eliminate them from the body. And during the period of growth, and within certain limits, until the full attainable physical capacity of the individual has been reached, the new will ever exceed the old, so that a gradual increase in bulk and power will be obtained. And the strength of the body as a whole, and of each part of the body individually, is in relation to the frequency with which these atoms are changed; and the strength of the body as a whole, and of each part of the body individually, is thus ever in relation to its *newness*.

Exercise is then the chief agent in the destruction of the tissues, but it is also the chief agent in their renovation, inasmuch as it quickens the circulation of the blood from which the whole body derives its nourishment; the tide on which is brought up all fresh material, and on which is borne away all that is effete and useless; brought up and borne away most rapidly in those parts which are being most energetically employed—where disintegration is most rapidly taking place.

I am here purposely narrowing my subject, and limiting my observations to the process of circulation only as it affects the nutrition of the muscles; but all the systems of the body, and every process connected with its growth and development, or influencing its health or strength, are also proportionately affected by the acceleration of the circulation of the blood by exercise.

But besides muscular movement, true exercise possesses another ingredient, which may be termed *resistance.* The voluntary muscles are made to do more than merely to move the parts to which they are attached. Man is placed on the earth to labour, to toil, to overcome and to remove material obstacles innumerable. Everything which floats upon the ocean or is built upon the land is the work of his hands—in simple fact, has been constructed by the contractions of his voluntary muscles; these muscles were made therefore not merely to enable him to *move*, but to do this and to carry his burden too.

They were made in their action to encounter and overcome *resistance* in every movement; and being created for this, their health and strength will be developed and sustained in proportion to the fidelity with which this their design is remembered and observed. Exercise, which is voluntary labour, must resemble actual labour in all its physical essentials, if it be desired to obtain from it the physical advantages which actual labour bestows; without resistance there can be no full demand for muscular contraction, no full call therefore for material disintegration, no full requirement therefore for material renewal, involving proportionate increase of bulk and power; for, as we have seen, the strength of the body, and of each part of the body, is in relation to its youth or newness [1].

These are the chief essentials of Exercise when viewed in connection with the voluntary muscles; but it is also an essential of true Exercise that the movements of these muscles shall be of speed or force

[1] In a long pedestrian tour, extending over nearly four months, in which the average per day on foot exceeded nine hours, and usually with a knapsack averaging twelve pounds, I found this law of development being in relation to employment strongly demonstrated; and I give the results here in preference to other instances which I could adduce, because they were the results of the mode of exercise most familiar to every one—walking. Thus the chest fell from 41 to 39½ inches, the upper arm from 14½ to 13¾ inches; the lower arm remained unchanged at 12½ inches: the lower limbs on the contrary were vastly increased, the calf of the leg passing from 16 to 17¼ inches, and the thigh from 23½ to 25 inches.—A. M.

sufficient to quicken the breathing; in other words, to increase the action of the *in*voluntary muscles engaged in the processes of respiration and circulation. During active exercise the act of breathing becomes greatly accelerated; each inspiration is larger in volume, and each follows each in quicker succession than when the body is inactive. This is a most important feature of exercise, for with every breath a load of the wasted material of the body is given up by the blood, in the form of carbonic acid, &c., and its place supplied by life-giving oxygen from the surrounding atmosphere. To make this all-important process plainer, let us glance at the mechanical action of breathing.

On the requirement for air, the '*besoin de respirer*,' being experienced, the inspiratory muscles contract and lift the osseous framework of the chest, thus increasing its diameter from side to side and from back to front; while at the same time the large arched muscle (the diaphragm) forming the convex floor of the cavity also contracts, and in doing so its fibres are straightened, and its elevated surface is consequently depressed, increasing the diameter of the chest from above downwards. As this takes place the air rushes down the trachea, or windpipe, and passes at once into the lungs, which it fills out in every direction. But all muscular action is intermittent; the contractile effort accomplished, the reaction begins; the inspiratory muscles relax, and a second set of muscles, the expiratory, antagonizing those which lifted the walls of the cavity, now contract, and the muscles of the abdomen, antagonizing the diaphragm, also contract, and the air is expelled by the aperture through which it entered [1]. This is, in outline, the process of ordinary effortless breathing; but in the forced respiration of energetic exercise, and especially of exercise calling into action the muscles of the upper limbs and the upper region of the trunk, many of the voluntary muscles may also be employed in the process of respiration.

I have stated that the involuntary muscles are prompted to action each by its proper stimulus; and the heart is stimulated by the presence and augmentation of blood within its cavities. Thus, the instant that any act of exercise, such as Rowing, begins, a considerable number of voluntary muscles are put into rapid employment; the contractile action of these muscles impels the blood in their veins onwards towards the heart, venous blood being greatly dependent on muscular action for its circulation; and the heart, stimulated by its presence, energetically contracts, ejecting its contents, and the blood is flushed along the pulmonary artery and distributed throughout its ramifications in the lungs. But the rowing is still going on, stroke following stroke; so wave on wave comes up from the heart, each driving before it its predecessor,—out of the lungs, along the

[1] See Appendix M.

pulmonary veins, back to the heart, where it is again rapidly admitted and as rapidly ejected[1]; for the heart is a double organ, performing the double office of propelling the blood through two distinct channels of circulation; through the one for its aëration in the lungs, through the other, when so aërated, for the nourishment of the whole body. Out of the heart then it is again ejected, out by the great trunk arteries, and along their innumerable branches, to complete the round of the systemic circulation. But neither heart nor lungs, nor vein nor artery, throughout the double circulation, is a *passive* agent in its progress; for though the heart is the great agent of propulsion, the whole circulatory channels possess a certain amount of contractile power, and are endowed with a degree of elasticity, and may in fact, in this respect, be regarded as hollow muscles actively engaged in regulating the moving current within them; and their health and strength, and functional ability, are promoted by the same agencies, as they are subject to the same laws, as those which influence the condition of the rest of the body.

On these two powers, muscular and respiratory, depends the ability to perform all bodily exercise. The first involves the contractile force of the voluntary muscles employed; the second is more compli-

[1] The quantity of blood ejected from the heart of a healthy adult of middle stature, at each propulsion, is estimated at about two ounces.

cated, involving the contractile force of the heart, the condition of the lungs to perform their function, the size and shape of the chamber in which these organs are contained, and the contractile force of the respiratory muscles, voluntary and involuntary.

Such, in brief, is Exercise, such the ends which it accomplishes, and such the manner of their accomplishment; namely, the *destruction* of the tissues, the hastening of the decay and death of every part coming within its influence; but also the speedy removal of all waste, and the hastening forward of fresh material for its replacement; and in doing this it attains three distinct but co-relative results.

1. It increases the size and power of the voluntary muscles employed.

2. It increases the functional capacity of the involuntary muscles employed.

3. It promotes the health and strength of the whole body, by increasing respiration and quickening the general circulation.

This being the nature and these the results of Exercise, in what manner is it administered to a man in training for a boat-race? What exercise does he take?

Imprimis, Rowing.

Let us now examine how the exercise of Rowing acts upon the body, by noting what parts are employed, and the manner of their employment; and how far it promotes the acquisition of the two great requirements for all such efforts—muscular and respiratory power.

Rowing as an art has made great advancement of late years; vast improvements have been made in the build of boats, the construction and disposition of propelling and steering gear, and also, and notably, in the mode of propulsion—in the 'form,' as it is technically called, of the stroke. In the first respect in reducing the weight and bulk of the boat [1], by making the material of which it is constructed as thin and light as possible, and in so fashioning it that the parts submerged shall encounter as little resistance from the water as possible, and the parts above water as little opposition from the air as possible [2]; in the second respect, by a scientific adjustment, on strict mechanical principles, of the shape and proportions of the oar, of its length within and without the rowlock; and of the fashion and disposition of the rowlock itself—the pivot of action of the propelling force; and last, but not least, by an alteration in the mode of executing the stroke; it having been found that a short quick stroke, by which the boat is kept at an almost uniform rate of speed throughout, is a vast saving of propelling power; the

[1] See Appendices N, O, and P.

[2] To such an extent has this been carried, that a sculling-boat now presents little more than a seat for the rower, and a point of attachment for the rowlock; indeed, it can scarcely be said to do even this, for if the rower be of larger proportions than a schoolboy, on each side he will overlap his boat. See Appendix N and P.

difference between this and the old stroke resembling that between an unbroken, even, level run, and a succession of leaps or bounds.

Now I regret to say that every one of these alterations, while it has undoubtedly advanced Rowing as an *art*, has detracted from it as an *exercise*. I shall endeavour to shew presently that everything which tends to make the muscular effort less, while making the respiratory effort greater, has this detracting effect; and the above-mentioned improvements in the art all have this effect in the most direct manner. Thus the weight to be propelled is reduced by the lightening of the boat, the water and atmospheric resistance is reduced by its improved shape and construction, the propelling power is augmented by the out-rigged rowlock; while the old-fashioned long swing of the back is discarded for the new high-pressure stroke, by which its duration is reduced, and by which the pressure on the organs of respiration and circulation is intensified in proportion to its increased rapidity. In fact, a boat-race has now become a matter of wind rather than of muscle, and, as an old waterman at one of our races last year remarked in my hearing, 'The crew that can bucket it the fastest will win the race, *if they don't bu'st.*'

But is not the exercise, the mere muscular exertion of the race, still very great? The exercise in rowing a College race (a short mile) is barely sufficient to keep a healthy man well; it is not sufficient to keep up the condition of a strong one[1]. This is shown to me every year. The best men fall off when the racing, or the exclusive training exercise for the racing, begins; under it a powerful man dwindles; and this, not from 'training down,' as the phrase goes, for the reduction is not in weight only, but in girth and tension and contractility of muscle, and in the stamina which gives endurance of fatigue. I know that this statement will startle some of my readers, but it is capable of proof, as I will endeavour to show presently, when I come to examine in detail the chief characteristics of this exercise, and the parts of the body which receive employment from it.

A little examination will prove, I think, what at first may not have been surmised, that the legs have the largest share of the work in Rowing[2]. For while all other parts employed, back, loins, and arms, act somewhat in detail and in succession, the legs act continuously throughout the stroke, and the individual efforts of each, and the concentrated efforts

[1] Not content, however, with my own observations of results on the men themselves, I have endeavoured to solve the question of the actual amount of force required for the propulsion of an eight-oar at racing speed, first, by theoretical calculation, and secondly, by practical test with the dynamometer. See Appendices B and C.

[2] It will be seen, on reference to Appendix A, that these facts, disputed at the time when first stated, are now admitted, and that the new method of rowing on *sliding seats* still more distinctly and energetically gives the greatest share of work to the lower limbs. —A. M.

of all the other parts of the body employed, are transmitted through them to the point of resistance, the stretcher. No doubt the seat presents a point of resistance during a portion of the effort, especially with men still learning to row, or when rowing within their powers; but the true application of the mechanical force, employed in the propulsion of the boat, is between the water-grip of the blade of the oar and the pressure of the foot against the stretcher on the floor of the boat. It will be found also that the stroke is nearly finished before the contractile efforts of the arms are in any degree engaged at that point, namely, when the trunk reaches the vertical line, and they are called in to finish the stroke, and to turn and run out the oar on the forward reach of the body, preparatory to another.

Rowing thus gives employment to a portion of the back, more to the loins and hips, and most of all to the legs[1]; but it gives little to the arms, and that little chiefly to the fore-arm, and least of all to the chest. Moreover, as there is but *one* movement in Rowing, namely, the stroke, indefinitely repeated with the most rigid precision, and as it is in the rearward half of this movement only that any real muscular effort is made, or resistance encountered, it follows that every muscle of the body not employed in this action is excluded from the exercise; moreover, also, every muscle included in it is employed

[1] See Appendix A.

but in one line of action, while it is qualified and designed to act in many, and will be developed and strengthened in proportion as these manifold modes of its use are observed; and moreover again, as, with few exceptions, all muscles have antagonistic muscles, designed to perform counter movements, it follows that, as Rowing consists but of one motion, the antagonistic muscles of those employed in executing this motion must be virtually unemployed. Thus, as I have said, the legs have strong employment in Rowing, but it is the *extensor* muscles alone which have actual employment: the *flexors* are comparatively idle; they perform no exercise, they gain no bulk, they obtain no increase in power. They are excluded from the work, they have no share in the reward.

Now it is the circumscribing of the line of muscular operation, the concentrating of the physical exertion into the narrowest channel, that has brought Rowing to its present point of artistic excellence,—which gives to the rower that statuesque appearance when resting on his oar, and that automatic precision of movement when in action, which constitute the very ideal of an oarsman, and of a crew.

The part of the body which receives the smallest share of the exercise in Rowing is the chest; it has little or no employment in the muscular effort required for the propulsion of the boat; and this is impressively evident in the results. Not only does it make no advance in development in this exercise, but, if it be exclusively practised, an absolutely depressing effect is experienced. No single result of recreative or systematized exercise may be more fully substantiated than this. Take any crew in the University, just as it stands, at any stage of its practice, and it is possible, in a given space of time, by varied systematized exercise, to increase the chest of every man by a given number of inches, with a proportionate development of power; let this cease, and exclusive Rowing exercise be resumed, and the progressing development of the chest will also cease; nay, its muscles will lose their condition, and their power will decline, in obedience to the organic law that power is in relation to employment, for here they have virtually none. I could at this moment point to men who have had Rowing for exclusive exercise since they came to the University,—men endowed with an organization capable of the finest development, whose chests have been almost stationary for years, the years during which they should have made the greatest advancement, who have now, in fact, the same developments in this region which they brought from school, lingering at 36 or 37 inches, when 40 or 41 were fairly within their reach.

And here I may state that this error of exclusive devotion to one exercise is not confined to Rowing, nor committed solely by rowing men; most men have a favourite exercise which they declare is 'the finest in the world,' and which they aver 'exercises every muscle of the body.' Now there is no single exercise invented or inventable by man, which gives employment to more than a part of the body, and to a very small part too, when closely examined; and none, with which I am acquainted, which gives anything approaching to uniform employment even to the parts employed. The error lies not in men's having favourite exercises; every man ought to have his favourite exercise, in which he excels or in which he strives to excel, in which he takes pride and in which he finds pleasure, just as he may have his favourite author or his favourite object of study; yet not for exclusive reading, if he would have his *whole* mind cultivated or employed; and least of all should such exclusive devotion to one pursuit, mental or physical, be during the period of growth, when ultimate conformation of organ and capacity of function are mainly determined. The error lies in expecting from the exercise what it was never designed to give—what no single exercise can ever be made to give. The human frame is too complex, too powerful in its attainable strength, I had almost said too important, to be so treated. It was designed for greater things, and must have greater care and larger means expended on its culture, than to be turned aside with a single mode of employment. It was fashioned and designed for modes of action without limit, and it is so constituted that its own perfection of development and power will be attained only by a wide and varied range of occupation—so that its own state of health, and its own point of power, will stand in relation to the integrity with which these conditions are observed.

But we may be reminded that a race is not to be won by 'brute strength;' and there is truth in the reminder. Skill, however, does not necessarily, or even naturally, accompany weakness, nor does awkwardness necessarily or naturally accompany strength; on the contrary, it will be found that strength is more frequently, more closely, and more suitably allied to skill than to awkwardness. The truth seems to be that strength can sometimes afford to dispense with skill, and can be all in all unto itself; and being seen thus disunited, the union is thought to be unsuitable and the divorce permanent; and as weakness passes not only unopposed, but even unobserved, when by itself, and is noticed only when allied to skill, it has become possible to regard them as natural companions. What is meant doubtless is, that strength alone is not sufficient, it must be strength united to skill—force allied to dexterity; and this is truth, and truth in its most desirable aspect; for the race would soon lose all charm for either actor or spectator if it could be won by weaklings however dexterous, or by any amount of muscular power if inartistically applied.

It is with the second requirement of exercise, respiratory power, or 'wind,' that we have now to deal; and first, let us hear what rowing-men themselves think of it.

'Men must run to be put into thoroughly good wind. No other motion removes the internal fat, the great enemy of good wind. There is no known exercise adequate to this result but this one [1].'

Now the respiratory organs are almost the only parts of the body where fat is never deposited; on the lungs it is never found; and when found on the heart, except in meagre quantities along the interspaces of its fibres, and upon some blood-vessels where it has important offices to fulfil, it is in actual disease, or in that 'fatty degeneration' which not unfrequently occurs in many of the tissues at an advanced period of life; and that either of these is the normal condition of the youths of our public schools and colleges is surely difficult of belief. But fat is found on the viscera and organs of the lower cavity of all healthy men at this period of life; and at this time of great and often ill-regulated exertion, its protective presence here is as valuable as it was on the surface of the body at an earlier stage of life, when the liability to injury was from falls and similar causes. The only way, as I conceive, in which its presence here could affect respiration unfavourably would be when accumulated

[1] See Appendix E, No. 6.

in such quantity and bulk as to prevent the due depression of the diaphragm and contraction of the abdominal muscles, and that this is the general condition of rowing-men is, I think, a thing still more difficult of belief than the other.

But the theory of internal fat not only exists, but is believed in, and acted on; and they find the proof of the correctness of the theory in the facts that by running men get thinner and lighter and the wind improves; while it is observed that they perspire copiously, and perspiration, say they, 'is only fat in a state of melt.' Truly, many a long-venerated theory has had less to support it than this. Nevertheless it is the text that has given origin to all the false doctrine preached on the subject of training for many a year.

In Rowing, as in some other exercises where the voluntary muscles of the trunk, and especially those of its upper region, are strongly exerted, the breath is 'held' in the lungs during the muscular effort, in order to keep the chest distended and firm, or, as it is technically called, 'fixed,' that these muscles may have firm and unyielding points of attachment during their contractile efforts—fixed fulcra for their levers; and when this is prolonged or repeated over any considerable space of time, it becomes a highly disturbing influence to respiration; and doubly so if the exercise be one which greatly augments the respiratory requirement; for the act of fixing the chest is accomplished by retaining the chest at its point of expansion, when in the natural order of respiration it would be collapsing. And while in ordinary effortless breathing, or during exercise where the lower limbs are solely or chiefly employed, such as in walking or running, the inspiration and expiration follow each other in uninterrupted succession,—each occupying about the same space of time as the other, and the two constituting the entire process—in Rowing, both these acts are hurried over during that time in which the muscles are relaxed, *i.e.* towards the close of the stroke, and on the rapid forward dart of the body preparatory to another; when the breath is again held and the chest fixed during the muscular effort.

Now in ordinary breathing the rate is, to a full-statured man, from sixteen to twenty inspirations per minute, while the racing pace is forty strokes per minute[1]; and we have seen that the breathing is regulated by the stroke, giving, therefore, the rate of respiration in Rowing at forty inspirations per minute.

But we have also seen that although there is a breath to every stroke, still the double process of inspiration and expiration does not occupy the whole of even this brief space of time, being accomplished during the momentary muscular relaxation towards

[1] In 'spirting' it will rise as high as forty-three or forty-four strokes per minute.

the end of the stroke, and the forward reach of the body preparatory to another. This greatly augments the rate at which this double process is performed. No need of internal fat to make a man gasp at such work at this!

The augmented processes of respiration and circulation during exercise are produced, as we have seen, by muscular agency. First by the constrictions of *voluntary* muscles on the veins, propelling their contents; and second, by *involuntary* muscles, when stimulated to greater activity by the blood thus propelled.

When a man is beginning his course of training, the involuntary muscles regulating respiration and circulation are suddenly called upon to double their customary amount of work, and this too under disturbing influences of the most trying kind; they fail of course, and the failure is set down, not to want of functional power, but to obstruction from internal fat. When a voluntary muscle, or set of muscles, fail to perform some task we set them, we simply say they are not strong enough, meaning that their contractile force is not sufficient to overcome the resistance encountered; we do not attempt to account for such weakness by obstruction or hindrance from extraneous substances—by *external* fat, for instance,—though, doubtless, there are cases in which muscular action is impeded by such deposits. Still, even when we see this, we do not view it as the normal condition of *all* men, and set down *all* muscular weakness to its presence; nor do we then prescribe some single and special mode of exercise, some exercise which greatly affects the parts where fat is *not* and where it is never likely to be, and say that this exercise and this only will remove it. What we *do* do in such cases is to give employment to the weak part—employment in nature and degree suitable to its existing capacity, and of the greatest variety within the range of its action; gradually augmenting this employment in proportion to the augmentation of strength in the part consequent on the exercise, acting on the organic law that, *cæteris paribus*, the development will be in relation to activity, and strength in relation to development. And the law applies equally to voluntary and to involuntary muscles.

I must remark, however, that although both voluntary and involuntary muscles are trained to functional power on the same *principles*, that is by employment, it does not follow that they are trained by the same *modes* of employment; in fact training for strength and training for wind are different things, attainable by different means; and it is perfectly feasible to take one or certain of these systems of muscles and train it or them, comparatively to the exclusion of the muscles of the other system. Thus a man of good physical capacity may be trained so that the voluntary muscles of his arms and chest would be powerfully developed, with a contractile force proportionate to their size and induration; and yet his respiratory power should be so disproportionate that he could not run a hundred yards at speed without gasping; and another, or the same individual, if possessing ordinary locomotive capacity, and fair development, may be trained to run ten times the distance without distress, but the voluntary muscles of whose arms and chest shall remain as they stood at the time that the training began. Indeed, this principle solved to me a riddle which greatly puzzled the sporting world some time ago; I mean in the prize-fight between Heenan and King. The former it was found, I believe, preserved his mighty muscular power unimpaired, but, to use his own phrase, 'he had scarcely begun the fight when he found his wind roaring.' I have never heard the particulars of the mode of training which he had adopted, but I have no doubt it would be found to be such as to cultivate the voluntary muscles of the shoulders and arms, and probably also of the lower limbs, but not of the involuntary muscles engaged in respiration and circulation.

What then is the cause of respiratory difficulty, or 'bad wind,' the internal fat theory being discarded? What prevents a man who has not gone through a course of training, from breathing as freely in the race as a man who has?

Strictly speaking, the answers to these questions have already been given, and all these questions spring from, and all these answers point to, one circumstance in the organization of a living creature—its *mutability:* it is constantly changing; it is constantly capable of being altered; bit by bit, atom by atom, it is pulled down; bit by bit, atom by atom, it is built up again; and the new is fashioned by, and is adapted for, the circumstances under which it is built. So that, after a time, a new creature is produced—new at all points, in organ and limb, but newest in the parts most directly under the influence of the circumstances under which the changes are wrought. Let us take for illustration the human hand. In men following widely different callings it can scarcely be recognised as the same organ; yet at one period of life it might have been more difficult still to perceive any difference; occupation has changed them, occupation has fashioned them, moulding the hand which followed it fittingly to its use. Look at the hand of a man whose occupation has been to wield the pen or pencil; it is slim and delicate as a woman's, the skin soft, the bones slender, the muscles small, and the joints round and mobile. Look next at his who follows some art or handicraft requiring strength combined with dexterity and precision of movement, and the hand, though still shapely, will be comparatively large and strong, the skin more opaque and darker coloured, the bones thicker, the muscles larger and firmer, and the joints still supple but strong. Look again at his whose whole occupation is manual labour, where force and tenacity of grip are the sole requirements, and a still greater change may be seen; the hand is yet larger, nearly twice the size of the first, though from its bulk and breadth it scarcely seems so long; the skin is rough and horny, the bones are short and thick, the muscles, when contracted, angular and hard as the bones, and the joints furrowed up and rigid, and stiff and slow in action, but with a closing force like the opposing parts of metallic machinery. The time was when all three hands were the same; the time was when any of the three could have been made to take the condition and aspect of either of the other two. As clay in the hands of the potter have they been, under the influence of *occupation.* Occupation has moulded each, fashioned each—fashioned and moulded each at all points best fitted to its particular use.

Let us see how this law which regulates development affects the respiratory organs of the man who is just beginning to learn to Row; or of his who is so out of practice—so out of training, in fact,—that he cannot sustain for any space of time the necessary rapidity of respiration. Let us take the first case, as perhaps the most simple of illustration. Why cannot the beginner, as far as wind is concerned, seeing that in this respect at any rate there is nothing to be *learned*, keep pace with the man in training? Simply because his is not yet a rowing heart, nor are his rowing lungs, arteries or veins. *His* heart and lungs and blood-vessels have been fashioned by other circumstances and other occupations, and fitted to perform their functions in another manner than that called for in Rowing, as distinctly and as surely, and with results as inevitable, as those which fashioned the hands of the artist, craftsman, and labourer. In Rowing, the heart has to contract, we will say, 110 times in a minute; *his* has been, by the circumstances which regulated its growth and determined its power, fashioned to contract only 75 times in a minute; and all nature's works are perfect, and accordantly adjusted each to each, and each to its place; and the blood-vessels of the lungs, and the veins and arteries throughout the body, have been at the same time endowed with elasticity and contractile power adjusted to the heart's capacity.

But just as occupation has made these organs what they are now, so will other occupations alter them; and the new occupations upon which the aquatic tyro is entering will re-fashion them to what these occupations require; *i. e.* the increased activity of the organs, caused by the exercise of Rowing or of cognate employments, will hasten the disintegration of its tissues and their reproduction, and these metamorphoses will be accomplished with rapidity and with completeness in proportion to the force of the fashioning influences; in other words, in proportion to the extent of the application to the exercise of Rowing, or of cognate employments. Actually and literally, a new heart and lungs, and a new system of circulatory tubes will be obtained suitable to the exercise of Rowing; just as distinctly, as actually, and as literally as if it were a new boating costume he had ordered from his tailor, which he has now to wear in lieu of the dress becoming his former occupation—of his cricketing suit, or his reading-gown and slippers.

But the difference—the mighty difference here—lies in the fact that the change of organ can only be made gradually, bit by bit, atom by atom; just as if, to extend the simile, the boating suit had been ordered to be supplied thread by thread of warp and woof, one at a time, and each for its place, and each to be introduced thread by thread, and one at a time, in lieu of threads extracted from woof and warp of the cricketing suit or of the reading-gown and slippers; and he will not feel at home on the water, nor be free from discomfort and distress, till the old costume is removed, and the new is completed.

And this is the origin of our wise old proverbs that 'Practice makes perfect,' and 'Use is second nature.' We repeat the sayings without realising the extent of the truths they express; we believe in their promise, but do not always comprehend the cause of their literal fulfilment. The results and evidence of the working of the law are seen before the nature of the law is understood, *that the functional ability of every organ is in relation to its activity.*

But here the question suggests itself, if this is an organic law, then it is applicable to all parts of the organism; if it applies to the heart and lungs, and circulatory channels, preparing them, changing them, fitting them for their augmented functions, how is it that the chest escapes its influence? The answer is, there is no exception to the action of this law, and the above instance confirms, not negatives, its universality. The chest escapes the altering influence of the exercise because it cannot be said to share in the employment; therefore it is uninfluenced—therefore it is unaltered: and the power of the vital organs which it contains is circumscribed by its capacity; their function is outlined by its circumference; and while it remains small, and tight, and stiff, the heart and lungs must press against its barrier-walls like caged birds against the iron walls of their prison; literally is this the case, and the imprint of the ribs has been marked on the lungs of a narrow-chested man.

To set a man with a flat, narrow, or otherwise defective chest to row in a racing-boat, is just as wise as to set a cripple to run or jump. This is the chief cause of the sickness, faintings, giddiness, and nausea experienced during and at the close of the race,—the chief cause of the greater evils that follow these, if their warning be persistently ignored[1].

Thus we have seen that muscular power plays quite a secondary part in Rowing; respiratory power makes the first claim, and makes it more exactingly than in any other mode of physical exertion in which men can be engaged; not only on account of the rapidity of the inspirations and expirations, and not only from the fact that these are *not* regulated by the natural action of the lungs themselves, but by the artificial movements of the exercise, but also from the interruptions caused by the fixing of the chest, and forcibly holding in the lungs of the air inspired, after, in the natural order of the function, it would have been expelled.

Everything therefore which can lessen effort in this direction—whether by enlargement of the cavity, which gives freedom of action to the organs within, by strengthening the muscles which lift its walls on each inspiration and depress it on each expiration; or by increasing the elasticity and mobility of its general structure—must be of direct and immense advantage.

The actual sensations felt after rowing will not

[1] It would perhaps be difficult to find a better specimen of a man possessing a naturally fine organization fully cultivated, than No. 7 of the Oxford University Crew of 1865, possessing both muscular and respiratory power in the highest degree. His measurements were, (age, 21,) height, 5 feet 9½ inches; weight, 11 stone 6 pounds; chest, 40 inches; fore-arm, 12 inches; upper-arm, 14 inches.

guide men accurately in this respect; they feel fatigued, and conclude that it has been produced by the usual cause of fatigue—muscular exertion; whereas in this case it would chiefly arise from respiratory exertion; and that which is actually due to muscular exertion would be less from extent of effort than the result of want of relief and interchange of action with other muscles, from the *sameness* of the movements in the exercise; the same muscles making the same movements throughout, and making the last as they did the first.

What other exercise do rowing-men take while in training for boat-racing? What exercsie in addition to their work at the oar?

Running or walking.

What parts of the body receive exercise in running? First, the legs; and here the flexor muscles have their full share in the locomotive effort: this will be greatly to the advantage of the limb itself, irrespective of its rowing power, which will be also augmented by the equalization of the development of the antagonistic muscles, as in the boat it is the extensor muscles which are employed[1]. Secondly, the hips and loins are actively and energetically employed in running; in action and position all

[1] It will be understood that in speaking thus generally of the action of muscles, some modifications on certain points must be allowed; such as, for instance, the *rectus femoris*, which, while it extends the leg, at the same time flexes the thigh.

different from what they were at the oar. The lower limbs therefore, and the lower portion of the trunk, receive full employment in running, and as these are all chief agents in Rowing, this exercise is well chosen as an aid to the muscular power required. What else? Broadly speaking, nothing else; the arms are tucked in by the sides, elbows down, hands closed, head erect, and the upper portion of the trunk held steady, that the parts enumerated above as the active agents in locomotion may be as little as possible encumbered, by the swaying or mal-adjustment of any portion of the burden. With respect to the other requirement of rowing-men, respiratory power, its influence is immediate and direct; for here we have the function of respiration performed in its natural manner, with no disturbing influence of fixation of the chest. The inspirations and expirations follow each other in regular succession; the process is accelerated only.

For Rowing, therefore, running is good, but like other good things, it must be used and not abused, or it may be converted into an evil. It must be rationally performed, especially in its initiatory practice, or it will fail in its expected results. Men seldom enter upon it with sufficient care, or pursue it with sufficient system. They run the first day as they run the last—all at once, and all at a burst; always the same distance, and all at the same pace; relinquishing the effort gasping, and lame from shin-ache. A trooper's horse is trained in better fashion than this. Running under such circumstances, had better be left alone; it but fatigues the limbs unprofitably, and, as regards respiration, aggravates the evil of the Rowing which it was designed to alleviate by gradual preparation. Few things worth doing can be done suddenly; certainly no change in the human body can be so accomplished. All the changes wrought in that are gradual, accumulative and regular; and the agencies which produce the changes must also be gradually and regularly applied.

With a man unaccustomed to running, I would say, let him begin with a mile [1]; setting himself to cover the distance in about eight or nine minutes, at the easiest pace and make-believe race he can run in. Let him break from his walk to the ground into this easy trot, and practise it until he find his wind decidedly improved, and the work, such as it is, pleasurable. He may then do one of two things—either increase the distance by another half-mile, to be run at the same pace, or hold to the first course and cover the distance in one or two minutes less. When the mile can be run in six minutes as easily as it was run in eight, let the tactics be changed; let him break the uniformity of the run, and cultivate variety of pace; let him begin the race, as at first, at an easy trot; keep at it for a quarter of the distance to allow the organs of respiration and

[1] See Practical Course of Training, Part IV, page 122.

circulation to take up gradually the accelerated action which is demanded of them as soon as the trotting begins, allowing also the muscles employed in locomotion to take up *their* accelerated action when the walking is relinquished; let the second quarter be in the same style but at a somewhat quickened pace, still keeping within the margin of easy performance; and let the third, if the preceding causes no distress, be quicker still, gradually culminating towards its close to an effort at the full strain of the powers; and last, let it in the fourth quarter gradually subside into the first easy trot, ending in the effortless walk, to allow the throb of the heart and swell of the arteries and veins to subside and settle down, and the lungs to resume their peaceful tidal motion, and the air-current in their cells its rhythmical ebb and flow.

I do not give these as absolute, but as approximate, distances and rates of speed; they must be in all cases proportioned to the powers of the individual; but whatever may be his powers, let him begin within them, and augment the work very gradually, whether in velocity or distance; and this augmentation should always be regulated by the actual advancement made by the running powers, until at speed and without preliminary break or preparation the distance prescribed can be run. The distressing and often incapacitating pain of shin-ache is owing entirely to a disregard of this principle of gradual preparation. It is but the same kind of discomfort, arising from the same cause, which men out of practice feel in the arms on rowing suddenly at speed; *i. e.* unpreparedness in the parts to perform the work suddenly put upon them.

Of late years the customary morning run has been discontinued or has been commuted to a short walk, which to such men is in reality no exercise at all. And why has it been discontinued? Because 'it takes it out of a man.' This is an ordinary phrase springing from a very extraordinary idea. It is thought that men have a certain amount of strength within them, and therefore the more that is taken out of them, *i. e.* the more exertion they undergo in other exercises, the less there will be left for the evening rowing; and acting on this idea, and following it up, as we are all apt to do when very much in earnest, to extremes, they avoid all effort, all action, all exertion, throughout the day; keeping their store intact by moving about as 'gingerly' as possible, until the occasion of its requirement. Now of all errors possible for men in search of muscular and respiratory power to commit, this is the greatest, the most directly opposed to the organic law ruling their acquisition.

In plain and simple truth the strength of a man, and his respiratory capacity also, will be in proportion to what he *does* take out of himself by exertion; literally and absolutely so, contradictory as it may seem, paradoxical as it may sound. The more rapidly a man *does* wear down the tissues of his body by properly regulated exertion, the greater will be their strength and serviceability, the greater will be their bulk and consistency, the greater their functional capacity in every way in which function can be legitimately performed; because the action of the several systems of the body are so perfectly in accord, that the very process which causes the destruction also accomplishes the reproduction; and the organic law regulating power is, as we have seen, *that it shall be in relation to the youth or newness of the parts exercising the function.*

Of course it is understood that the exertion shall not exceed the powers of recruitment; and of course it is understood that the recruitment shall be facilitated by adequate diet and rest; of course also it is understood that men shall not take such exertion immediately preceding the rowing as to cause actual bodily fatigue; but I do say that, considering the very meagre amount of muscular exercise obtained from rowing once or twice over the course, and considering also the capacity for exertion which I know to be inherent in the men who row in these races, then I do say that an hour of active exercise before breakfast at walking and running, and at the least as much of an energetic kind between it and the mid-day meal, would contribute vastly to their health and strength, and vastly to their physical resources in the evening race[1]. This post-breakfast exercise should be the antithesis to that preceding it—exercise to the upper limbs, which, as we have seen, have little or no employment in Rowing or Running; exercise in which every voluntary muscle engaged in boat-propulsion will be systematically employed, so that no available particle of rowing-power may be lost, and in which every voluntary muscle *not* engaged in boat-propulsion will also be employed, so that the equilibrium of growth and development may be preserved—so that the *man*, in fact, as well as the *rower*, may be cultivated; and

[1] The exercise in training practice on the Oxford system, allowing for the difference of some Colleges where a short run is preferred to the morning walk, amounts to this:—

WALKING—Say one mile, averaging four miles per hour	15 minutes.
ROWING—Say twice over the course and back; part of the distance at racing pace, part at two-thirds speed, and part at half speed, averaging the whole distance, and allowing for backing and turning (five miles), at say nine minutes per mile .	45 „
	60 minutes.

The training practice begins with the Term and lasts about three weeks, when racing commences. Once or twice during this time a crew will probably be taken to Nuneham (about 5 miles), but they do not always row back on the same day, and during the time of the races rowing over the course a second time is exceptional, although often done. See Appendix E, No. 1.

above all, exercise in which the fair and full development of the chest may be ensured, and every muscle, voluntary and involuntary, primary and auxiliary, engaged in respiration may be strengthened to its fullest capacity.

Let no man be afraid to exert himself lest 'it take it out of him.' There is nothing in him that will not be replaced with interest by the very process of extraction.

But while urging upon men the adoption of this more energetic discipline, I would warn those unaccustomed to exercise before breakfast that they cannot begin it with too much care, or proceed with too much caution; the shortest walk or run at the slowest pace will be sufficient for introduction, to be gradually quickened and extended as bodily power is increased.

I have been speaking of Running when practised as an auxiliary exercise to increase the rowing power; using one exercise to help another, on the principle of the advantage of variety of employment, as already explained. When, however, running is practised for itself, when the training is for the running, and the exercise is to prepare the body for the performance of some difficult pedestrian feat, then it should be begun and conducted with still greater method and care; and all its separate features should be studied, and every other exercise enlisted in its service which can be brought to bear upon the parts of the body employed, either as aids to local muscular power, by developing the voluntary muscles directly engaged in locomotion, or to respiratory power by strengthening the involuntary muscles and all parts of the frame engaged in respiration[1].

In fine, it is essential to excellence in any special exercise, assiduously to practise the exercise itself; and this emphatically applies to exercises where precision or dexterity of movement is required. But where muscular force to any considerable extent is also required, then is *variety* of exercise necessary, because the voluntary muscles are constituted not for one but for many modes of employment, and not for one but for many grades of effort; and the greater the variety in these respects the greater will be the material development, the higher the degree of mechanical force, obtained. Sameness in exercise will give precision and dexterity, but to vigour and power variety is essential.

And as respiratory power is dependent not alone on the condition of the organs which (strictly speaking) perform the function, but also on the condition and capacity of the chamber in which they are contained, therefore is it of primary importance to develop the chest to its fullest capacity for the practice of all exercises in which great respiratory effort is involved.

[1] See System of Physical Education, by Archibald Maclaren. *Clarendon Press Series*, Oxford, 1869.

PART II.

NEXT in importance to Exercise is Diet, or as it is variously called, regimen, or system of food.

Unlike exercise, which has never received attention commensurate with its importance, diet has long been receiving even more than its due share, and instead of being viewed as regards its actual nutritive function—as following exercise so as to supply the want by it created—it has been advanced to the first place, and invested with attributes altogether imaginary; and 'things good for training' and 'things bad for training,' and 'things good for wind' and 'things bad for wind,' are questioned and combated and debated until the actual place of diet, as an agent in promoting bodily health and strength, is apt to be forgotten.

I propose here to glance briefly at the subject of dietetics; first examining diet with reference to the requirements of the human body under ordinary circumstances, and then inquiring what changes should be made in it, to meet the exceptional habits and wants of training.

It has been already stated, that the blood is the bearer to the tissues of the body of that nutriment which is to replace the waste arising from the disintegration constantly taking place in them,—yielding up, as it is carried through the circulatory system, constituents of its substance to supply the place of those particles, which have become waste and are eliminated from the body in various ways. This nutriment is furnished by food, which by the various processes of digestion and assimulation, &c., is gradually converted into blood, from which, as we have seen, each tissue has the power of extracting its own proper pabulum.

But food has another office to fulfil. It is necessary to health, nay to life itself, that the temperature of the body shall be maintained at a given point, that point being with but trifling variations the same by day and by night, when active or when at rest, at all seasons of the year and in whatever climate life may be passed[1]. This heat is generated in the body itself, the materials for its maintenance being found in the blood, partly from the combination of the oxygen inspired by the lungs with certain elements of disintegration, but chiefly, in such a climate as ours, by its combination with certain elements of our food; and, as we shall presently see, every substance which we employ as food is subservient to one or other of these processes—the formation of tissue, or the production of heat.

Food has thus a double office to fulfil, each one of vital importance; namely, to furnish the blood with

[1] The standard heat of the human body is placed at 98 degrees.

the materials for repairing the waste of the tissues, and its fluid secretions, and with the materials for carrying on this internal combustion, the fuel for this ever-burning fire. Each of these two processes is as important to life and health as the other; and food is taken, consciously or unconsciously, as much for the one purpose as the other; for just as the vital functions cannot be performed, and life itself cannot be preserved, when the nutritive supply falls for any length of time beneath the demand occasioned by the waste, so would these functions fail, and life itself cease, if the heat of the body were allowed to fall for any length of time below the normal standard.

The organic[1] compounds of food have been divided into three principal groups, *albuminous*, *saccharine*, and *oleaginous*. The first of these groups includes all the constituents of food which are closely allied to albumen. This is a substance resembling in chemical composition the animal tissues themselves, and is found in an almost pure form in the white of egg or the *lean* of meat. It is present in vegetable as well as in animal substances, and bears a different name according to the source from which it is derived. But though varying in certain particulars it is still in effect the same, and its essential im-

[1] I do not in this place notice the inorganic compounds of food although essential to health, as these are contained, in suitable proportions, in the organic.

portance as a constituent of food arises from the fact that it is from albumen that the tissues of the body chiefly derive their nourishment. It is also capable of serving, when required, for the production of heat.

The second of these groups, the saccharine, includes all substances which resemble sugar in their composition, or are capable of being converted into sugar during the process of digestion. They are derived solely from the vegetable kingdom, and are found in large proportions in all farinaceous and vegetable articles of diet. They resemble none of the animal tissues in chemical composition, and are almost entirely employed in the maintenance of the heat of the body by the combustive process above described. They are however capable of being converted in the body itself into the compounds of the oleaginous group, and as such may be used in the nutrition of the nervous and fat tissues.

The third group, the oleaginous, comprises all substances of an oily or fatty nature, whether derived from the animal or vegetable world; these are believed to afford nourishment to the nervous tissues and to the adipose or fat tissues; but their great value lies in their calorifying or heat-producing power, which appears to be greater than that of any other substance.

To these is sometimes added a fourth group, the gelatinous, comprising all articles of the jelly kind.

It has been supposed that constituents of this group aid in the nutrition of the gelatinous tissues of the body, but it is now considered more probable that they are chiefly, if not entirely, subservient to the production of heat.

There are, besides, several substances employed as aliments which do not strictly belong to either of these groups; these for the most part contribute little to the nourishment of the tissues, and are chiefly employed in calorification.

Thus it will be seen of these groups of alimentary substances, that one is principally applied to the formation of tissue and the others to the production of heat; but it must be remembered that almost every article, whether animal or vegetable, used as food, contains substances belonging to two or more of the groups in varying proportions; nor could life be supported on any one alone. All experiments on this subject have proved that an animal fed exclusively on substances belonging to but one, dies of starvation.

Every rational scheme of diet must be based upon a knowledge of these principles; for it will be in proportion to the discretion with which the various substances comprised in these groups are mingled and employed, that food will be efficient or otherwise in maintaining the body in health and strength.

The lower animals are for the most part either carnivorous or herbivorous; in their natural state we rarely find them uniting these two forms of diet, and we find the construction of their digestive apparatus suited to their appetite. Thus with the carnivora, whose nourishment is in a very concentrated form, the stomach is small and the intestines short; while in the herbivora, whose food contains little nourishment in large bulk, the stomach is very large and the intestines very long.

The digestive apparatus of man, in accordance with this rule, is much larger than that of the carnivora and much smaller than that of the herbivora, thus indicating that his food is a combination of that of these two classes of animals; and we accordingly find that that diet which is formed by a judicious union of these two descriptions of food, *is* the one of all others calculated to produce and maintain a healthy state of body; for these combine in the most suitable degree those constituents which nourish the tissues, and those which produce animal heat.

It is by this power of adapting his food to the circumstances in which he is placed, and his know*ledge* of the laws which should regulate this adaptation, that man is enabled to live and preserve health in climates of every variation between the poles. He finds that in those countries where, from lowness of temperature, it is necessary to resort to artificial means in order to maintain the standard heat of the body, the most desirable kinds of food are those comprised in the oleaginous group—fats of all kinds; for here alone is found the required proportion of heat-making elements. Again, in countries where the heat exceeds that required for the health and comfort of the body, a diet in which the farinaceous and leguminous character predominates is found to be preferable; because this class of aliment contains smaller measure of combustive material in larger bulk than the oleaginous; and the mode of life in such countries being a much less active one, the waste of tissue also is comparatively small, and calls for a smaller supply of the purely tissue-forming.

It is not, however, altogether a matter of indifference whether the tissue-forming constituents of food be obtained from the animal or vegetable world: by the exclusive use of either, a considerable influence is exercised on the condition of the blood itself; on the one hand by raising, and on the other by diminishing, the proportions of one of its most important constituents. Nor is it altogether immaterial whether the heat-producing compounds of food be drawn from the oleaginous or saccharine groups: besides its calorifying power, a certain amount of oleaginous matter, eaten as such, appears to be essential to the perfect conversion of food into blood.

It would be unnecessary here to enter upon any analysis of the numerous and widely varied substances which are rendered subservient to our use as food[1]; but experience confirms the hypothesis afforded by structure and natural appetite, that in moderate climates like our own, a considerable proportion of animal food, with a due admixture of farinaceous and vegetable food, is the most perfect combination of the albuminous, oleaginous, and saccharine groups attainable. The precise effect of fresh vegetables in nutrition is by no means clearly understood, but experience has proved that their employment as an article of diet is absolutely essential to health.

Having seen the principles upon which our food should be selected, we will therefore next enquire what quantity is necessary for the carrying on, in proper manner, this double office of the formation of tissue and the production of heat. This must in a healthy individual be determined by the appetite; not the appetite excited by the taste of varied and stimulating food, but the natural demand of the system for fresh nutriment.

It must always be remembered that our bodies are nourished not by what we *eat* but by what we *digest*. And further, that the digestive powers are limited, and can only operate fully and without injury to themselves upon a given quantity; for during health these powers will ever be in relation to the wants of the body, as evidenced by appetite.

In another aspect quantity must be considered,

[1] See Appendix H.

an aspect in which it becomes inseparably connected with *quality*. As I have remarked above, a certain *bulk* is necessary to the proper digestion and assimilation of food. Nature has decreed that our nutriment should be, as it were, diluted by being contained in a proportion of innutritive matter; and except in peculiar conditions of body, or states of existence, such for instance as entail severe muscular exertion, where the waste of the tissues is extremely great; or where the exercise entails great respiratory effort, (when distension of the alimentary organs would prove at once a hindrance and a source of danger), food, in which a large quantity of nourishment is concentrated into a comparatively small bulk, is injurious. Under ordinary circumstances, therefore, animal food requires the addition of some less stimulating aliment to supply the bulk, and hence one great advantage of farinaceous and leguminous aliments.

The proper *times* of eating appear to have been better understood than the other principles of dietetics. Experiments all prove that from three to four hours is the time required to digest an ordinary meal[1], selected on the foregoing principles; and it is important that the stomach should have had time not only to dispose of one meal, but to have, as it were, a time to rest, before its energies are claimed for the digestion of another; and accordingly

[1] See Appendix F.

we find that from four to five hours is the usual interval between meals. The precise hours of the day are of no actual importance to a healthy individual, because the human body has such a marvellous power of adaptability that its demands, indicated by appetite, will soon return at the time when they are accustomed to be satisfied.

It is generally well known that exercise should be avoided immediately after eating, because a large supply of blood and nervous energy is required by the stomach in carrying on its functions; and hence arises that incapacity for exertion experienced after an abundant meal. Respiration too is circumscribed to ordinary breathing when the stomach is full; the depression of the diaphragm being checked on inspiration, and the contractions of the muscles of the abdomen being hindered on expiration, when the alimentary canal is distended. Neither should a meal immediately follow violent exertion, for the blood will be then greatly distributed among the parts of the body which have been actively engaged in the exercise; and here again nature is our unerring guide, for at such times there is no real desire for food experienced.

Besides quantity, quality, and the proper times of taking food, there are yet a few points worthy of observation in connexion with its condition and preparation. Among the chief of these is cooking. The effect which this produces on the viand is of several kinds; one, and not the least important, being its modifying influence upon the taste and smell—a modification which does not always receive due attention in dietetics; also, by lessening the cohesion of the particles and by separating the fibres, the meat is rendered more easily masticated, and consequently more fully subject to the action of the gastric juice in the stomach; and, lastly, it undergoes certain chemical changes during its subjection to heat in the process of cooking.

Another point of the highest importance in all alimentary substances is that they should be perfectly *fresh;* and here again nature is our guide, causing us to turn with disgust from all stale or decomposing substances [1].

As Hunger is the warning voice of nature telling us that our bodies are in need of a fresh supply of nutriment, so is Thirst the same voice warning us that a fresh supply of liquid is needed to replace that which has been separated from the body, in the form of exhalations from the lungs, perspiration, and other secretions. Though the sensation of thirst appears to be confined to the mouth and throat, the demand for fluid is in reality experienced by the entire system, and the immediate relief afforded by drinking is owing to the rapid absorption of fluid from the

[1] Animal food should never be allowed to pass that first stage of decomposition which, by lessening cohesion in the fibres, causes it to be tender.

stomach and its speedy introduction into the general circulation.

Thirst, like hunger, being a natural demand, may safely be gratified, but, like hunger also, it is liable, if unduly indulged or stimulated, to become a habit, beyond or apart from actual requirement; and its gratification is then injurious (as regards quantity), because liquids taken in larger quantity than is required by the system, are not at once absorbed, but remain in the stomach—distending it, relaxing it, and interfering with the production of gastric juice. The increased thirst experienced during and after strong muscular exercise is owing in a great measure to the diminution of the fluids of the body by perspiration and respiration.

The best general drink for a healthy person is undoubtedly water; its action is so valuable and so important as to be virtually indispensable to the healthy condition of every tissue, and the performance of every function. It constitutes the basis of all the beverages we take from day to day, and, without so intending it, it is almost exclusively for the water they contain that they are taken. Not only can no article of food be dissolved or converted into blood without it, but it combines freely with the tissues also and appears to form a necessary part of their structure; and the muscles eagerly absorb and retain it after exercise. Indeed, water constitutes more than two-thirds of the entire weight and bulk of the body; thus a man weighing 12 stone will have more than 8 stone of water, or, as has been ascertained by experiment, 'A human body weighing 154 pounds, or 11 stone, contains 111 pounds of water[1].'

Besides the water which the body receives in a liquid form, either as water or in other drinks, much of what we call solid food has a large proportion of water; in the potato, for instance, 74 out of every 100 parts are water[2]. Nor is this confined to vegetables; bread and meat contain considerable quantities of water, all to assist in keeping at its standard amount this great reservoir in the living organism, subject as it is to loss by numerous causes. Under ordinary circumstances more than a pint will be daily exhaled by the lungs alone in respiration, and from two to three pints will be secreted by the kidneys; and the skin, without special exercise, and merely by what is called insensible perspiration, from two to three pints more, making in all a loss of from five to six pints of fluid excreted from the body daily under the ordinary conditions of life[3].

[1] *Lectures on Food.* E. Lankester, M.D., F.R.S.

[2] See Appendix H.

[3] In early life, when working in the Gymnasia and Fencing Schools in Paris, I noted the amount of liquid which I found necessary to comfort and health and to physical power, to replace loss from perspiration, chiefly caused by heat and the great muscular exertion which I was undergoing. This ranged between six and eight pints per diem, consisting chiefly of wine and water; in other form, from 120 to 160 ounces of liquid, independent of what

Tea, coffee, chocolate, &c., have often been considered as improper aliments, but this appears to be the case only when they are taken too strong, too hot, or in too great quantity; taken thus they are undoubtedly injurious from their effects on the nervous system and on the stomach; but when taken with due regard to avoid these extremes they are refreshing and beneficial. The injury to the stomach from their being too hot is perhaps a greater evil than that to the nerves from being too strong; the effect of hot liquids on the linings of the stomach appears to be analogous to that which they produce on the skin, namely, by over-stimulating, to relax and weaken[1].

Beer, in moderation, is unquestionably a wholesome beverage, and in certain conditions of body may be taken with the greatest advantage. It is found to lessen to some considerable extent the elimination of fat from the body; hence one of the causes why persons who drink much beer are liable to become fat. When taken merely for the purpose of quenching thirst it should be weak, for in this

was contained in the so-called solids, a considerable portion of which were bread and ripe fruits. The haymaker's confession with reference to his weak beer, that 'he began the day's work with a gallon, and wetted it every hour with a pint,' would not probably greatly exceed the want caused by the elimination of moisture from his body in a day's mowing in the open fields, under a July sun. —A. M.

[1] The highest temperature at which food, either solid or fluid, should be taken, has been stated at 100 degrees.

state it does not contain more than half-an-ounce of alcohol to the pint.

Wine in this country can scarcely come under the head of aliments, and when drunk habitually it almost ceases also to be a stimulant. Let no man, young or old, habitually drink wine; he never knows its value who does so; for its chief value and greatest virtue, that of a stimulant, is lost by the circumstance of its having become an article of daily consumption. I speak of port and sherry, and not of the uninebriating continental wines.

Distilled spirits of course find no place on a young man's table. He knows that to youthful blood and to youthful brains they are pernicious,—destructive as vitriol to steel.

From the foregoing remarks it will be seen that, for a man in the position of life for whom I am more particularly writing, there is at their ordinary table abundance to meet all the wants of the body, under every condition of physical exertion; and that, therefore, what is called for by the exceptional requirements of training, is to make a judicious selection, embracing such as afford the required constitutents of food in suitable proportion[1], and excluding those

[1] Indeed it would appear that so long as these essential constituents are obtained, and the food prove suitable to the digestive organs, and agreeable to the palate, it matters but little in what form, as organic substances, they are taken :—whether in the bread and bacon and cheese of the field-labourer, or the fish and fowl and game of the man in higher position of life. See Appendix I.

which, though harmless, or even useful at other times, might now prove prejudicial.

This principle was perceived at the outset by rowing-men, and their code of laws on dietetics consists almost entirely of restrictions; but again, like one or two other things which I have already noticed, the idea has been too eagerly embraced, causing the excluded articles to be regarded with an amount of aversion, altogether disproportionate to their real alimentary unfitness; and also causing the accepted articles to be regarded with an excluding favour, altogether disproportionate to their actual merits—indeed, to be invested with properties not possessed by any alimentary substance whatever, and to be regarded as accomplishing results in which food, so far as our information extends, could play no part.

The effect of this too rigid system has been to produce a *sameness* in diet, which has a depressing effect upon the nutritive organs, and upon the natural appetite, which is the expression of the body's wants; for however nutritive in itself food may be, when eaten with distaste it will not be digested so freely or so fully as if it had been eaten with relish and pleasure.

To see that this is the case, we need only observe the physical difficulty we experience in swallowing what we dislike, or the proverbial facility with which we swallow what we *do* like; nay, even before we can bring it to the lips, do not the glands of the mouth and throat pour forth their secretions anticipatory of the first process of digestion—mastication and deglutition? Something also in this, as in other matters, should be yielded to 'use and wont.' To change a man's habits suddenly, even if the change be for the better, is not always judicious, and not unfrequently fails in its object, on account mainly of the unpreparedness of the body for the change; and men accustomed to variety will injuriously, instead of beneficially, be affected by even necessary restrictions, if too suddenly begun.

The true and substantial nourishment of the body requires variety, and the healthy condition of the stomach itself requires variety, care being taken that it is variety in succession of meals and not of dishes at the same meal[1]. Seeing that the due and complete conversion of the food into blood is the desideratum, everything that will complicate or hinder the operation should be avoided; and where many substances of different degrees of digestibility, some requiring two, some three, and some four hours[2] subjection to the gastric juice,

[1] One authority, perceiving the necessity for this principle in diet, prescribes that the same dishes shall appear on the table no two days running, but this is surely carrying the principle to the opposite extreme, and supporting, (although in a contrary direction to that complained of, sameness), exaggerated notions of the importance of diet. There is nothing in rational training to require a rule like this. See Appendix E, No. 6.

[2] See Appendix F.

are all put into the stomach at one time, it follows as a matter of course that, even if the process of digestion could be as completely and as regularly carried on, as when the meal consists of one principal substance, yet the alternations of rest and employment, which we have seen are necessary to its health, are interrupted.

The alimentary virtues of beef and mutton are undoubtedly great,—greater, perhaps, than of any other two articles which could be named as the staple of diet, under such circumstances, for healthy young men; these very virtues are however held in check by the wearisome monotony of their use and mode of presentation; and also, and let me mention the two extremes in sequence, by the amount consumed—I can scarcely say *eaten*. I have known many men, and still know some, who believed and believe that the whole art and secret of training is, to use their own phrase, 'to stuff as much beef and mutton into them as ever they can, and then go on the water to work it into them[1]:' a double error, intensified by its inversion, and directly opposed to the physiological law, which regulates the demand by the loss, which enacts that the supply shall be in *answer* to the demand, as the demand will be in answer to the waste consequent on the exertion. Therefore the exercise must regulate the diet: for could a man

[1] Following Captain Barclay, perhaps, who expressly advises exercise after eating.

consume the contents of a whole market-place, his stomach would but digest what was sufficient for the requirements of the body at the time of its consumption; or, even if a larger quantity could be digested, assimilated, and converted into blood, not one drop of it, or one globule of one of its drops, could by any process be incorporated into the body until a proportionate demand had been created by the waste of tissue. To eat, therefore, beyond the requirement of the natural appetite, is a gross error, for every particle of food so eaten becomes an encumbrance, a hindrance, and a loss. Strictly speaking, the digestive organs will not convert more food into blood than is needed to supply the actual wants of the body, and if they can be excited to do so, every drop so produced is a superfluity for which there is no immediate use. There are several ways by which such superabundance of nutriment may be disposed of. First, it, or a portion of it, may be converted into blood; but the next meal will be reduced in quantity, for want of natural appetite, by the amount of the superfluity of the preceding one, and the composition of the blood itself will be injuriously affected. Secondly, it may be converted into fat, which, wherever it may be deposited *as a superfluity* will be an encumbrance, impeding to the extent of the deposit the free action of the parts where it is placed. Thirdly, it may be passed through the stomach and intestines in a partly digested state, but to their certain discomfort, and probable disarrangement, and with no possible advantage to the system. And, fourthly, the superfluity may be disposed of by two or more of these processes, entailing the evils consequent on each in proportion to the departure from natural function. When therefore we hear of men eating enormous meals, and then going out 'to work it into them,' they are reversing the order in which the natural requirements of the body for food are supplied, and they are trying to perform the conjuror's trick of putting a quart of wine into a pint bottle, without having taken the conjuror's precaution of providing a secret receptacle for the superfluity.

How then are we to ascertain the proper quantity of food required—that which is sufficient and no more—sufficient for each separate individual, sufficient for each special occasion, varying, as does the requirement, with habits and condition of life and occupation and age and temperament and climate and season and time? How are we to know the proper quantity of food required, when subject to so many and often conflicting influences? The answer is distinct, prompt, and unerring, because Nature herself has given it,—given it before the word *training* ever met our ear, or its meaning was communicated to our minds: and she has been repeating it to us daily ever since our first unconscious meal.

When the natural appetite has been satisfied with suitable food, we have had sufficient; we have had all that can be made useful in augmenting or in sustaining the strength, or in promoting the growth and development of the body.

This gives us even a better reason for the exclusion of all spices and pickles from the table of a man in training, than that they are in themselves indigestible or otherwise injurious,—they are stimulants to eating beyond the true appetite, which is the expression of the true requirements of the body; hence also a better reason for the limitation of the meal to one or two dishes, than that these are suitable and all others are unsuitable for the diet of a man in training,—variety of viands possessing variety of flavour stimulates to eating beyond the natural appetite. The law of restriction in this respect is therefore very wholesome, the danger of superfluity being infinitely greater than that of insufficiency.

I would advise every man while in training, at dinner and throughout the day, to drink nothing but water; confining himself to a moderate quantity of beer with the evening semi-meal. The present practice of drinking beer, sometimes new and sometimes stale, is, I consider, most injurious; and in conjunction with one or two other habits which I conceive to be errors, and to which I will presently allude, is one of the causes of that painful affliction of rowing-men, Boils.

Indeed, in training on any rational system, to drink, of any other fluid than water, the quantity required to replace the amount of moisture given off by the body, is almost impossible, without injury to the digestive organs, disarrangement of the process of nutrition, and the general lessening of the powers of the body.

And here I come to what appears to me to be the fundamental error of training dietetics, namely, the restrictions put upon the amount of fluid which a man has to take, in order to satisfy the demands of the body. We have already seen that in ordinary life there is excreted from the body daily, as it has been computed, from five to six pints of fluid, but this can bear little proportion to the loss sustained during the exciting and stimulating circumstances under which a man lives while training,—so much time spent in the open air and sunlight, the great stimulants to the skin and other organs which secrete moisture from the blood;—the greatly accelerated respiration, causing greatly increased exhalations from the lungs in the form of vapour, and from the whole of the body's surface in the form of perspiration[1].

[1] In one hour's energetic Fencing, I found the loss by perspiration and respiration, taking the average of six consecutive days, to be about three pounds, or, accurately, forty ounces, with a varying range of eight ounces. Of this about thirty-six ounces remained in the clothing, the remainder having probably been lost in respiration, transpiration from the face and hands, or evaporation from the clothing.—A. M.

But why should there be any restrictive laws on this subject at all? Why may not a man restore to his body the water which has just been extracted from it—water which is necessary to its comfort, health, and efficiency? It is the most natural of all natural demands, the most simple of all requirements, the most salutary and safe to gratify. We never think it necessary when hungry to refrain from eating, when tired to refrain from resting, when cold to refrain from warming, or when hot from cooling ourselves; then why refuse to drink when thirsty, a requirement so natural and springing from causes so apparent[1]?

[1] In cases of extreme thirst the best plan is first to cleanse the mouth and throat, either by rinsing it with a mouthful of water as a gargle, or by chewing a morsel of bread or biscuit and spitting it out when lubricated, and then to swallow slowly a few mouthfuls of the liquid; again to repeat the rinsing and the chewing, for the mouth and throat having been the place where the thirst was most severely felt, the salivary excretions at this time are unfit to be conveyed into the stomach; again to repeat the mouthful-by-mouthful mode of swallowing until thirst has become a little allayed. By this means the water will be conveyed into the blood almost instantly, leaving no quantity to remain in the stomach; after a little space the luxury of a hearty *drink* may be freely taken. I have myself followed this rule under the fullest extremes of heat and thirst, meeting the simple demand for the fluid (by the sensation of thirst) by quenching it at the first opportunity, adopting only the *natural* precaution of restoring it gradually, approximating the restoration somewhat to the manner of extraction, and always with increased comfort, health, and bodily power;—not only during special exercises which I was laboriously practising, but when traversing on foot, in mid-summer, some of the hottest parts of Europe, when, as the natives complimentarily have it, 'everything was asleep or in the shade but dogs and Englishmen.'—A. M.

I am speaking, of course, of that general thirst which is the result of the diminution of the fluids of the body, and which is the exponent of its demand for their replacement; for although the sensation of thirst is always the same, and has its seat in the same locality, viz. the mouth and throat, yet there seem to be in reality three distinct kinds of thirst, springing from different causes, indicating different conditions of body, and susceptible of being assuaged by different modes of relief. In considering the subject of thirst, and the best manner of its alleviation, it is important to distinguish between these three kinds, because the overlooking of such distinction has been, I think, the cause of much of the disagreement of opinion on this important subject, by men whose opinions and statements are in every way worthy of the most serious consideration.

First, there is what may be termed *general* thirst, which is the expression of the demand for liquid experienced by the whole system, to supply the place of liquid with which it has parted, consequent usually upon bodily exertion or extreme external heat. For this form of thirst there is but one real means of cure, viz. the replacement of the fluid which has been extracted,—drink, in the simplest form obtainable.

Secondly, there is what may be termed *local* thirst, the requirement being in a great measure limited to the mucous linings of the mouth, throat, and air passages. This thirst arises from no loss of fluid experienced by the system, but from local dryness and irritability, occasioned by their frequent contact with dry or heated air, dust, or other irritating influence. It may therefore be cured by any means calculated to allay local irritation, and to stimulate to action the glands of the parts affected; such as rinsing the mouth, chewing orange or lemon-peel, sucking a pebble, or swallowing butter. Drinking in this case can obviously afford little or no real relief, and is to be avoided, as filling the stomach with liquid for which there is no demand experienced by the system [1].

There is also a third kind of thirst, arising from no loss, local or general, which the body has sustained, but caused by the presence in the stomach of some irritating article of food, requiring fluid for its dilution. This is the thirst experienced after eating salted or spiced food, or drinking exciting drinks. It can be alleviated by drinking, but will only be cured when the offending substance has been dissolved or removed from the seat of irritation.

Nor is it necessary to adopt greater precautions in satisfying thirst than other bodily wants. It is

[1] The thirst experienced by men immediately after the race is a combination of both general and local thirst; for during the greatly quickened respiration the air expired does not contain the usual amount of watery vapour; and the dry air inspired and expired with such extreme rapidity will cause local thirst of the most intense description. Care should therefore be taken to alleviate this sensation by any of such means as are mentioned above, before proceeding to satisfy also the general demand for fluid.

important not to drink too fast or in too great quantity in times of extreme thirst[1]; just as it is important not to eat too fast or in too great quantity in times of extreme hunger. It is advisable when thirst is extreme to refrain from drinking suddenly or in large quantity, not because the stomach is heated by exercise—for the heat of the stomach and of all the internal organs in health is always nearly the same—but because at such times liquid should not be taken into the stomach faster than its absorbent vessels can take it up and convey it to the blood. And it is desirable equally to avoid the accumulation of water in the stomach, or its too sudden and copious introduction into the circulatory channels. For this reason any property in the liquid imbibed which proves an inducement to drink slowly, and at the same time stimulates the glands of the mouth and throat, where the *sensation* of thirst, when it has been acutely felt, often lingers long after the actual wants of the body have been supplied, is a great advantage[2].

[1] The same influential authority who has foreseen the necessity of variety of food, permits a man *at the end of the day* to 'drink as much cold water as he has a mind to.' Now I submit that this is not what is wanted. Men are not at such times either to eat or drink of anything 'as much as they have a mind to,' but carefully and heedfully to mete out the supply to the actual requirement. Moreover, this wholesale gratification of a protracted desire must be indefensible. A little and often is the true principle. The *demand* for drink should never be allowed, so to speak, to accumulate. See Appendix E, No. 6.

[2] For this purpose there is nothing better than lemonade.

I had never been able to comprehend how the idea of restricting this natural demand of the body for fluid arose, or, having arisen, how it could be perpetuated and carried on from year to year; or what benefit a man was supposed to derive from it, and from all the misery and discomfort he thereby suffered, until I came upon the 'internal fat' theory, and then there was no mystery about the matter; for even when this 'great enemy of rowing-men' had been expelled, as evidenced by the reduced weight, yet somehow if the man was allowed to quench naturally his natural thirst, by the simplest of all means, by a draught of pure water, the lost weight was all restored, the 'enemy' had returned in full force, and it had all to be done over again. Therefore it has been decreed that—no matter what the circumstances may be under which the thirst is caused—hot weather or cold, much exercise or little; no matter whether the man's stature be large or small, or whether he perspire freely or slowly; whether it be at the beginning of the training, when the work is new and severe, or later, when he has become familiar with it and it is easy;—at the beginning of the training, when all the efforts and exposure tell tenfold as strongly, in this respect, upon the frame unused to them, as they do towards the close, when the law of adaptability is beginning to mitigate the misery of the deprivation [1]; under any

[1] Some men suffer from thirst to the last.

circumstance or condition of body, his drink shall be one, or at most two, cups of tea at breakfast, one pint of beer at dinner, and one at supper. There is no point in training upon which a man stands so firmly as this[1].

After seeing the part which water plays in the animal economy; after seeing the amount which the human body daily loses, and must lose, if it is to remain in health, even in ordinary and unexposed life, it follows as a matter of course that a man at the end of a day of training practice, with a very restricted allowance of liquid, will be considerably reduced in weight; but it is the reduction, not of a burden which he had to carry, but of *himself*,—of himself most emphatically, because his muscular and nervous energies are all reduced by it, as evidenced by the irritability of a man suffering from thirst, his restlessness, sleeplessness, his dry and feverish skin[2], his parched mouth and cracking lips;

[1] One authority simply declares that drink should be avoided altogether! and that 'the man who can be satisfied with rinsing the mouth and gargling the throat with water, will train better than he who drinks any kind of fluid, even in limited quantities.' There is a notion, too, that '*solids only* conduce to strength, and tend to supply the waste which takes place in the system,'—a notion so stated by a writer on the subject,—and that therefore all moisture or moist food is injurious or in some sense objectionable. For this reason even stale bread is by many men rejected, and crust or dry toast substituted. See Appendix E.

[2] An M.D. writing on the subject says: 'Excessive thirst (in training) is a sign of feverishness, and should not be encouraged in much drinking.' The advice may perhaps be questioned, but accepting it as sound, what in this case caused the feverishness?

and all because the moisture extracted from his body has not been restored; for it was essential to comfort and to health, to the tone of his nerves and to the contractile power of his muscles. These have been as fairly deprived of a portion of their mechanical force, as palpably, as if certain of their fibres had been extracted from their sheaths. No man, that is, no healthy young man of the class of whom I am speaking, would permanently lose weight by exercise, if these dietetic restrictions were not in force. He would *gain* weight and not lose it, and gain it too in proportion to the amount of exercise taken and the energy with which it was pursued, for this is the organic law regulating growth and development, as already described. So well is this understood in the army that if a recruit loses weight by exercise, it is considered a subject fit for medical enquiry.

The theory however is, that the weight lost is fat—internal fat; the man is 'training down,' or 'training fine,' and therefore this reduction of his weight is a subject of rejoicing and congratulation. Give him five minutes at the first pump and he will soon train 'up' again. I have walked down the river side, night after night, and seen every rowing-man in the twenty racing-eights sitting at his oar. I have gone from barge to barge and seen every rowing-man get into and get out of his boat, and in a season's crews I have not seen one man whose weight I could reduce by exercise, but the reverse. These are not the men, and this is not the age, at which it is *possible*, with adequate diet and adequate rest, to reduce the bulk or weight of the body by exercise. One method alone remains capable of doing this: extract from the body a quantity of its fluid, which, as we have seen, is part of itself, enact that this fluid shall not be restored, and you have the man reduced by the amount of the extraction.

I have spoken thus strongly of the error of an inadequate supply of fluid in training, but, in my opinion, under the present laws of training, the reduction of weight is also due to inadequate muscular exertion. The partial employment which Rowing gives, the sameness of the employment, the disproportion which *resistance* bears to *movement*, the nominal weight of the boat, the less than nominal opposition which the boat encounters from the water, with the exaggerated respiratory action, all tend to this end, and all contribute to produce what I observe to be the inevitable and invariable results of training tactics—loss of bulk, loss of weight, loss of power. And the question here presents itself, and does so in a manner to admit only, as it seems to me, of an affirmative answer, 'have not these dietetic restrictions re-acted injuriously upon the administration of the other agents of health—on exercise, for instance, by making the thirst already induced literally insupportable, if aggravated by bodily exertion?' For no man already parched with thirst would voluntarily take exercise to increase that thirst, and if induced to do so from conscientious adherence to training rules, his strength would be impaired, not increased, by such exercise: and the notion would be started, or, if already existing in his mind, confirmed, 'that exercise took it out of him.'

But I believe that, although the internal fat theory has been the means of perpetuating this restriction with regard to liquid, yet that the law of restriction had a legitimate origin in the customs of the times when it was probably first instituted. I think it might perhaps be traced to the times when boating was in a measure limited to watermen, and boat-racing consisted of their periodic trials of skill in their craft; and with such men at that time, probably, restriction on their ordinary habits of imbibition of liquids was the most salutary rule that could be framed and enforced; because the habits of inactivity and self-indulgence consequent upon frequent or prolonged drinking, would be the reverse of what was required for that bodily condition favourable to success in boat-racing; for muscular power played no secondary part in those days of heavy and bulky boats, encountering great aqueous and atmospheric resistance, and with all their propelling gear and fitments of a comparatively unskilful kind.

When Rowing passed from the stage of being merely 'patronised' by 'gentleman amateurs' to being adopted by them as a recreative exercise for themselves; when they came to the water to learn of the waterman the waterman's work, doubtless they would learn, and doubtless also they would adopt, the waterman's ways, of preparing for it; and perhaps at that time it was the wisest course they could adopt, and perhaps also at that time the difference in habits of intemperance, if any, might rather be in favour of the professional rower.

Everyone who can look back for even a quarter of a century, will admit the immense improvement that has been effected in this direction. The change I believe to pervade, in a greater or less degree, all classes of men; but in that of which I am now specially speaking, and speaking on the strength of careful observation—of men who pass through public-school and University life—the improvement is so great that little is left to be desired.

Now it is my firm belief, a belief also founded, I may say, on the strength of careful and extensive observation, that these restrictive training laws and regulations, carried although they may have been to injurious extremes, have been most influential agents in the working out of this reform: agents to which all the corrective and preventive measures of local authorities, of proctor and police-power united, have been as nought; for the crowning value of this reform is that it has come from within, from the men themselves. There has been no prohibitive *Thou shalt not* in this case; the regulations and the laws all were and are voluntary, handed over and handed down from man to man, from school to school, from college to college, and University to University; aye, and beyond the University too, inculcating the idea and habituating men to its influence, that intemperance and self-indulgence are incompatible with health, strength, or activity; that energetic and regular habits, implying early hours of rest, early hours of rising, hard beds and spare bed-clothes, and frequent and abundant use of cold water, are all agents in promoting physical power, all means of obtaining physical distinction. 'The glory of a young man is his strength.' Amen. Among mundane things he will never find a better.

But the severity of legislation and the stringency of laws may surely be relaxed, when the evils which they were designed to prevent or punish are virtually abandoned, and culprits err only in their eagerness for well-doing. Granting the soundness of the advice, given by an authority, as to the desirability of reducing the fat of the body, when it has so accumulated 'that the shoulders are clogged and loaded,' and the 'belly' is so 'bulky' as to prevent a man from 'reaching over his toes;' yet if no such accumulative encumbrances exist among rowing-men of the present day, the value of the advice is lessened. Sound, again, may be the advice as to the mode of training for 'a gentleman's son,' who, on coming to the University, takes to hard drinking, and other amiable practices, and is threatened with an attack of *delirium tremens;* but as no such gentlemen's sons now-a-days happily *do* come to the University, or if they come, happily or unhappily, are not likely to pull an oar in a College Eight, or be admitted into the society of those who do, the usefulness of the advice is lessened, and its necessity, like the time and the occasion of its enunciation, has passed away.

Nevertheless, the obsolete advice is taken up, and kept up, and acted on, and applied to those whose ways of life, and whose bodily constitutions, and all whose material and immaterial surroundings, are essentially different. It is like applying a prescription prepared for a *bonâ fide* patient to a man sound in wind and limb; and just as the prescription aimed at making a sound and healthy man of the patient, so will it when thus misapplied make a patient of the man now healthy and sound.

To speak distinctively of the separate meals. The staple article of the first meal, about eight o'clock, is either beef or mutton, and, as we have seen, the selection is a wise one. The everlasting beefsteak of former years has now a divided sway with the mutton-chop, and in some colleges it is more varied still. This is a great advantage, and the range may very safely be made wider yet. Eggs, unless poached, are still excluded, (why ?) and even when eaten the white is rejected. A man in training, with his dread of fat, would be shocked to find that in eating the yolk he has swallowed what is little more than a ball of oil, and in rejecting the white he has rejected an article of almost pure albumen, the special pabulum of the muscular tissues. Undoubtedly stale bread is better than new, but not from the fanciful virtue of being 'better for wind.' It is better than new, because during mastication it can be better broken up, and the saliva can more freely penetrate it, and so more readily and rapidly prepare it for the next stage of digestion. New bread is liable to be worked up during mastication into a tough doughy ball, merely externally lubricated. Butter in itself is most wholesome, and furnishes an excellent aliment of the oleaginous class, the presence of some article of which we have seen to be essential to the perfect conversion of food into blood; but men who find it difficult of digestion should avoid it. Tea is preferred to coffee, and, in my opinion, on very insufficient grounds; for the allegation that the latter is heating is far from being substantiated, and hardly agrees with its universal use throughout the East and on the Continent. Choice in this respect may safely be left to the individual, for although the active principle of the two beverages is so nearly alike as to be almost identical, yet their effect differs with different constitutions. The chief thing to be guarded against—and this applies to all drinkers of tea and coffee, as well as to men in training—is not to drink them too hot. There is nothing more injurious to the stomach than hot drinks of any kind, and could drinkers of them only perceive the delicacy of the membrane which lines the throat and stomach, no enforcement of this advice would be required. Indeed, from a knowledge of the injurious effects of drinking warm liquids, as also from a knowledge of the tonic and invigorating properties of the excellent French wines now largely and cheaply imported into this country, I am of opinion that their adoption in Continental fashion, *i. e.* largely diluted with cold fresh water, would be a far better morning beverage, for men undergoing special physical exertion, than either coffee or tea.

The hour of dining is well selected, leaving five clear hours between the principal meals, and about the same space of time between the last and the rowing. The same principles which guided in the selection of the first meal, should guide also in the second, *i. e.* plain and substantial solids with simple and unexciting fluid. The importance of an abundant supply of vegetables is often lost sight of. The mere drinking of water or other liquid will not entirely supply the want in the blood for moisture, at times when it is often and largely eliminated from it; it is desirable that a certain amount of fluid, proportionate to the amount and nature of the solids, should be slowly extracted in the ordinary process of digestion from the solids themselves, and of this vegetables contain a large proportion; moreover the inorganic substances which they contain, and which we know to be essential to the health of the body, are not attainable in the same form from any other source. A fair proportion of vegetables is therefore absolutely necessary to the healthy condition of the body: not rice and sago, but actual roots and leaves and green seed-pots; of these let men freely partake, avoiding all fanciful selection [1].

There can be little doubt that all pastry and made dishes should be excluded from the table of a man in training, from the simple reason that all compositions of fatty matters and flour are difficult of digestion, and contain little that is nutritive when digested. *Le jeu ne vaut pas la chandelle.* The energies of the digestive organs are taxed severely by a substance which gives no adequate return for the labour. Therefore the rule of avoiding all kinds of pastry and made dishes is a necessary one; although it certainly borders on that step said to be next to the sublime, to see the look of horror and consternation with which men, whose stomachs could digest cast steel, eye a square inch of raspberry-tart!

There are also a number of proscribed articles

[1] What has been said of the restrictive laws against water may be said with equal truth about those against vegetables. The same authority who cuts off all liquids, limits the supply of vegetables to a 'good potato now and then, for a change! This is the only vegetable a trainer should use.' See Appendix E.

usually classed under the head of *condiments*, such as pickles, spices, seasonings, and sauces; all these are best avoided. They are not only stimulants to eating beyond the natural appetite, by varying the flavour of the viand with which they are taken, but many of them are insoluble without much water, and are thus a second cause of thirst beyond the want of liquid in the system.

It is not however from fear of the consequences to their digestion, but to their 'wind,' which makes men avoid forbidden aliments, acting on the idea that respiratory power is obtainable from special articles of diet. The respiratory power, or wind, is doubtless unfavourably affected by the presence in the alimentary canal of any substance which actually taxes digestion. So also bulky food which distends any part of the digestive apparatus affects wind for the time being, because it prevents the due depression of the diaphragm and contraction of the abdominal muscles. But beyond this it is difficult to understand how any special article of diet can improve respiratory power. This idea is more than a negative evil, for it leads men to neglect the one means which can give it—exercise adequate to develope to their full capacity the parts of the body which perform that function.

The slight supper about six or seven hours after dinner is unobjectionable, and the bread and cold meat of which it is usually composed may be legitimately accompanied by a moderate allowance of beer. For at this time, the entire body is not only less elastic, less springy, and less sustained, but reduced in weight, in girth, and in height[1]. The action of the organs of respiration is less energetic and regular, and the organs of digestion have probably also to a considerable extent lost their power, and may therefore be advantageously stimulated by such a draught, or by a glass or two of wine, according to the habits or inclinations of the man; an advantage not equally felt if these liquids have been taken at the preceding meal, when no requirement for a stimulant could be experienced[2].

All use of tobacco is forbidden to men in training; and I would quite agree with the restriction if it were forbidden in non-training times also; but I hold it to be from the purpose of training, suddenly or greatly to change a man's habits in anything, and especially in such as notably affect the nervous system: and I know that many a man would far more willingly go without his dinner than his pipe, until the periodic craving has been overcome, and

[1] After a day of active exercise a man of middle stature will probably be half an inch shorter than he was in the morning.

[2] A glass or two of good wine will often be of the greatest value as a restorative from depression and a promoter of sound and refreshing sleep. Let however no fanciful regulations influence choice, like those in vogue with some professional trainers, who allow to pedestrians two glasses of wine per diem and to boxers the samé quantity, but to the former sherry and to the latter port!

the jarring nerves have learned to be composed without the aid of the accustomed sedative. Let it not be from this supposed that I advocate the use of tobacco. I would only advocate the rational system of not suddenly breaking in upon a man's fixed habits, at the time you are asking for the effective display of his greatest bodily energies. There is no subject so open to controversy as the practice of smoking, and none which enlists opposing champions more able, earnest, and enthusiastic; and yet when the arguments and positions are dispassionately examined, it is discovered that, as sometimes happens in more important contests, and with more exalted combatants, they are in reality nearly agreed, and that a little yielding of each extreme would reconcile them. Thus it is admitted by the intelligent opponent of smoking that, in middle life, and at the close of an anxious, harassing, and fatiguing day, the gentle sedative of a cigar or pipe may be a safe and valuable agent in soothing an over-excited brain and over-irritated nerves; it is equally freely admitted by adult champions on the other side that, during juvenescence, before the real battle of life has begun, when there is nothing more serious to harass and fatigue body or mind than the preparation of studies and the pursuit of amusements, there does legitimately exist no such requirement. And every one, whose opinion on the subject is worth having, is agreed in this, that the narcotic which may be harmless to the mature frame of manhood, may be injurious in the highest degree to the immature frame of youth. I have never seen the young man who did not smoke, whom I thought could be benefitted by doing so; while I could count by hundreds those whom I have known to be injured by the indulgence. But when the habit has been acquired, and confirmed by use, the eve of the races, or the short period of preparation for them, is not the time to break it off, and least of all should it be done suddenly.

In Appendix E I have given an abridgement of several training systems, which will shew the variety of opinion which exists on the subject of diet. It has been remarked that this variety is an advantage, because 'as no one system will exactly fit every man, it must be made a little elastic, or something must give way somewhere.' But it must be remembered that this variety of opinion is not held with this view; the variety is the variety of disagreement, not of toleration; each authority holds to his own as the one true faith. Each advances something new, each condemns something old, until there is nothing new to advance and nothing old to condemn. For example, one advises to sup on half-a-pint of weak gruel, with a few raisins and currants, and a glass of port wine in it; a second, on the gruel with the raisins and currants, but without the wine; a third, on the gruel, but without either raisins or the currants or wine; and a fourth on nothing at all! Again, men take their stand on their beef and mutton—there they feel secure. Mutton or beef, roast or broiled, with a sprinkling of salt for seasoning, by these they hold amid the shifting quicksands of training dietetics. But no; beef, their last refuge, their sheet-anchor, is slipping. It has been discovered 'that mutton is better than beef for wind, and roast better than broiled.' *Nil desperandum!* Let a man hold on to the mutton, roast: aye, but if he does he must eat it without salt, for salt it has also been discovered 'is bad for training.'

But the good sense of a practical man cannot be quite at fault, even when groping about bewildered among dietetic crotchets. 'The north-countrymen,' says H. Salter, 'are not often so particular as those on the London river, as they frequently have fruit, rice-puddings, &c., but after all, as in this instance, where the bent is so decided, the great thing in training is to find out as soon as possible what mode of living the subject has been accustomed to, and as it must to a great extent be the most suitable to his peculiar case, to adopt it without hesitation.'

It has been already remarked that the alimentary properties of food, and its digestibility, are much influenced by *cooking;* and on this point also men would seem to have wandered from the right path by their extreme desire to avoid the wrong. Having learned that over-cooking hardened the fibre of meat and lessened its nutritive value, they have gone to the opposite extreme and eat it nearly raw; ('underdone' is the term applied, but it is not only often 'blood-raw' in the interior, but, as I have often seen, simply as free from influence of fire-heat as it was when it hung in the butcher's shop.) The steak or chop to be merely 'warmed through' is held to be quite sufficiently cooked for men in training[1], but it does not often get even this amount of cooking, as taste and smell can testify, and colour too, for the dark dull leaden hue of raw flesh is there still. I have seen men swallow such food with as much repugnance as if they were taking physic, never 'sticking their teeth into it' at all, but 'bolting it' in pieces, with the aid of the niggardly apportioned tea, or equally niggardly allotted beer. Yet men wonder that on such diet as this they are assailed by diarrhœa or constipation, that boils rise in groups, that blisters canker into sores, and that wounds do not heal!

There is a favourite mixture which must not be overlooked, viz. egg in sherry. Medical men prescribe it to patients, as containing at once a stimulant and nourishment, when a stimulant is required, and nourishment cannot be taken in other form; but surely crews of racing-boats need not aliments in such form. Moreover, it has been recommended to be administered to men 'just as they are stepping

[1] It will be seen in the Appendix E that on this point also authorities disagree.

into the boat.' Now how will this mixture, so administered, act upon the man who has swallowed it? The wine will act upon his nervous system immediately, whether beneficially or not is another question; the egg will remain in his stomach *as egg* until long after the race is over, and will aid him no more than if it had been put into his pocket.

There is no danger whatever in going into a rational system of training, but there may be considerable danger in going out of it, if not done gradually; if the dietetic restrictions be relinquished too soon, and the physical exertion too suddenly abandoned. Indeed the custom still in vogue with many, of instantly, the very night of the last race, flinging off all restraint, is suicidal,—and the ill effects are laid upon the Rowing. The very fact that the exercise has ceased, requires increased watchfulness, for a space, over the appetite. The same law which should regulate all changes—gradual advance and gradual retreat, is here not only desirable but necessary, and that in proportion to the extent and duration of the departure from the ordinary habits of the individual. I am the more earnest in calling attention to this point, because training, when conducted on rational principles, is the most important means of ensuring the safety and in promoting the efficiency of the rower; and from the alacrity with which men enter upon its duties, encountering with the utmost good-humour all its *petites misères*, and resisting, with the most exemplary self-denial, all temptation to break through its irksome but self-imposed restrictions, I feel sure they have but to be convinced of the importance of the recommendation to adopt it.

PART III.

Exercise to create the demand; Food to yield the supply;—what is needed to complete the process of renovation?

Sleep;—during which the incorporation into the living organism, and the endowment with vitality of all new additions, take place.

The amount of *time* required for this purpose varies not only with individuals, but with the same individual at different periods of his life, and is influenced by various causes, and by the action of the other agents of health, and specially by Exercise. The growing and immature frame evidently requires a much longer time for recruitment than is found necessary at a later period of life, when growth and development are completed; as might be expected from the facts that in the latter there is but the day's waste to restore, the day's 'wear and tear' to replace; whereas in the other, there is the permanent and continuous demand for the body's enlargement and consolidation. Thus the requirement is greatest in infancy, when growth is most rapid;

gradually lessening through childhood and youth, on to adult life; remaining at its minimum over able and active manhood, and again increasing in old age.

It is customary to name eight hours as the standard amount of sleep, required under ordinary circumstances by an adult in fair health; but I am inclined to think that in the greater number of instances this considerably exceeds actual requirement, and that habit, in this, as in many other things, has contributed to establish a fictitious want. Six or seven hours will, in my opinion, be found adequate, after a month or two of systematic and gradual abridgement, to yield all that mind or body can need. Certain it is that with care, sleep can be, if the phrase might be used, *condensed;* we might get in a shorter space what we require, without lessening its value.

There is a belief that sleep to be perfect must be begun before midnight, and the saying is as well credited as it is familiar, that one hour's sleep before midnight is worth two after it. The theory upon which this idea is founded, or rather the theory which endeavours to account for this idea, having accepted it as fact, is perhaps too fanciful to be convincing, although it embraces some facts which do not otherwise seem explicable[1]. I think the real

[1] The outline of this theory may be thus sketched from *Hufeland's Art of Prolonging Life;* translated by ERASMUS WILSON, M.D. Every one who has had the painful duty of sitting by the

origin of the idea may be traced to this: that early retiring to rest, so as to secure the commencement of sleep before midnight, ensures that the body shall not be overtaxed by excitement or dissipations in addition to the day's toil; and that it being observed that, when this was done, so as to enable this necessary agent of health and strength to come into operation before midnight, recruitment was more complete, it was believed, or it was thought a desirable precept to advance, that there was a special virtue in the pre-midnight sleep.

It must, I think, be viewed as one of the errors of

bedside of a sick friend must have remarked the increased nervous excitement manifested at the advent of evening, and culminating to a crisis towards midnight. This excitement is not confined to patients, but is shared by every one whether sick or in sound health, but it is most *noticeable* in feverish patients, because in them it is intensified in proportion to the activity of the fever from which they are suffering. This feverish state of nervous excitability is not unknown to medical men, and by them familiarly called *Evening Fever;* for during it not only is the nervous system, including the cerebral organs, in unnatural activity, but the pulse also is quickened and progressively culminating to the midnight crisis. The cause of this periodic fever is surmised to originate in 'the absence of the sun, and that revolution of the atmosphere which is connected with it;' as it begins with the time of his disappearance, and its crisis is observed to coincide with the period when he is in the Nadir, or midnight; and secondly, it is surmised that it is during this crisis that the renewal of all waste of the body experienced during the past day, the act of incorporation of all new material in the living organism, is effected; and that when this crisis is permitted to pass before sleep, such incorporation must be untimeously, and therefore imperfectly performed, and the renewal of tissue from previous waste imperfectly accomplished.

training tactics that men are encouraged to take too much sleep; at any rate to spend too much time in bed. What requirement can young men, undergoing such bodily exertion as present training practice involves, have for ten or eleven hours' sleep[1]? What need to spend nearly half their time in bed? In this, as in most things, some men will require more than others, but speaking generally, seven hours will be found abundant at this time of life. To sustain the body in full vigour, if a man goes to bed at eleven o'clock he ought to be out of it by six.

The importance of fresh air is, upon the whole, well understood, and upon the whole, fully appreciated and acted on; but something still may be said regarding the more efficient ventilation of bedrooms. (Speaking in general terms, and bearing in mind the accommodation in this respect yielded by hotels and lodging-houses, college rooms are not unfavourably constructed to admit sufficient air and light for the single occupant. When a deficiency is experienced it is in 'old buildings,' 'garrets,' and 'back rooms.') Whatever may be the cubical capacity of a man's bedroom, or its facilities for changing its atmospheric contents, he holds in his own hands, in a great measure, full power for the unlimited extension of its facilities in both these respects. Let every man, whose throat and lungs are sound, leave his window slightly open; the smallest space will

[1] See Appendix E.

do—a few inches in summer, and in winter half an inch or less, the thickness of the blade of a knife at top and bottom, or at top only; for the difference of temperature between the internal and external air is so much greater in winter than in summer, that it will enter freely at the single aperture without special outlet.

Our organs of external sense are not behind the other organs of the body in their power of adapting themselves to the circumstances in which they are placed, and unless care be taken this adaptability will be too often to our disadvantage. Thus let a man sleep in a small close room, and although in the morning he will awake flushed and hot, he will detect nothing disagreeable in the atmosphere; but let him go into the external air for a few minutes, and then return,—it is insupportable. Has he been breathing this throughout the night? Not altogether, not so bad as this throughout the night; it has been getting worse every minute since he first retired to rest and it is now at its worst; for every breath he breathed lessened its purity. Let him the next night leave his window open, as recommended, and in the morning he will waken without headache or heat, and the flush, if flush there be, on his cheek, will be the effect and the sign of renewed vigour from sound and refreshing sleep. Let him go into the external air, as before, and then, as before, return to his bedroom;—can half an inch of ventilation by a single window do so much?

I would urgently recommend the man in training to rise early. To him who would build up his body in health and strength, this will be the corner-stone of the edifice. There is in the morning air an invigorating freshness which is sought in vain at any other period of the day. There is an absolute sensational pleasure in the act of inhalation of the external air in the early morning, quite special and peculiar. And let him not only rise early, but do this and rise the very first instant he awakes. The fact of his being awake shews that the full recruitment of his frame has been accomplished; that bed can do no more for him, and that after this, every hour passed in the air of the sleeping-room is a serious loss, for in one hour every drop of blood in his body will have many times passed through his lungs, and have been subjected to the air inspired, be it pure or impure. Let him never forget this.

But air is not only valuable as regards *quality*, but as regards *quantity* also, the quantity actually inhaled; and although during sleep the breathing can neither be quickened nor augmented in amount on the inspirations, beyond the actual tidal capacity of the lungs, as it can be while awake by exercise; yet it is susceptible of the reverse process—of being unduly diminished, to the reduction of the oxygen inspired and consequent accumulation of carbonic acid in the system; and by no cause more readily than by too many bed-clothes. A great deal of oppression may be endured from this cause unconsciously, yet not less injuriously than from improper clothing by day. There is a pernicious habit common to bed-makers of pulling the bed-clothes a yard too high, and then folding the over-length back again; thus placing just double the weight of blankets and sheets over the chest, the part of the body which requires it least (for if cold be felt it will not be here, but in the extremities)—the part of the body which is least able to bear extra weight; for from its necessity to rise and expand upon every breath of air inhaled, all accumulation of bulk or weight over it is injurious.

The instant that a man is awake, let him get out of bed; and the instant that he is out of bed, and his ablutions performed, let him open his windows to their fullest extent; thus giving to his apartments and their furnishings what he gives to his body by the agency of water; for these two agents of health should ever go hand-in-hand, fresh Air and fresh Water.

Bathing must be viewed as an agent of health in two distinct aspects: first, in its capacity as a cleanser of the skin, and secondly, as an agent of considerable tonic power. In its first aspect it addresses the skin as the organ of transpiration only; in the second, as the organ of common sensation, possessed of great nervous sensibility and influence. In the first, it addresses the skin with the view of removing from it all impediments to functional ability, and arousing it to greater activity; in the second, it acts directly through the skin upon the nervous and circulatory systems.

In viewing the bath in its first aspect, as a cleanser of the skin, we must remember that the entire surface of the body is continually pouring forth streams of fluid exudations, separated from the blood by the glandular roots of the perspiratory and oil tubes with which it is closely studded. It is through the skin that the medium temperature of the body is mainly preserved, and the perspiratory ducts form the main channel through which this important operation is performed; for moisture being a powerful conductor of heat, perspiration eliminates the heat from the body, when produced in excess of its wants, as in exercise. Some idea of the extent and importance of this excretory process may be formed, since it is computed that the number of these ducts and tubes, over the whole extent of the body, average no less than 2,800 to the square inch of skin. A second process, of a somewhat cognate nature, equally important to life and health, and equally marvellous in extent, is that of the oil ducts and glands. These, with the exceptions of the palms of the hands and soles of the feet, pervade the entire surface of the body, though less regularly than the perspiratory ducts; for in some places they are few in number, slightly spirated and of small diameter, while in others they are thickly crowded, wide and straight, with large convoluted roots. These glands secrete an oily fluid, which is exuded through the ducts and poured over the surface of the skin, for the purpose of lubricating and softening it, and thus keeping it pliable through all atmospheric changes, and every degree of heat and cold.

It is through the perspiratory ducts that what is called 'insensible' perspiration (*i.e.* that which is vaporised and carried off as fast as it is secreted) is constantly poured forth, and it is through these ducts that moisture, not necessarily in excess or superabundant, is in a great measure drawn from the blood in forced perspiration, for the equalisation of the body's temperature during muscular exertion or exposure to great external heat [1].

It is evident that the rational clothing of the body must, in a measure, be regulated by a knowledge of this function of the skin which covers the body's surface and which regulates its temperature; and clothing will be comfortable or otherwise, sanitary or otherwise, as it is fashioned to admit of the escape of the vaporised moisture constantly rising from the

[1] When the perspiration is the result of great external heat, it cannot properly be said to be secreted by the skin, being in a great measure simply passed though it by the process called transudation.

skin,—sufficiently loose, and open, and porous, to permit the heated air around the body's surface to escape. Otherwise oppressive heat would rapidly be accumulated and held around the body, and extreme exudations of fluid extracted from the blood would in consequence equally rapidly take place.

We shall see, when we come to speak of clothing more in detail, how far this principle is observed during the exercise of Rowing; but I mention it here to shew how a knowledge of it has put into a man's hands a means, by which he can rapidly lesson the weight of his body. He has but to accumulate covering upon covering, so that they will not allow the heat generated by exercise to escape from the surface of his body, to cause the copious extraction of the body's fluids; and the body is just as capable of material reduction by such means as if, in Abyssinian fashion of obtaining a beefsteak (where the skin is lifted and the steak is cut from the living animal), a given bulk of flesh were cut from his trunk or limbs.

The great cause of error in these forced perspirations lies in the idea, that perspiration is in whole, or in part, *fat*—that it is actually the accumulation of fat in or on the body which is thus visibly and tangibly melted away. Hence the belief that fat can be reduced by the presence of external heat. Now perspiration and the reduction of fat, although they may be brought about by the same means, have in reality nothing to do with each other. Perspiration contains fat only in an infinitesimal quantity, and this is drawn directly from the blood. The amount of fat deposited in the body can only be lessened by one of two means. First, by exercise; for by muscular exertion circulation is quickened, and respiration is increased, by which a greater quantity of oxygen is inhaled; and whenever this is the case a proportionate amount of carbon is demanded to combine with it for combustive purposes; and the carbon is found most readily in the fat and analogous substances already deposited in the body—or supplied in food. This already points to the second means of reduction of fat, namely, to withhold it and other heat-producing substances from the food,—thereby causing the absorption of that already within the body,—either by omitting from diet those aliments which contain them in the greatest abundance, or by a general reduction of the amount of food of every kind consumed. For although certain articles contain calorifying substances in much greater degree than others, yet all or nearly all articles of ordinary consumption contain them to some extent, or may be made subservient to that purpose. And thus to take active and energetic exercise, which involves increased consumption of heat-producing substances, and at the same time to withhold or greatly limit the supply of these in food, must directly, under ordinary conditions of bodily health, reduce the fatty deposits.

External heat, therefore, unless accompanied by exercise, active or passive (as the shampooing of the Turkish bath), would rather seem to have the tendency to sustain undiminished the fat already accumulated in the body, because, in proportion to the caloric supplied from without, is the demand for its supply from within diminished; in proportion as heat is supplied by external agencies is the necessity for its production by internal ones lessened—is the store of internal fuel husbanded.

But, it will be answered, the heat produced by heaped-up clothing on the body, during exercise, is not supplied from without, but from within, and that too by the ordinary process of combustion within the organism; its escape into the surrounding air is merely prevented by the entanglement of the numerous body-coverings. And this answer, so far as it goes, is true enough; but it does not take in the whole question. The heat, once eliminated from the body, and thus detained around it, in no way differs, as far as its effect upon the body is concerned, from external heat produced by any other means. Let us put the question somewhat differently. Which would be the most effective, to run two miles in flannel encumbrances, in the manner prescribed, or to run a greater distance without them, the sole object being the reduction of the *fat* of the body?

In both these cases the reduction of fat would be commensurate with the amount of heat actually produced within the body, because it is to assist in this process that it would be absorbed;—commensurate therefore with muscular action, which quickened circulation, and increased the expenditure of nervous influence; and commensurate with respiration, regulating the inhalation of oxygen, with which the elements of fat combine. Now which of these two processes—which of these two modes of taking exercise—would make the greatest demands upon the upstored fuel of the body;—the first, which holds the heat around the body, to be absorbed and eliminated, and re-absorbed indefinitely throughout the exercise; or the second, in which it is set free, and carried off by the atmosphere as fast as generated?

If, however, the sweating exercise were taken for the reduction of *weight* only, and this irrespective of reduction of substance, whether solids or fluids, or whether acting favourably or unfavourably upon health and strength, then the former would be unquestionably the better method; for by this means the extraction of the fluids of the body can be accomplished as directly as by the insertion, if the comparison may be used, of a tap or syphon into a barrel; for the perspiratory ducts dip at once into the current of the blood, and their office is to draw from it moisture, and pour it out over the skin, and to this office they are excited and in this office they are sustained by heat, whether internal or external; and therefore the retention by the clothing of the heat generated by the exercise is a most powerful means to this end.

But it is believed that not only can the fat of the body be reduced by forced sweatings, but that the fat on any particular part of the body, or on any limb, can be reduced, specially and separately, and independent of the remainder, by the simple process of encasing it in extra clothing at the time that the exercise is taken; in simple fact, that its fat can be melted down by the heat induced by the exercise, and held with extra security around the particular part by the extra wrappings; just as the fat could be melted from a joint of meat in an oven. And detailed directions as to the number and nature of these garments to be worn for each and every part, to accomplish these local metamorphoses, are given in books accepted as authorities on the subject.

In the first place, admitting for argument, that fat can be reduced on any particular part of the body by elevation of its temperature yet the temperature of any particular part of the body cannot be raised during exercise beyond the general temperature, merely because it is enveloped in a greater number of wrappings. The wrappings do not make the heat, they only catch and retain what comes out of the body. The heat induced may at such places be more completely prevented from escaping, and there the surface of the body may be warmer, seeing that the atmosphere is prevented from receiving its heat;

but as the heat is the product of combustion within the whole organism, regulated by circulation and sustained by the exercise, it will be distributed uniformly, or nearly so, throughout the body; the exceptions being, when it does occur, *not* the parts bearing the extra coverings, but those most immediately engaged in performing the exercise; because there muscular movement is most rapid and energetic, and there destruction of tissue and expenditure of nervous influence are most continuous, and there circulation is most fully augmented and sustained.

And granting further, that greater heat could be created and sustained at the particular part desired, by means of local coverings, and that this heat thus retained could reduce the fat there deposited, by sweating, still it would not follow that the sweating would be greatest in these parts. The sweating would be then, as it always is and ever must be, greatest at those parts of the body's surface where the perspiratory ducts are the most powerful and numerous, be the part clothed or naked, covered with one garment or many.

I am aware that these practices are sparingly used by rowing-men, and are chiefly used in training for other exercises; still they are used occasionally, and the distinction is not always drawn between them and the exercise for which they have been employed,—in fact Rowing gets the blame of the evil, when evil follows.

Men must judge of the necessity for extreme perspirations, each in his own individual case, and to what extent they should be carried. But of one thing they must be sure, that they are handling a most powerful agent for good or evil, and in the reckless and indiscriminate way in which it is now used, I fear the evil immeasurably predominates over the good. And what is the consequence?—Unless the man has a constitution which one could scarcely expect to find in a draught-horse, there is a miserable break-down, and he is said to have 'trained off.' There is a better phrase for it now becoming current among young men, which is, not that a man has trained off, but that 'he has fallen to pieces.'

I began this treatise by asking the question 'What is training?'—for unless we know what we want we are not likely to know it when we get it, or when we miss it;—and the answer appeared to be, 'That training means to put the body with extreme and exceptional care under the influence of all the agents which promote its health and strength, in order to enable it to meet extreme and exceptional demands upon its energies.' Then what does this 'training off' or 'falling to pieces' mean, when men are only preparing for the contest and struggle, by putting the body *with extreme care* under the agents which promote its health and strength?

Comment on this point is unnecessary. The agents are misapplied, the extreme care becomes a reckless effort at material reduction, through the extraction of the fluids of the body which are essential to its well-being, and instead of being prepared and strengthened for the effort, it is subjected to an ordeal infinitely more trying than the purpose for which the training has been undertaken.

I do not from this mean to condemn sweating altogether; on the contrary, when produced by natural means it is the visible sign that the great agent of training, Exercise, is accomplishing its work, and it is the great means of preserving the healthy condition of the skin—a matter of such great importance to health and comfort—and of performing many other important offices. But sweating produced otherwise than by actual muscular exertion should be conducted with extreme care, when the object is the health and strength of the body, and an equivalent for all fluid so extracted should be carefully and liberally returned in its purest and least exciting form.

Nor do I of course say that there are not conditions of body when this change of a portion of its fluids may not be beneficial to the blood, to the tissues, and to the skin itself; and I do not say that there are not some kinds of competitive exercise in which a reduction of the weight of the body, as the burden to be borne, would not be an advantage; but it must be clearly recognised that, under ordinary conditions of health, the price to be paid for a forced reduction of weight by forced transpiration, implies and involves a reduction of mechanical force also, proportionate to the fluid extracted. Reduction of weight by exercise under such circumstances will be scarcely possible; for the perspiration induced, not by heat artificially collected and held about the body's surface, but by the natural process of secretion, consequent on accelerated circulation and rapid muscular action, will be daily restored by the regular processes of nutrition.

It seemed necessary to make this departure from the observation of the agent immediately under consideration (Bathing), because while the skin is the active medium through which these excretions take place, the bath, especially in its first aspect, assumes a more than ordinary importance in training. It is necessary to health under all conditions of life, but especially so under these circumstances, that the skin should at frequent intervals be cleansed from all transpiratory exudations and from extraneous matters which gather upon its surface, as well as from the wasted particles of its own substance which are regularly accumulating there; for the cuticle or outer skin is composed of layers of cells, filled with fluid from the cutis or inner skin, upon which they are originally formed. Life and death are constantly going on here as in every other part of the body; gradually the inner layers of cells come to the surface, their place being occupied by others constantly being formed, and on reaching the surface the most prominent of them become despoiled of their moisture from evaporation, collapse, flatten, and become disparted from their fellows in the form of dry scales, adhering, unless the skin be regularly cleansed, to its surface by the glandular exudations, to the enfeeblement of the secreting glands (the regular function of which is thus impeded) and the consequent impairing of the healthy condition and purity of the blood itself.

Now simple water has the power of dissolving the saline matter exuded by the perspiratory ducts, but not the oily matter exuded by the oil ducts; for this latter purpose soap is necessary, because certain ingredients in its manufacture have the property of dissolving oily substances. The temperature of the water also greatly affects its cleansing power, for cold water being of a temperature much lower than that of the surface of the body, its contact with it causes the skin and subjacent tissues to shrink, by which the pores or mouths of the ducts are closed, and the lines and declivities in which lie the greater part of its excretions are contracted. A higher temperature has a contrary effect; the skin expands under its influence, allowing the deepest cutaneous deposits to be reached and removed.

In the second aspect of the bath, that of a tonic, its properties are in an inverse ratio to its cleansing power. Here the point desired is what is sought to be avoided in the former aspect, namely, the sudden contraction and shrinking of the skin and subjacent blood-vessels, by which the blood circulating in them is driven inwards upon the internal organs. This is the *rompre pour mieux sauter*, the recoil for an energetic return. The tissues through which the blood is driven are greatly stimulated by this sudden afflux; the action of the heart and lungs becomes more vigorous, back rushes the blood, faster and more forcibly than before, as manifested by the ruddy glow which comes over the body after its sudden immersion. Thus the concussion and reacting effect is not confined to that part of the nervous and circulatory systems which forms the sensory layers of the skin and the fibrous bed upon which it is extended, but is shared directly by the entire body. For the cutis or true skin, of which the cuticle is but the protective covering, is an organ of marvellous delicacy of construction, consisting of a network of nerves and blood-vessels so minutely interwoven, that the point of the finest needle cannot penetrate its meshes without wounding a nerve or severing a minute artery or vein.

In training, these two distinct objects of the bath must be steadily kept in view, and the tonic or the cleansing bath taken as required. It is not unusual to hear men say that they prefer cold water to warm, or *vice versâ*. They forget that they are for different purposes; as well may they say they prefer stockings to boots, or coats to waistcoats. They serve different purposes, although both are necessary to the well-being and comfort of the body.

In addition to the daily morning plunge, I would recommend a tepid bath of about 80 degrees, with free use of soap, to extend over a few minutes only, once in every four or six days, according to the amount of exertion which the frame may be undergoing at the time; and, under ordinary circumstances, I would recommend the dry rub or tepid sponging after exercise, during the day or in the evening. All *dabbling* in cold water after strong or protracted exercise, when the energies of the body are reduced and the temperature of its surface cooling down, should be avoided.

The best time for the cold bath is undoubtedly immediately after getting out of bed, when the whole surface of the body is glowing from its warm coverings; if taken later, or during the day, it should be as soon after the exercise as possible, while the blood is rapidly circulating near the surface of the body, and therefore the re-actionary capacity is at its greatest. It is a mistake to think that the body should be allowed to 'cool down' before the bath, this would be to court a chill. It is less dangerous, but equally fallacious, to think it necessary to dry the body first to 'close the pores' as has been recommended. Nothing can close the pores but one thing, *the shrinking of the skin*, and to do this before the cold bath is to defeat the purpose for which the bath is taken: to do it before the warm or tepid bath, supposing it could be accomplished by the means recommended, which it could not be by any possibility, would serve no purpose good or bad.

In training, the best time for the warm bath is either some little time before dinner, or before supper, a preference being given to the latter when choice is allowed. Under no circumstances should the bath, warm or cold, be taken until some hours after a meal, for reasons similar to those given for the same observance with respect to exercise, *i.e.* from its effect upon respiration and circulation, acting on digestion.

The evaporation of heat and moisture from the body's surface is impeded, not only by the number of garments worn, but by their shape and size, and the closeness of their texture, and the nature of the material of which they are made. Thus linen is more obstructive to the evaporation of moisture than cotton, and cotton more so than flannel, silk holding an intermediate place between linen and cotton.

Now all these points have been well observed by rowing-men in their racing costumes. Two light loose garments, constituting a single covering to the body, are all that is worn. A jersey of spun cotton, a few ounces in weight, and as open as net-work, leaving the neck and arms bare, with loose white flannel trousers; these with a light, low-crowned, narrow-brimmed straw hat for head-gear. Nothing could possibly be better contrived than the dress of the rower.

There yet remains one point which must not be passed over without notice. It is customary for men to physic themselves, the whole boat's crew all round, before 'going into training.' On what rational plan is this done? All medicines, it must be understood, are virtually poisons, *i. e.* calculated to produce a given change in the normal action of some function or functions of the individual; it is the quantity taken and its fitness, which gives them the properties and the name of medicine. On what plea then of fitness or of requirement do all the crew take the same quantity of the same drugs? and what are the advantages which they suppose will accrue from this wholesale purging? The usual answer to this question is, that it is 'to remove the crudities of the stomach and bowels and have a clear point to start from.' What the obnoxious 'crudities' may be, and how they come to get lodged in every stomach from bow to stroke, and how it is necessary to disturb the action of the nutritive organs, when their action is sound and good, by medicines whose virtue lies in producing this abnormal result, or what the 'clear point' may be, if not an empty stomach, and scoured intestines, I have never yet been able to make out.

For Rowing, the medicine usually consists of a simple purgative, but for feats of pedestrianism, stronger measures and medicines are applied; 'salts and senna in the morning and antibilious pills at night, to clear the stomach and bowels and tissues of all extraneous matter.' But even this is mild to what is thought necessary for Boxing. And although training for that accomplishment does not properly come within the intentional scope of these pages, and although the practices to which I shall allude are already greatly modified, still it may be useful to see what has been thought necessary to the acquisition of bodily power in an exercise, where such power was so emphatically required.

'If the person trained, after the second week exhibits signs of irritability, he must be bled and purged well and take a dose of powerful cathartic. Vomiting may be used when the stomach is foul, to get rid of the crudities not cleared by the purging. This radical cleansing is absolutely indispensable to bring the organs of digestion to a healthy state of action.' Surely this will allay the irritability of the British boxer, and surely his crudities will all be removed by this 'radical cleansing.' But no. In addition to this he is to swallow 'one grain of tartar emetic with twenty grains of ipecacuanha, worked off with camomile tea.' And if this be insufficient he is to have, as a simple opening medicine, 'blue pill worked off with senna tea.' How any human body could stand this purging, vomiting, and bleeding, with pills antibilious and blue, with salts, senna, and camomile, with forced sweatings and restricted liquid and semi-raw flesh, stale bread and few vegetables, is to me incomprehensible; no wonder surely that such prescriptions should be followed by directions as to the manner of keeping up the spirits of the *patient*, and how to manage him if he 'trains off' or 'falls to pieces.'

And yet I shall be met with the remark—and legitimately so, because it is marvellous—'See what things men so trained have accomplished!' The truth is, that men who *were* able to stand this were able to stand anything; moreover it is mild, I believe, to what the 'old system' of training entailed, and yet 'see what things men so trained accomplished.' In modern tactics it was principally at the beginning of the training campaign that this 'treatment' was applied, whereas in the old system it was prolonged less or more unto the end—surely without metaphor, 'unto the bitter end.'

I would advise men, in training or out of training, to leave all drugs alone; if unwell, let them go to the doctor in whom they have faith, and take what he recommends, and take nothing which he does not. There is no 'crudity' either in bowel or brain so dangerous as this notion of amateur physicking[1].

[1] That these practices are still, however, on occasions resorted to will be seen from the following extract from a communication from an oarsman of long experience received while these pages were

In the foregoing pages, when speaking distinctly of Rowing, I have been expressing my opinion, as to the best mode of adopting the use of the ordinary agents of health, with reference to training for the College Eight-oar Races in the summer weather, but I would modify some of my recommendations when the training is for the winter races. The requirements of the body in summer and winter are not identical. In winter, diet should be more generous, with a larger share of the third group of aliments, for the heat-producing articles are more in request, and the metamorphoses taking place in the tissues are favoured by a full supply of such food. A smaller share of vegetables will be required, and a smaller amount of liquid, for a much smaller amount of moisture will be eliminated from the body, and much less thirst probably experienced. During the day, and after exercise, all bathing should be relinquished, and the dry rub take its place. There is nothing so injurious, during so much respiratory effort as rowing entails, as a *chill*, and nothing so likely to give it as partial bathing and protracted washing while the body is cooling down after exercise. The thin open jersey, so suitable to the summer,

passing through the press. 'The training of a *Cox* may be interesting as it came under my personal experience. For a week before and during the races Pills and Turkish baths once or twice a week; running daily in heavy clothing; food as little as will sustain life. It is needless to add that after the races he was far from well, having reduced his weight some ten or twelve pounds.'

should now give place to the loose flannel shirt, not only for comfort, but when viewed as an aid to efficiency, present and prospective. Cold acts with a numbing and deadening effect, not only on the nerves of sensation but on those of motion also; under its influence muscular contraction is less rapid, the mobility of the joints less free, and the skin is less elastic. Therefore, however much men may despise comfort and look only at efficiency, let them not retain in the middle of winter the costume selected for its fitness for the middle of summer [1].

But I think, and many will agree with me, that the time is coming when all winter racing will be viewed as a mistake,—without any advantage to the rowers which could not be otherwise obtained,—without interest or pleasure to the spectators (if any),—often interrupted, and sometimes prematurely ended by floods and the severity of the weather. To strip in a frosty wind, or storm of rain or hail, is to diminish by much the aptitude of the body for this special mode of exertion, by reducing its elasticity and suppleness.

It is, I am aware, difficult to say when these races

[1] I cannot do better than give the reply of Capt. Burton, at home preparing for an exploration into Central Africa, when I asked him what *training* he adopted to prepare his body for the hardships he was about to undergo. His answer was significant: 'The best training for work in Africa is, I find, to take the best care of myself that I can while at home.'—A. M.

ought to take place—the time when this militia to the regular army of oarsmen is to be drilled and taught its duty; but doubtless they who manage all aquatic matters with so much judgment could grapple with this also. I only give my opinion as to its effects upon the crews, for to the above objections I attribute many a break-down which I have seen in men of late years. It is forgotten too that these men who are thus exposed are, as a rule, the youngest on the river[1], the least qualified to stand the exposure. They are too inexperienced, too impressionable, to be the *enfants perdus* of the aquatic strife.

To these observations I would add that too much care cannot be taken in selecting men for the work, and in 'coaching' them when selected. Rowing at speed with young hands should be long delayed and very gradually approached. I am not speaking of the advantages of such measures to them as oarsmen, although these will undoubtedly be great, but as to the effect which such gradual initiation into an art, which makes such great demands upon the energies of the most susceptible organs of the body, will have upon present and future health and strength.

The training practice should also be made to

[1] This will, I am aware, scarcely apply to this year's races (1866) in which many senior men rowed; one boat, it was said, numbering five Bachelors. But surely this is from the purpose of these races, which were instituted for the rearing of oarsmen for the College Eights.—A. M.

extend over a longer period than at present,—three weeks of preparation for a series of races extending over half that period; indeed the nature of this preparation and its duration so closely resemble the actual racing which it precedes, that I have found some difficulty in separating them when wishing to speak of them distinctively.

Men should not be selected for skill alone, or willingness alone, for the spirit of a man to enter upon such efforts is often in an inverse ratio to his power to pursue them; but also by their general bodily power and state of development[1]. No man of ordinary stature and fair growth should be allowed to put hand upon an car in a racing boat until his chest has the minimum girth of 36 inches; less will not give him space adequate to the full and fair action of the vital organs within, in the work upon which he would engage; less, no man of ordinary stature and fair growth need pass his eighteenth year without possessing[2].

There are other points which must be left to the candour and good sense of men themselves; such as never to row while suffering from severe cold or any

[1] I missed a man from the Gymnasium a term or two ago, whose exercise I had thought it necessary to regulate with unusual care. On enquiry into the cause of his absence I found him rowing in his College Eight! A man of his measurements was just as fit to walk a thousand miles in a thousand hours as to row a course of College races. His measurements were—(Age 19) height 5 ft. 9 ins.; weight 9 st. 3 lbs.; chest 32 ins.; arm $9\frac{1}{4}$ ins. and $9\frac{3}{4}$ ins.—A. M.

[2] See Appendix L.

inflammatory affection of the chest or throat, and instantly to withdraw from the crew on the slightest indication of any irregularity in the heart's action. It is every man's duty to be candid on these points, not only for his own sake but for the interests of Rowing.

PART IV.

A PRACTICAL COURSE OF TRAINING.

IN the foregoing chapters I have endeavoured to explain the nature of the several agents by which growth and development are maintained, and the chief principles which should be kept in view in their administration, both in times of ordinary life, and also when, under exceptional circumstances, they are modified to accomplish special objects. I will now endeavour to summarise these remarks so as to present a practical course of preparation, or, as it is called, *Training,* for Rowing, both for the Summer and the Winter races. And in order to avoid repetition, I will give in the margin, for reference, the page where the subject under immediate consideration has been more fully treated.

SUMMER RACES.

A College 'Eight,' as a rule, is formed of such men of the past year's crew as may be for the time in residence, together with the best men of the 'Torpid' crew of the current year. The Torpid crews have thus not inaptly been compared to a half-drilled levy still learning their duties, from which the regular forces of College Eights are recruited; while the University Eight has been likened to a small *corps d'élite*,—picked men from all the crews,—organised for a special service.

Page 116. The first point which presents itself on reviewing critically the present system of training for the series of College races, eight in number, rowed in the Summer Term, is, that the time devoted to it is not sufficient;—not sufficient to admit of that gradual and progressive preparation which is, as we have seen, of the very essence of training. About three weeks is now the extent of time allowed, and it would at first sight appear that these regulations were unalterable, because the races are arranged to end before the 'Schools' begin. It is therefore not possible to defer them till later in the Term. But it will be found that there is a week at the beginning of the Term which is, I will not say wasted, but spent in work which might be done at another time; spent in getting the crew together, before any actual course of training is begun. Now I am tempted to ask earnestly, cannot this week be utilized for training, and thus a clear course of four weeks be secured? Could it not be possible for the captain-elect to make the selection of his crew, and to test and confirm it by a few trials or experimental trips, before men separate at the close of the Easter Term? I myself believe that this could be done without any real difficulty.

I will assume therefore that the captain has got his crew together at the end of the Easter Term, and that as soon as they meet after the Vacation he is ready to begin the regular course of training. He has literally not a day to lose, and he must not lose one.

A training day divides itself into three parts, i. e. Morning, Mid-day, and Evening, and this it will be found is no arbitrary or fanciful distinction, but the three portions into which the day naturally divides itself; each division embracing the application of the chief agents of training. DIVISIONS OF THE DAY.

The captain of a crew will probably find no difficulty in seeing all his men up and out of their rooms by seven o'clock on a summer's morning, and it will be to them no hardship, not more than any healthy schoolboy would pleasurably undertake; not only up and out, but assembled on some convenient training-ground ready to begin the morning's exercise. MORNING Page 94.

It is to Exercise he must chiefly look for those changes in his men which we have seen are to be accomplished in a course of training; to Exercise, therefore, he will give his closest attention and unceasing care. The progressive principle must be faithfully followed; every week must see the work augmented, either in distance or in speed, for every EXERCISE Page 4. Page 37.

week will see the men's powers augmented, and requiring for their continued advancement an increase of work. The exertion which would be sufficient for the first week would be insufficient for the second, as again the exertion sufficient for the second would be insufficient for the third.

Walking and Running. Before laying down rules for conducting this course of exercise, which is to consist of *Walking* and *Running*, let us glance at its object and use. What is it designed to accomplish? What is it designed to give? Page 35. First, it will accomplish a very material improvement in all the parts of the body actively engaged in the exercises performed, and we have seen that these are the very parts most actively employed in rowing. This improvement will be so decided that it will be perceptible both in their increased hardness and size, and also by the unmistakeable evidence of their greater vigour, energy, and endurance. Secondly, Page 42. it will directly begin to act favourably upon the organs of respiration and circulation, and this will be evident by the increased facility of breathing, both when going at an accelerated pace, and for a longer space of time; and we have seen that this is the thing of all others to be desired in rowing, for this is the great requirement and here lies the great strain and pressure in rowing. Indirectly also it will accomplish valuable results; the amount of fresh air thus inhaled will have an invigorating effect upon the whole body, and on the mental faculties also, equally susceptible with the physical ones to stimulation and invigorating influences from this source. Again it will act favourably upon the skin by stimulating it to functional activity, and this when carried on in connection with the regular ablution, about to be enjoined, immediately following on the exercise, will have valuable results upon the body's health generally, and upon the condition of the skin specially. It will also act favourably upon appetite, not only by increasing the natural desire for food, but by promoting digestion and assimilation, and all the processes by which food is converted into blood and incorporated into our living frames.

It will be found that the first week of the course of training is the most difficult to conduct. If any one of the crew has a lack of spirit to sustain exertion which may be irksome to him, he will show it now; if he has any weak point in his organisation, it will give signs of its existence now; therefore were there no other reasons for beginning the work carefully and proceeding slowly, these would be sufficient. But there are others of an important nature. It will be found that, out of the eight oarsmen of a crew, one or two will not have been accustomed to rise regularly at seven o'clock even in summer, and that more than one or two of those who have been so accustomed, have not been in the habit of taking anything deserving of the name of exercise.

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For all these reasons, the morning exercise should be, in its initiatory stages, very light and gentle indeed; I would place it in duration within an hour, including the time occupied in going to and from the training-ground.

For the *first week* let two miles be walked at the rate of three and a half to four miles an hour, beginning the walk at the former rate and, towards the end of the week, breaking into the latter; and ever after throughout the training course sustaining the walking at this latter rate.

The *second week* should see an augmentation of the work. Men will now to some extent have become accustomed to the methodical rising in the morning, to the open air, and to the regular exercise. On these grounds this exercise may now be increased in its two aspects of duration and speed. The men should now be on the ground by half past six o'clock. Let the first mile be walked as before, but in the second mile, let the men break into a light, leisurely, easy run; the pace need not greatly exceed that of the walk, but it will be a new mode of progression to the limbs, and the action of the heart and lungs by it will be accelerated.

The *third week* should see a still further augmentation of the work. Let it begin as heretofore with a walk of a mile; at its close let the men break into a run as in the preceding week, but as the race proceeds let the pace be quickened, so that when half the distance is covered the men may be running at speed. From this point let the pace be gradually reduced, so that at its close it will have subsided into the leisurely run of its commencement.

We have now arrived at the *fourth week,* the week that precedes the races, and, as will be presently seen, this and other modes of exercise will have been so augmented as to have gradually brought the body, and notably such parts of it as are to be engaged in any important manner in the approaching races, together with the heart and lungs, to perform their work at a rate of speed, for a space of time, and over a distance approaching to that of the actual race. Limb and lung will be very perceptibly strengthened, and running at a rate approximating to that of speed over the whole mile may now be safely tried. As heretofore the introductory mile should be walked at the old rate of fifteen minutes; but at its close the men should break at once into a sharp run, to be kept up at a regular uniform pace to the end of the mile.

It is desirable that the run should be at a rhythmical and uniform rate, set and timed by the best runner of the crew, and always *within* their powers.

During the *week of the races* the morning exercise should be reduced. Let it consist of a walk, of half a mile only, followed by the run, as in the preceding week.

It must ever be borne in mind that it is not at all desirable unduly or greatly to induce perspiration by CLOTHING.

Page 110. the morning exercise. Men will of course perspire, and that freely if they are in good health, and such perspiration should in no case be suddenly checked, but on the other hand it should not be promoted by heavy clothing or extra wraps of any kind. The rapid muscular exertion and the greatly augmented breathing will of course generate heat, and moisture will suffuse the surface of the body to relieve it of that heat; let therefore the coverings of the body be thin and few in number, that both heat and moisture may readily find escape into the surrounding air.

Page 102. Considerable thirst will be caused by this course of morning exercise, however heedfully it may be taken, and all forced sweating would greatly increase it. Let therefore the clothing worn during the exercise be well chosen, consisting of loose flannel trousers without drawers, a jersey of the thinnest texture, covered by the loose and light boating jacket; the flannel cap, and light shoes. Above all things let the knitted woollen comforter be avoided, and the neck and throat kept open and free.

The return from the training-ground should always be at a smart brisk pace, to guard against any cooling down of the body until it can be entirely divested of its coverings and subjected to regular ablution.

BATHING. Page 95. Were it possible for men to obtain a bath large enough for a complete and instantaneous immersion of the body, such would assuredly be the best manner of performing the morning's ablutions,—the tonic bath *par excellence*. Next to this is the sponge-bath. Page 109. The water should be fresh from the pump, and the bath filled during the absence on the training-ground. The actual application of the water should be brief, rapid, and continuous until completed, but the drying process and the dressing—what may be called the air-bath—should be leisurely performed. The bath will be found an important agent in the assuagement of thirst, apart from its direct beneficial action on the skin.

Diet. Page 44.

The rising at the comparatively early hour, the open air, exercise, and the bath will all have contributed to healthy appetite; not perhaps for the first day or two but certainly within the first week.

Breakfast.

The abundance of wholesome and nutritious food usually to be found on a College breakfast-table leaves no difficulty in making a suitable and judicious selection, for this is the point after all to be observed at the training breakfast. As a rule men can scarcely do better than continue the traditionary chops and steaks so long as these remain attractive. Fish or fowl may with advantage, at intervals, be Page 77. added to, or substituted for, the more substantial fare of beef and mutton. On the other hand, the huge wedges of butter to be seen flanking men's plates in all stages of their varied meal are distinctly to be avoided; marmalade is greatly preferable. Eggs, whether boiled or poached, are Page 78.

both wholesome and nutritious, and contain in small compass a considerable amount of tissue-forming aliment, and may form an excellent support to, or substitute for, the chops and steaks on occasions when change is desired. In truth men can scarcely go wrong provided always they leave off in time. Let them always remember that within a few hours another meal, equally substantial, will follow the one on which they are now engaged, and within a few hours after that again will follow a third.

Page 78.

The exclusion of coffee from the training table is an unmeaning crotchet. In the majority of cases coffee is just as eligible as tea, and many will prefer it. In this matter let every man have that which he likes best, or rather let him have that which on experience he knows likes *him* best. I cannot but here express my hope yet to see what may be called the French breakfast adopted during times of training, that is, the substantials washed down with good sound claret and cold spring water in about equal proportions, or, of one third wine to two of water. After the exercise in the morning on the training-ground, and the stimulating and bracing bath, this cold and tonic drink will be very refreshing; and if a man desires it by all means let him have his cup of tea or coffee after it.

BODILY REST.

Mental work.

Fresh air, exercise, bathing, food; what more is claimed for the body's recruitment and invigoration in this first division of the day? one thing only—

bodily rest, best secured by mental activity. Let the succeeding three or four hours be given to mental work—to College work—and let it be engaged in as closely and assiduously as any other pursuit recommended for the body's training, for assuredly it will greatly assist in its invigoration.

MID-DAY.

We now enter upon the second division of the day, and like the first it should begin with exercise.

EXERCISE.

A glance at the exercise of the morning will show that it was almost exclusively performed by the lower limbs. Page 19. Of course the trunk, and notably its lower region, and even the upper limbs, come in for a share; but speaking broadly the work was addressed to, and performed by, the muscles of the lower limbs, and following the unerring organic law, as it was these who did the work, so it is they who will reap the reward; i. e. it is they who will gain the increase in size and power.

Another point, and this not inferior in importance to the first; the exercise induced great activity of heart and lungs, activity gradually and methodically increased, and this activity thus induced and regulated has an effect as improving to these organs as increased activity has had on the muscles of the legs; it has given them increased facility to perform their work. The morning's exercise may therefore be briefly said to have accomplished these two things: 1st, it has strengthened the lower limbs; and, 2nd, it has strengthened the organs of respiration and circulation contained within the chest.

Gymnastics. Page 40. Now the exercise of the second division of the day should be addressed to those parts of the body which have *not* been actively engaged in the first, namely to the trunk and upper limbs, and specially to that part of the former in which the organs of respiration and circulation are contained. For it is a fact, fortunately now by no one disputed, that the full and fair development of the chest itself is a vast means towards insuring the healthy action of the all-important organs which it contains; of increasing their functional capacity and of protecting them against evil from too sudden effort or too protracted exertion. The point now desired, therefore, is a system of exercise which will meet these ends. This would be so were a man merely anxious for the uniform and regular development of his body, apart from any view to aquatic attainments; but as the exercise is to be taken with the exclusive view of increasing its power at the oar, of protecting it against the evils said to attend boat-racing when the frame is weak or the chest imperfectly developed, such exercise should not only be taken, but be taken with special regularity and method.

Page 191. It is in the Gymnasium alone where such a course of exercise can be carried out.

Before commencing a course of systematized exercise every man must be accurately measured; his weight, his height, his girth of chest, taken and registered, with other measurements to gauge the respiratory capacity[1]. These should be taken at the commencement and at the close of active training, and the increase recorded will show the amount gained.

It is quite possible not only to regulate each separate man's work by his individual capacity, and with reference to his special wants, but to do this while a whole crew are working together. The whole crew therefore should, if possible, go through this course of exercise together. When men can select their own time, the preference should be given to the hour just preceding dinner, which has been judiciously fixed at two.

The first day's work in the Gymnasium would reveal the physical calibre of each member of the crew, show where he was weak and where he was strong, so that the finger might be laid upon the spot that was beneath or above the general capacity of the rest of the body. It requires no argument to prove the advantages to be gained from a course of exercises conducted on such principles as these.

The exercises should be strictly progressive, but without any extension of time. They would last for one hour only, and this hour should be the same throughout the course. The order of progression would be by amount of effort, or, in other words, by

[1] See Appendix K.

the difficulty of the exercises themselves; for all the exercises in the Gymnasium are graduated, each leading directly to that which is above it. The improvement in the physique of the men from this course of exercise would of necessity be very great, especially in the upper region of the body, namely chest and arms, for to them the exereises would be mainly addressed. Admitting that the men began the course of training with a chest measurement of 34 inches (the minimum girth in selecting men for Torpid crews), they would average 36 inches at its close.

CLOTHING. This course of exercise would not, probably, leave any perceptible perspiration on the skin; for during its performance very little clothing would be worn; and when a number of men such as a boat's crew work together, a pause or short breathing-space follows each man's effort.

BATHING. Page 109. After this course of exercise, therefore, and on a man's return to his rooms, there would be no need for the bath in any form, nor is it desirable again to stimulate the skin even by a dry rubbing; it should be left alone.

DIET. Dinner. Page 79. We now arrive at dinner. It is this meal which perhaps involves the greatest change in a man's ordinary habits in rowing times, and therefore it is that at this meal the greatest restrictions should be made, and moderation most strictly practised.

Again I may endorse the suitableness and abundance of viands usually provided both in animal food and in vegetables. There is scarcely an exception Page 49. now in giving, both in quantity and in variety, a sufficiency of the latter, and this in itself is a valuable improvement on the old régime.

Throughout the present work, wherever the subject Page 58. of diet has been discussed, the importance of variety has been earnestly urged; but this has been meant Page 60. strictly to imply that men should have adequate *choice,* not that they should partake of several kinds of animal food at one and the same meal, and the distinction would apply still more emphatically to the mid-day dinner. The training diet should at all times be simple and unexciting, addressed to meet the actual requirements of the body and honest expressions of appetite, and not the mere desires of the palate, or fanciful and unmeaning dietetics of tradition. This leads to my again urging what may Page 51. appear the ungracious request to dine on one kind of meat, and even then to leave off with an appetite.

I have so frequently observed that many of the Page 62. discomforts which men feel in training times, whether known as 'internal fat'—'want of condition,'—or 'bad wind,' are all simply forms of indigestion, arising from injudicious diet,—from eating inordinately of meat without adequate proportion of vegetables, from stinting the supply of drink and notably of water and water-containing substances, from doing these at times of the day standing in relation to active bodily exertion calculated to arrest or retard or interfere with the processes engaged in the *boná fide* nutrition of the body, that I have of necessity placed myself in opposition to all the accepted traditions and cherished precepts of training as hitherto laid down. But what was to be done? I believe that all these traditions and precepts are founded on misconception if on anything, and that they lead to mischief and to further error; for they blind men who are anxiously looking for the right path, and they throw stumbling-blocks in the way of those who would walk the right path at all hazards. Rowing men have only to be convinced of the right path and they will pursue it, let the difficulties which lie Page 53. in their way be what they may. I would then urge that all viands be well cooked, and always be Page 85. accompanied by vegetables of some sort (it does not greatly matter what) in abundance; these are necessary in many ways apart from the mere nutritive elements which they contain. Their bulk mixed up with closer and more stimulating food is wanted for the process of digestion; the water which they contain in large proportion is wanted,—water which may be slowly taken up into the system during the prolonged processes of digestion and assimilation, and which the mere act of drinking cannot altogether supply; and for many, even equally important, reasons which need not perhaps be enumerated here.

THIRST. Page 54.

The thirst experienced at and after this meal will perhaps be considerable, and as the sensation will denote a requirement quite natural, it should be fully, but at the same time heedfully, gratified. I say heedfully, because in the gratification of a requirement of this nature, an artificial thirst may be very easily set up, which with judicious management may be made temporary, but which without it may soon take a permanent and fixed form. Men have almost universally come to regard the amount of beer to be drunk at this time as limited to one pint, and if beer is to be drunk at all this should on no account be exceeded, but at the same time it may prove quite inadequate to remove the thirst experienced. When this is the case, and men will soon be able to know the extent of their probable wants in this direction, let water be drunk during the early part of the dinner, reserving the beer for its latter stages. The reason for this is that pure water can be at once taken up into the circulation, and so may at once meet that demand for fluid evidently expressed by the thirst; whereas beer must itself be digested before it can be so disposed of, and while this same property of slow appropriation might prove serviceable in certain stages of diet and thirst, in the present instance, where immediate demand for simple fluid is unequivocal, it would not prove so. Page 65.

Dinner over, let the crew separate, each man to his own rooms, and after about an hour's interval let him again take up the mental work already recommended BODILY REST. Mental Work.

for the earlier portion of the day, and let him keep at it too till the time draws near for assembling for the next appointed course of physical exertion, namely the work at the oar. Much time is often frittered away in this division of the day, and nothing good either for mind or body got out of it, but rather the reverse; men get fagged and weary from doing nothing. Even physically the mental activity and attendant bodily rest,—rest more complete to the whole system than can be obtained from mere bodily inactivity,—will be distinctly beneficial, and will greatly tend to allay that nervousness and irritability which often assail men as the time approaches for going to the river.

EVENING. With this rest the second division of the day closes, and the third, like the first and second, begins by exercise. This time the exercise is on the river, and as in the two former instances, it should be progressive.

EXERCISE. Rowing. It is of course understood that, in a greater or less degree, each member of the crew is accustomed to this mode of exercise, the mere circumstance of his being one of a College Eight establishes this fact; but it must never be forgotten that while in the two other modes of exercise each man did his work by himself, and for himself alone, in the exercise on the river which we are speaking of, each oarsman sinks his own individuality in the collective boat's crew; and it is the *oneness* of the crew which forms so important a feature in its work,

Page 15.

and which contributes so much to its efficiency, and this oneness can of course only be obtained by constant practice together. The training exercise on the river therefore has two aspects. First, as regards the training of each separate oarsman, and secondly, the cultivation of his fitness as an unit of the boat's crew. However good therefore the individual oarsman may be, and however methodically and profitably his exercise in the two other divisions of the day may have been executed, it is imperative upon him to follow out this third form of exercise with at least equal method and regularity.

The Oxford racing-course is roundly set down at one mile[1], and the racing pace is to row this mile in seven minutes[2]. Now the usual work done in training for the races is, to row twice down and twice up the course each day; and it is also usual for the crew to take a longer row than this shorter Page 41.
course admits of, by going down to Nuneham (about 7 miles) once or twice during the training practice. Moreover, captains of boats' crews are careful to make the speed at which the boats are rowed 'to increase with the strength of the crew.'

Now this is all pointing in the right direction, if not actually going in it; there is an idea of progressiveness about it, although there is no actual *boná fide* progressive practice worked out. But something more is wanted than the vague intention of

[1] See Appendix E; No. 1. [2] See Appendix B.

making the speed be in relation to the computed strength of the crew. The accelerated speed and extent of distance rowed should be on the unerring principle of gradual and regular augmentation of effort, either by rowing over a longer distance, or over the same distance at a greater rate of speed.

It would not, I fear, be found possible for so many eight-oared boats to follow out, day by day, and week by week, a very regular course of practice on this narrow reach of water, crowded as it is at this season of the year with boats of every description and size, but even with these hindrances the attempt should be made to carry it out as methodically and as gradually progressive as possible.

The present practice of a double row over the course, or twice to Iffley and back each day, should not be exceeded in the first week; it is a fair amount of work to begin with. But after the first week a third row up and down would not be too much. The row down should always be leisurely and heedfully done, with a view to accuracy of work and correctness of form only; but the return rowing,—the actual course over which the race is rowed,—should be at a quicker pace; say, during the first week at about half that of the racing pace, and this pace during one of the return rows to be increased from week to week, so that at the end of the month's training, the actual racing speed would be attained. Care should be taken during the last week to practise Starting.

Many a good crew lose their race by maladroitness in this respect.

Having arrived at the week of the races, some modification should be made in this exercise, as with the two others. Let the row down be, as before, leisurely and carefully done, and with as much regard to form as in the first week of training; also let care be taken that it is well timed, i.e. that the crew will just be able to take up their place, divest themselves of any extra clothing and see that everything is clear and in its place. Men often become jaded and nervous by waiting for the start. After the race, whether a success or a failure, again let the crew row down, at the ordinary rate. The return must be with reference to the condition of the crew at the time, and may be made at any of the rates of speed already adopted and leading up to racing pace.

On all occasions men should be on their guard against lingering at the barge, by the river-side, or on their way home, after the race or rowing practice. The return home should always and at once follow the quitting of the boat; and, as on the return home after the morning exercise, it should be at a brisk walk; as after that exercise also, it may, at choice, be followed either by a sponge-bath or by a dry rub, slowly performed—lingered over—enjoyed.

BATHING. Page 110.

The next meal should not be later than eight or half-past eight at the latest, and may take any form or bear any name which a man most affects; for it

DIET. Supper. Page 81.

may and should be so arranged as to chime in with each man's special ideas, even if they be prejudices, on the subject. For each separate man may really have that which he likes best, and yet be following good sound training tactics all the while. It may either be in the form of a 'clumsy tea,' i.e. solids consisting of bread and meat with tea for exclusive drink, or it may be supper, with equally substantial or identical solids, but with a pint of beer instead of the tea; or indeed followed by a cup of the latter, when the prescribed beer is exhausted; or, finally, it may take the form of a late and limited dinner consisting of the before-mentioned solids and beer, and followed by a glass or two of wine. There is no great choice of fruits at this season, nor is much choice wanted where good oranges are obtainable; a free use of these, or in their absence a less free use of figs, with the vegetables at dinner and marmalade at breakfast, will go far to render unnecessary the use of medicines during training.

SMOKING. Page 82.

The much-abused pipe may also be produced, provided always that it has hitherto been a man's habit, and that its relinquishment would be to him a discomfort, or would in any manner or degree affect his night's rest, or would cause nervousness or irritability now or in the morning. To those who do not smoke there is no better sedative than an hour or an hour and a half's reading, whether such reading be as 'work' or for recreation.

A good night's rest, or rather, a good sound dreamless sleep for several consecutive hours, is a necessity in training, as urgent as either exercise or diet, and nothing must be done which would interfere with it, or left undone which would secure it. I have known men almost paralysed in all their efforts by sleeplessness, and this sleeplessness I have been able to trace to anxiety and over-excitement on the subject of the approaching races. There is no specific against this susceptibility to excitement, but it is often promoted and increased by the prolonged criticisms and debates on the events of the day, and possibilities of the future, kept up after the evening meal. There is no doubt great temptation at this time for men to 'fight their battles o'er again,' but like other temptations it must be firmly resisted. Let each man seek his own room by half-past nine or ten at most; and, as already recommended, get an hour or an hour and a half's reading before going to bed. The latter time will still enable him to be up at six o'clock next morning. It is as great an error to go to bed too early as too late. Page 90.

WINTER RACES.

The Winter, or, as they are called, the Torpid Races take place in Lent Term, and are rowed over the same course as the Summer Races. They do not begin till the fifth week of Term; if therefore the captain gets his crew together during the first week, he will have before him a clear month for training.

In laying down a course of training for these
Page 113. races, it will be found that while the general plan made out for the Summer Races may be followed, yet certain modifications must be made in it for the winter campaign, for the following reasons.

First, on account of the season of the year when it takes place. As a rule, this season will be found much less favourable to the open air exercise recommended for the first division of the day. Secondly, the time of the day when the races are rowed, and at which the rowing practice must be carried on, is different; and this alteration breaks into the uniform division of the day laid down for training for Summer Races, and necessitates important changes. Thirdly, on account of the age, rowing experience, and physical condition generally of the men themselves; they are younger, less developed, less matured, and their stamina and power to resist fatigue and discomforts of weather are less.

As a rule a considerable proportion of a Torpid crew will have had but slight experience in rowing, and still less in racing; some will have had a certain extent of practice at school, but others will have had none until they came to the University. Keeping these points in view, a course of training for the Winter Races may be thus laid down.

During the *first week* the men will be on the training-ground at seven o'clock; this hour may be thought early, but there is no tenet in training creed more important than early rising. One mile of walking at the rate prescribed for training for Summer Races will be sufficient. MORNING. EXERCISE. Walking and Running.

The *second week* should see this work augmented and altered. After walking half a mile, let half a mile be run in the manner recommended for the corresponding week for Summer Races, to be followed by a walk of half a mile. Page 124.

The *third week* should see another change and a still further augmentation of effort. After walking the initiatory half mile, let the whole mile be run at the pace of the preceding week.

The *fourth week* should see an alteration without much augmentation of the effort; after the half mile walk let again the whole mile be run, but let the men break into it slowly, augmenting the pace so that at the end of the half mile the men are running at speed. From this point let the pace be gradually relaxed, so that at the end of the mile it may be at the same rate as at the commencement.

During the *racing week* the practice should consist of the run only, as in the fourth week, breaking into it very slowly and augmenting the pace very gradually.

It must always be remembered that the morning exercise is only to be taken when the weather is fine. In wet or very cold weather, which is of frequent occurrence at this season, the open air exercise prescribed for this division of the day should be relinquished, and the exercise in the second division of the day should be increased proportionately, say, by half an hour's work.

BATHING. Page 132. On the return to the rooms after the open air exercise, the bath should be taken in all respects as recommended in training for Summer Races.

DIET. Breakfast. Page 127. Breakfast should be in all respects as in training for Summer Races. In the same manner also should thirst be met, should it set in in this division of the day.

BODILY REST. Mental Work. Page 128. As far as time will admit the same course of physical rest and mental activity, recommended for this period of the day in training for Summer Races, should be pursued.

MID-DAY. EXERCISE. Gymnastics. Page 130. The course of exercises at the Gymnasium will be virtually the same as that prescribed for the summer training, but regulated with reference to the different degree of strength and greater wants of the men. It will still occupy an hour, and when possible should terminate near to the time for luncheon.

DIET. Luncheon. The hour for luncheon is put at one o'clock, and with the hour for racing fixed at three, it is the proper time for this semi-meal. No improvement on what is at present prescribed can be offered. It is just what it should be, 'a little cold meat and bread, or a sandwich with a glass of ale.' If more drink is wanted let it be of the simplest description, water or lemonade, but wine under no circumstances.

AFTERNOON.

The races take place about three o'clock in the afternoon, and this should regulate the preparatory practice. The time allotted to reading in this division of the day in Summer is altogether wanting now. After luncheon men assemble for the river. It is for this reason that luncheon should always be slight, a mere make-believe meal just to scare away actual hunger, should it present itself.

EXERCISE. Rowing.

During the first week, and provided that the weather be fine and no floods out, or not out to such an extent as greatly to augment the effort of rowing back against stream, this exercise should be in all respects the same as that recommended for the corresponding week in training for the Summer Races. Page 138. But in the event of very severe weather or strong floods, the exercise should terminate with the first return.

Every effort compatible with the state of the river should be made to carry out this exercise in a progressive manner. From week to week the pace of the return rowing should be systematically and regularly quickened, so that the week before the races should see the boat propelled at racing speed during one of the return rows over the racing course.

During the racing week the precautions recommended for the same period for Summer Races, as to timing well the going down, taking up position, &c.,

should be very strictly attended to. The removing of extra clothing should be deferred till the last moment, so that the body may not be chilled before the start. The race over, the crew will again row down, and return at the reduced pace recommended for the corresponding period of Summer Races, but always with reference to weather and the state of the river.

The same precautions given with regard to lingering at the barge, or on the return home, should now also be kept in view with special strictness, as these are the times and this is the condition of the body, it having been heated, stimulated and exerted, and now cooling down, when chills are received and when they prove most severe. Scarcely a year passes that I do not find men so attacked and so suffering.

BATHING. For these reasons I would forbid the bath after the return home; I would advise not again to wet the skin, or do anything calculated to reduce the surface heat of the body, at this time of the day during winter training. A rapid use of a soft dry towel, Page 139. when changing garments preparatory to dinner, will have an opposite effect, but it should be briskly done, avoiding all lingering over any part of it.

DIET. Dinner. The dinner is in Hall, and there may be here more room for men to break through the restrictions recommended at the training table than when they dine and sup together. But men will best consult their own health, and the interests of their boat, if they rigidly adhere to the chief limitations laid down for

dinner in training for Summer Races; that is, to one Page 132.
kind of meat, with abundance of vegetables, any kind of cereal pudding, or fruit from fruit-pudding or pie, eschewing the paste in any form. The beer should not as a rule exceed a pint; if this be insufficient to quench the thirst experienced, let the extra drink be water, taken with the precautions already recommended on this head. At any short time after dinner, (men will know the time when they can most Page 133.
conveniently meet,) they should assemble for a glass or two of wine, with some dessert of ripe fruits, followed, if desired, by a cup of tea.

Each man will know how tea in the evening affects him; if it produces wakefulness after he is in bed it should be avoided, if not it will clear his brain and steady his nerves in the work with which I am now going to advise him to close the day, namely, from two to three hours quiet unbroken reading. For this reason, and others which might be given, let every man lay down a rule to seek his own rooms at seven or half-past seven at latest. He will find this mental work conduce as directly and influentially to his bodily health as anything he has done during the day.

Half-past ten or eleven o'clock should see every man in bed.

THE INTER-UNIVERSITY RACE.

The Inter-University Race is rowed on the Thames, on the course between Putney and Mortlake, reckoned at four miles three furlongs. It takes place in the Vacation after Lent Term.

The manner in which the crew is got together is as follows. During the preceding Michaelmas Term the captains of College Eights send to the President of the O. U. B. C. the names of any men of their crews who, in their judgment, are worthy to be tried in the two experimental crews called 'Trial Eights,' which are formed early in the Michaelmas Term.

The captains of College Eights, in sending in the names of men to the President, are not restricted to those who have actually rowed in their College boat; other men known in their Colleges to be good oars, or who are of the physical calibre of the men wanted for these experimental crews, would also be considered eligible. It is true that this last circumstance is far from frequent, although it does occasionally happen, but frequent or not, it shows the scope of the President's resources and powers in forming his crew;

for by these means, not only the best oarsmen in the University, but the men most capable of being made so, are brought before him and placed at his disposal.

The Trial Eights once formed, their work is critically watched in all its bearings, both during their experimental practice, and also in a race which takes place between the two crews at the end of Michaelmas Term. From these two crews the President selects the men wanted to complete the University Crew. It need hardly be said that this selection is not a very easy one to make, and the only wonder is that it gives rise to so little grumbling as it does, and is so free from complaint of favouritism, when we remember how many are eager to be chosen to fill the vacant seats in their University boat; and it shows at the same time the fairness of the President's awards, the confidence of the candidates in his judgment, and their own self-denial and *esprit de corps.*

The machinery for bringing to the front the ablest men seems to be perfect. By it, as thus organised, the best materials which the University possesses are placed in the hands of the President; and this too in ample time, not only for him to form his crew, but to weld it together to the tone and temper best suited to the task for which it is designed.

The race is not rowed until after the Term is over, and actual training does not begin till six weeks before the race, thus allowing for a month at Oxford and a fortnight at Putney. These arrangements are sound and good; but what is done with the first two weeks of Term? It is spent in experimental rowing, trying the men selected, each in his place, oar in hand—in fact in getting the crew together. These two weeks of grace are so very precious that one is tempted to ask, if they are made the most of,—if it could not be possible for the captain, during this preliminary stage, to get such information as to the capacity of his men, as would enable him to fix definitively on the crew before actual training begins[1]? And so perhaps avoid those later and disturbing changes which on occasions amount to a sort of disintegration of the crew up to the very eve of the race? If this could be done, no portion of the time set apart for actual training would be interfered with, no part of the course of training itself interrupted or made merely experimental, no part of it disturbed by re-arrangements; the crew as a crew, compact and whole from the first, would enter upon its preparation on a given day, to work up through it at a given rate and in a given time,—all foreseen, regulated and fixed from the beginning.

There are certain broad rules which should regulate all training, such as these:—The course of training

[1] While these pages are going through the press the above recommendation is being adopted both at Oxford and Cambridge.—A. M.

should be clearly defined before it is entered upon; it should always be entered upon cautiously and carefully; all its work should be systematically progressive, and so regulated that, when its highest and culminating efforts are reached, they will in no manner or degree overtask the powers of the men, or be to them severer exertion than was the work of its introductory stages. For if the progressive principle be faithfully followed and the augmentation of work be not too rapid, the capacity of the men at the close of the training will have been so developed as to be still in the same relation to the (now augmented) work as it was at the beginning. Moreover a course of training should always be so arranged that it will lead up to the race for which it is undertaken, *i. e.* that the last day's work of the training will be identical in all essentials of time, of distance, and of effort generally, with the race itself.

There are certain things, however, which on occasions interfere with the regular and methodical carrying out of these rules, such as a continuous period of bad weather, or when the training takes place at a season of the year in itself unsuitable for that portion of it which must be performed out of doors.

This is notoriously the case with the time of year during which the training for the Inter-University Race must be carried out, and, as has been recently seen[1], of the time when the race itself is rowed.

At the commencement of the training the hour at which men at present get up, *i.e.* about seven or half-past seven, is not far from what is required of them, for the mornings are dull and unattractive; but as the season advances, and the mornings grow longer and brighter and warmer, they might well be on the training-ground from half an hour to an hour earlier; indeed, if they are not so they are retrograding, not advancing, in their training; for to pause is virtually to go back. The same remarks apply to the exercise taken in this division of the day; what they do take at the beginning, although very inadequate for such men preparing for such a race, might still to some extent suffice for a beginning, but it ceases to be of any real value because it is not augmented as time goes on. '*A short walk and a short run of about* 150 *yards.*' That is all! As in the beginning so at the middle and the end, the same throughout—no change, no augmentation in distance, in duration or in speed.

What exercise is taken during the second division of the day? '*Occasionally a walk.*' That is all. Does it sound like work for men in training for the four-mile race at Putney? Yet this is all, and often more than is taken. Between breakfast and dinner

[1] The Inter-University Race of 1872 was rowed in a snow storm.

therefore there is no bodily exercise, for we cannot receive the 'occasional' walk as anything fit to be introduced into a course of training. It would be difficult for men to believe, it would be difficult for me to express to them, the extent of the loss they sustain in spending inactively this most precious portion of the day, and neglecting those exercises which they so urgently need,—the very time when they could do so much—the very time for those exercises which would do so much for them, in enabling them to encounter with impunity the strain about to be put upon their powers.

Is it because they think that exertion to the moderate extent, and taken in the methodical and gradual manner, recommended for younger men when training for far less arduous efforts, would be too much for them,—'*would take it out of them*'—as the phrase goes? I have sought to show that there is no error which a man can make in training equal to this. Exercise is the chief of all the agents of health which accomplish those changes in the body for which the training is undertaken, and the neglect of this one will go far to render valueless the good to be derived from all the others.

Or is it because they are afraid that the practice of other exercises would affect unfavourably their work at the oar,—'*would spoil their rowing*,' as it has been stated? This is an error second only to the foregoing, for it strikes in the same direction and with equal force, although coming from another source. It may be literally accepted that the practice of one active bodily exercise does not and cannot interfere with the successful practice of others. I am careful to say *active* bodily exercise, for any one could distinctly see how the close practice of any particular exercise, which necessitates a man's keeping a constrained or confined position or attitude over any lengthened space of time, or which involves the exclusive use of one portion of the body, or of one portion of the body very much more than the other, might be to some extent unfavourable to the practice of exercises, where all the positions are free and unconstrained, and the action is lithesome and energetic. I could, for instance, understand how assiduous practice in rowing in racing boats, as now constructed, where the attitude and action of the rower are very clearly defined and preserved within the narrowest limits, and in a sitting position, would not be conducive to excellence in more active and unconstrained exercises, to wit, Tennis, Racquets, Fives, or Fencing; but I think it would be difficult to prove that the practice of any of these, or of exercises of cognate character, could act unfavourably on Rowing. No doubt the idea has originated in the fact that men, who devote much time and much attention to one exercise, naturally excel more in that exercise than men who divide their spare time and thought over many; for the idea is not confined to rowing, or advanced exclusively by rowing men. Perhaps something also is to be allowed to the not unnatural love of the enhancement of a favourite exercise, by veiling its attributes in a little mystery. But the objection is not real, and will not stand examination. One could understand an artist, or the performer on some delicate musical instrument, entertaining fears of this kind, for in the practice of their arts great precision and lightness of touch, implying extreme mobility and sensitiveness of finger and hand, are essential to excellence, and exercises which would give force and bulk and hardness to these would assuredly reduce sensitiveness and mobility; but such objections cannot surely be seriously entertained as applicable to an exercise like rowing, or the manipulation of an oar in a racing-boat!

But even admitting, for the sake of argument, that there are certain other exercises the practice of which would re-act unfavourably upon rowing, the objection could not possibly apply to either of the two kinds of exercise which I have recommended as auxiliary exercises in training for rowing. The first mode (walking and running), to be taken in the first division of the day, is to strengthen the lower limbs and lower portion of the trunk of the body by employment in their natural mode of progression, as distinguished from their artificial employment when seated in the boat; and at the same time, and by the same mode of exertion, to increase the respiratory capacity, to improve the 'wind,' by gradually accustoming the heart and lungs to act with force by means of employment in a natural form, *i.e.* undisturbed by the fixation of the chest as in the stroke in rowing. Is not this to meet some of the most urgent requirements of rowing men? If this may be said of these recreative exercises, surely it may be said still more emphatically of the systematized ones which have been recommended for the second division of the day. They take up and complete what these have left unfinished,—they take up, strengthen, and cultivate to their highest attainable capacity, those parts of the body which these exercises cannot reach.

Whatever fears may be entertained as to the practice of one form of recreative exercise interfering with the successful practice of another, they could not apply to gymnastics at any rate, for these have no partial employment of one part of the body to the neglect or exclusion of others, no cramped up or constrained positions; the exercises have for aim and object simply—by modes of exertion strictly regulated by the natural use of the parts employed—to endow them with their highest degree of attainable power; and this is done to the whole body and to the whole body equally. Their object is not to prepare a man for this or for that exercise, it is simply to cultivate his powers to their highest point, and leave the application of these powers to be determined by the after-wants, wishes, or pursuits of their possessor. It is the old story of the good shilling. Only let a man get the shilling, and then he may lay it out as he likes best. In the present case, the rowing man would not need to cast long about him for a use to put it to; it would procure for him the very thing of which he stands most in need, heart and lung room—heart and lung power—space and power for his training practice, and for the race for which the training is undertaken.

It has been further given, as a reason for this strange inactivity throughout this early portion of the day, that the men are reserving their strength for their afternoon's work at the oar. I could understand this as being the reason later in the training course (although I could not accept it as sound tactics), for men are then no doubt anxious about their immediate work in the boat, and willing to sacrifice anything for what they believe to be for its advancement, but this inactivity is not confined to any particular portion of the training, but extends over the whole course, from the first day to the last.

But even were this the motive, it would be founded on error, for in true training there is no such thing as reserving of powers,—no such thing as sacrificing one point of the training for another, for they are all designed, each in its place, and in its prescribed degree, to work out certain changes in the bodily powers, to *help* the rowing, not interfere with it. If, therefore, the work at the oar is found so trying as to demand the curtailment of the other kinds of exertion, to enable the men properly to perform this one, the work at the oar itself should be reduced, so as to bring it into harmony with the other work done.

But what is the extent of the work at the oar as at present practised? The crew row down 'to Iffley and back, twice a day; about once a week, instead of this, they row down to Abingdon lasher (about 7 miles), and once or twice perhaps in the course of the month's training, instead of Abingdon lasher, they row down to Wallingford (about 21 miles)[1].' It cannot surely from this be thought necessary that the early part of the day should be passed in a state of bodily inactivity, in order to keep up greater strength for the work in the afternoon; for except in the extra weekly rows, the work done at the oar is very moderate indeed, not more than is done by every College crew, in training for the Summer Races in their College Eights—not more than is done by the tyros in the art in the Torpid Races.

It is of course understood that the men forming this crew are all good oars already, and this very

[1] After one of these long rows down stream the boat is brought back by watermen, and the crew return by train.

moderate amount of work afloat may be all that is required to keep up their present rowing qualifications; nay, may be sufficient to bring them up to the point of rowing efficiency required for the contest at Putney; of this their captain must judge, but one thing is certain, that whether this be the case or not, whether the race be won or lost, be to them a victory or a defeat, they have by no means prepared themselves for the contest as they might have done, and the after-results upon their frames thus inadequately prepared must ever be doubtful.

There is, there can be, but one way of preparing for an ordeal of this kind, and that is by some such system as that already laid down for training for the earlier stages of rowing in the Winter and Summer Races. It is true, that a man who has rowed in these two series of races, and has faithfully followed the rules there laid down for a rational system of preparation, would in this latest stage of rowing have his bodily frame, and particularly his chest, fairly developed, and the delicate organs which it contains in a measure prepared for extraordinary exertion; but even then only *in a measure,* for he is still at that age, and under those conditions and influences, which leave his powers open to almost indefinite advancement; he would still be as susceptible of improvement, or nearly so, as when he first lifted an oar; it would be as easy for him now to pass from the chest measurement of 36 inches of the Summer Races to 38 inches, as it was to reach the 36 inches from the 34 inches of the Torpid Races, and this is the very least he should possess.

But under the deadening system at present pursued, the very parts of the body which require methodical preparation and strengthening are utterly neglected. There is no gradual development of chest, no expansion of its frame, no strengthening of its tissues, to fortify it against the great respiratory strain to which all at once it will be subjected; for the exclusive exercise at the oar will attenuate, not widen, the chest; will stiffen it, not render it more flexible and elastic. There is no gradual preparation of heart and lungs, or of any of those delicate structures which with heart and lungs will be called upon to drive the blood throughout the body, at the wild rate of racing speed. All these ameliorating agencies are neglected, all these safeguards are set aside,—set aside and neglected at the very time when they are most needed.

UNIVERSITY OARS.

Reprinted from 'Nature,' Nos. 177, 178, 181.

Many a strong hand will tremble as it lifts this book[1] for the first time, and many an eye will glisten with pleasure, or grow dim with regret, as it scans its lists and tables and reads the revelations made therein. For what do they tell—and tell too with a rare fullness and circumstantiality? All particulars as to the health, past and present, of the Oarsmen of both Universities who have rowed in the annual matches during the last forty years; that is, from the time of their organisation up to the last race rowed before the author began collecting the materials for his book. Year by year the crews are formed and the races rowed. Year by year the races pass and are forgotten, and the crews disappear and are *not* forgotten, although they may pass away from our sight. What has become of the old Oarsmen,

[1] 'University Oars.' By John Ed. Morgan, M.A. Oxon, F.R.C.P. (Macmillan, 1873.)

the friends and favourites of other days? Are they 'doing duty' in peaceful country parishes, or in crowded cities at home? or have they venturously gone forth to new lands to seek for more genial employments than the old one yields? What are they doing now? how fares it with them? and above all, have they suffered in heart or brain, in nerve or lung, from their old practice at the oar? The ample lists in Dr. Morgan's book, his own ably written pages, and the liberal extracts from his correspondents' answers to his queries—his correspondents being the oarsmen themselves and his queries being with sole reference to their health and bodily condition—tell us all: tell us where they are, what they are doing, what they did when with us and how they did it; and, in their own language, tell with characteristic frankness, and in words which we can still recognise as their old modes of expression, what they think and believe for or against their old favourite pastime. All write cheerily, and all to a man almost speak with prideful remembrance of their work at the oar, and the good they have derived from it. From Bengal writes McQueen:—'I am now a stout man, weighing fifteen stone, but able to be in the saddle all day without fatigue, or if necessary walk my ten or fifteen miles without any distress.' I wonder if he still possess the same hand-power that he had in his youth? He had simply the strongest hand and wrist I have ever known, and never did I place my own palm in his without setting my teeth close, and subjecting the member when set free to a gentle manipulation, to restore circulation and revive feeling in its flattened digits. His was the true Herculean build. Nind writes from Queensland: 'Since taking my degree in 1855 my constitution has been put to the test in many climates, for I have lived in Canada, on the west coast of America, and in Australia, and I can safely aver that I never have in trying circumstances found a failure of physical power; and that when hard pressed by fatigue and want of food, the recollection of the endurance developed by rowing and other athletics gave me fresh spirit and encouragement.' And yet Nind was not naturally a powerful man. His frame was the very antithesis to that of McQueen. Those who remember him as he first came to the University will recall his exquisitely moulded features, almost feminine in their softness and sweetness of expression. Schneider writes from New Zealand:—'I may state that so far as I am concerned, I am able to discover no particular symptoms either good, bad, or indifferent, specially attributable to rowing. . . . . I now come to what I believe to be the chief, if not the only, real danger attendant upon Boat-Racing, and that is the violent strain upon the action of the heart caused by rowing a rapid stroke and exerting every energy to maintain the same to the end of the race.'

Who among us could argue the matter more wisely? These are bright and pleasant pictures, but like all other pictures, they have their dark side. In the lists of Oarsmen certain names are printed in italics—not many, thank God!—a small percentage only. These are they who have rowed out their life-race; who have for ever passed out from their period of training and of trial. They rise before my mind's eye as I first knew them. Brewster's magnificent form towering half a head above his stalwart shipmates. 'Invalided from his regiment, caught cold by returning wet from a Brighton Volunteer Review: died from its effects.' Men are all wise after the event; and we hear now of those who always doubted his real strength and stamina, and point to his untimely end as evidence of their own penetration. Polehampton, the chivalrous, the gentle, the brave! 'Decorated while at college with the Royal Humane Society's Medal for saving a companion from drowning at his own imminent peril. Shot through the body at Lucknow—and died of cholera when attending to his comrades stricken by the same malady.' The very career he would have marked out for himself, had it been left to his hand to trace it! Hughes, the accomplished, the frank, the manly—the very nature, that, speaking in our love and in our pride, we emphatically style the beau-ideal of an English gentleman—'died last year of inflammation of the lungs.'

For many a long year strange tales of the risks and dangers of rowing, or rather of boat-racing, have had a floating existence in the Universities, and gaining strength and circumstantiality by time and repetition, have extended to wider circles. While the old tales lived and held their own, other and more startling legends sprang up, and also grew into importance—legends so alarming, and related with such circumstantial detail, that the most sceptical began to think that 'there must be something in it.' Whole crews, it was stated, had been swept off in a few brief years by their terrible struggles and efforts at the oar. This feeling of uneasiness, if not of absolute alarm, attained a sort of climax, a few years ago, by the letters of an eminent surgeon, published in the *Times*. For reasons which seemed to his professional judgment sufficient, he took the side of the alarmists, and pronounced an opinion, strongly expressed, against boat-racing as now practised. These letters were answered with more or less ability by votaries of the oar, men then actively engaged in rowing, or who had recently been so. The controversy lasted for some time, and at last rather died out, or was allowed to drop, than brought to any satisfactory conclusion by the arguments or proofs advanced on either side. By the opponents of boat-racing the case was opened rather unguardedly by statements requiring a stronger array of facts, than could be brought to support them when the call for proof was made; by its defenders was met by the somewhat blunt rejoinder, 'You don't know anything about it; you never lifted an oar in your life.' The former forgetting that there is nothing so difficult to overcome as enthusiasm, *esprit de corps*, and, perhaps, prejudice; the latter forgetting that the effects of certain modes of exertion, on certain organs and tissues of the human body, may be sagely divined by a skilful and experienced physician or surgeon, without his ever having in his own person practically undergone such exertion.

As I have said, the argument dropped rather than was brought to any satisfactory conclusion, and if each side did not claim the victory, each stoutly denied that the other had won. Unto this day do we hear alarms sounded with reference to these races, again does paterfamilias feel nervous qualms at the intelligence that his son has betaken himself to the river. Again do non-rowing men console themselves for the want of river distinctions by the thought of their exemption from its risks and liabilities, and again do rowing men enjoy the *éclat* of having greatly dared for the reputation of their Colleges and University, with the secret conviction and comfort that the dangers they have run have not been so great after all.

It was to close this open question for ever, and settle once for all this standing dispute, which has many scientific aspects of great interest, that Dr. Morgan undertook the present work; recognising evidently to the full the standpoints selected by the disputants in the controversy, the one, their practical knowledge as experienced oarsmen, the other, his theoretical knowledge as a scientific surgeon; for, as the author informs us, his qualifications for the task are twofold:—

'As a physician to a large hospital, I have necessarily enjoyed large opportunities of gaining an insight into the laws which regulate our health, while my rowing experience began at Shrewsbury (where I spent many a pleasant hour on the Severn), and was matured at University College, Oxford, where I was for three years Captain of the John+, a boat which has often played a prominent part in the struggles on the Isis, and which has served as the training school for no fewer than ten of the crews which during the last thirty years have won the University Fours.'

These qualifications certainly seem adequate to the task, and the plan pursued by Dr. Morgan also seems the best possible, albeit entailing enormous labour on, and demanding vast patience from, himself. This plan was simply to institute a strict and exhaustive search after all the men who have rowed in these Inter-University contests; to track them, as it were, to whatever part of the world they might have gone; this done, to get their own written testimony, if alive, and that of their friends, if dead, as to whether the part they played in these contests entailed any after evil results upon their constitutions and frames, and (if any) their nature and extent.

Considering that more than forty years had elapsed since the commencement of these friendly contests, and that between the years 1829–1869 twenty-six races had been rowed, giving for the crews of both Universities, and allowing for men who have rowed in more than one race, the gross number of 294 men, the task was a formidable one; but, it must be added, has been as ably conducted to its conclusion as it was resolutely undertaken. The author has ascertained that out of these 294 men 245 are still living—39 having died: the time of their death, and the ailment of which they died, are carefully given by the author, and to this point we will return. He next tabulates the following results elicited by his inquiries:—

Benefited by rowing	. . .	115
Uninjured "	. . .	162
Injured[1] "	. . .	17

The *benefits* derived are somewhat vaguely stated, as indeed was to be expected when almost the only benefits that could be reasonably derived from such pursuits would be of a *general* nature; such as

[1] Some mistake has been committed in compiling these tables. Thus the general Summary at page 378 gives the numbers as quoted above, while the separate tables given for each year, from which the summary is compiled, makes the number of *injured* to be 19 instead of 17.

increase of strength and stamina, increase of energy to undertake, increase of power to undergo, physical exertion; increase of fortitude to encounter and to submit to trials and privations and disappointments. A goodly list of benefits when critically examined. *The uninjured* are those who, in their replies to the author's queries, state *negatively* the results of rowing upon their constitutions and frames; or, in the author's language, who merely say in general terms 'that they never felt any inconvenience from rowing;' while the *injured* are they who state with less or more distinctness that their exertions proved harmful.

We must confess that this last item in the bill, the 17 injured, is at first sight a little startling, and so it must, we think, have appeared to the author, for he very carefully and minutely examines the cases so recorded, and some, I think successfully, dismisses as unreal; while others, I fear it must be candidly avowed, must remain as *bonâ fide* instances of injury. But is this a matter to be wondered at when the number of men who had been so engaged is taken into consideration? Is there any other pastime or pursuit in which grown men can take part, such as draws forth at the same time their bodily power and keenest emulations, which will yield a smaller percentage of evil? Would the hunting-field, would the foot-ball field, or even the cricket-field, if closely scrutinised?

The author tells us that during his inquiries on this subject he has written over two thousand letters. We can well believe it, knowing how unwilling many men are to reply to personal inquiries, and specially so when the inquirer asks after personal ailments. He has not however done himself justice in not giving us in his book a specimen of his letters addressed to his scattered correspondents; for in all cases of dispute, and contested evidence, it is always a matter of objection if the question as put indicates or leads up to the sort of answer desired; and when, as has been already said, scepticism on one side and *esprit de corps* on the other so strongly prevails, doubts may be entertained of the accuracy of some of the statements made in the correspondents' replies. But we think that it will be admitted that as a whole those replies are eminently satisfactory.

A circumstance quite noteworthy, however, strikes the reader who scrutinises the lists as tabulated recording the instances of *injured*, and we would be glad to hear some explanation or interpretation of what at present seems inexplicable. Thus out of the first six races only three men are recorded as injured, while out of the next four races nine men are so recorded, five being mentioned in one race—that of 1845—and two more in the race of the following year. Again occurs a period of comparative immunity from injury, only one case being instanced in the next seven races. Once more is the order changed, for in the following four races four men are recorded as injured, while in the five remaining races of the series no injury whatever seems to have been sustained. The author does not seem to have instituted any inquiry on this point, yet surely it is one worth investigation, seeing that it is this very matter of liability to injury which is the sole subject of dispute, to settle which is the avowed object of his book. Was this injury-rate affected by the mode of training of the crews, the physical calibre or age of the individual men composing them, by the severity of the contest itself, or by the character of the season when the men trained and rowed?

Of the 294 men who rowed in the 26 races taking place between the years 1829 and 1869 (both inclusive), 39 men have died, or rather I should say 40, for one other death has occurred, apparently since the introductory portion of the work was written, and the tables in the appendix were compiled, and we are assured on the authority of elaborate statistics and the logic of averages, that, in comparison with other portions of the civil community, this is a very moderate death-rate. Of the diseases which have carried off in youth or early manhood these 40 men, we will instance but one kind, as being the only one with which boat-racing can presumably be connected, namely consumption, 'and other diseases of the chest:' to these perhaps may be added 'heart affections.' Of the former there are 9, of the latter 3, in all 12.

We are assured, again, that this percentage is a moderate one, that these ailments are still more exacting, not only with other portions of the 'civil community,' but also with the seamen of the Royal Navy, and with the men who fill the ranks of the army, and notably so of the Guards; it being notorious that men of tall stature are more liable to be attacked by, and less able to resist, diseases of this nature than men of more compact build. But here we must confess that this portion of the book does not leave upon our minds quite so comfortable an impression as we could desire. It is felt throughout that the parties compared have little in common in the essentials that make such comparisons valuable. True the University Oars as a rule are tall, above the average height even of men in their own rank of life; but they are 'picked' men—picked for strength as well as stature—picked for physical power already proved—whose whole life from infancy up to manhood has been one varied series of all that art, nature, and science could bring to bear favourably upon their growth and development. While on the other side do we not find the reverse of these conditions prevailing? does not the author himself, elsewhere, describe with painful emphasis the wretched forms, stunted frames, unhealthy occupations and debasing habits of a large portion of the 'civil community;' and is it not notorious that soldiers in regiments where height of stature is the chief requisite, were probably throughout their growing time subject to privations in food and clothing and housing, which coupled with rapid growth, and their surroundings after enlistment, presented the very conditions most favourable to the development of the diseases in question?

While expressing an opinion of qualified satisfaction with the comparisons instituted, we can in no way question the accuracy of the figures given; but we must record our feeling, which we believe will be one generally felt, that such evidence fails in accomplishing the purpose for which it was advanced.

I have stated my belief that, could the truth be ascertained, as many or more injuries would be found to have occurred in the same space of time (a similar number of men having been so engaged) in hunting, at foot-ball, or at cricket; probably too as many of these injuries would have proved fatal. But in stating this we are brought face to face with the fact that, in all instances of hurt or of injury so sustained, they would arise from *accidents*. But this is not the case with the injuries which spring from Boat-racing; here, be they trifling or be they severe, be they few or be they many, they seem to be the natural outcome of the exercise itself; not a hurt, in a sense in which we commonly use that word, of bruise, or break, or strain, and to which we may apply support or remedy, but an unknown evil, unfelt, unsuspected, at the time, but to which existence has been given—to be developed in after-life, when we least suspect it, and are least able to cope with its advances. Now the question which presents itself here to me, and must present itself to any one who cares for the continuation of this favourite exercise—and yet would free it from this grave drawback—is this: Are these injuries, these evils inevitable? No, I answer, at once, and without reservation, they are not inevitable; on the contrary, I believe they may be altogether avoided, for I trace them to be due entirely to two errors committed by rowing men, or, rather, to a misconception on two points—the one as to the nature of the demand which their work at the oar makes upon the several energies of the body, the other as to the system of preparation, or, as it is technically called, *training*, which is undertaken to enable the body to meet these special demands upon its energies. Correct these and this exercise will stand out at once, relieved from all let or hindrance, free, freer than any other, because it is exempted from the *accidents* that lie in the path of others. Correct these and the tripartite list which Dr. Morgan has supplied of *benefited*, *uninjured* and *injured*, would be transformed into one uniform list of the first-mentioned only, for every one would be benefited who pursued this pastime.

In the contest which took place on the Thames last week (Oxford and Cambridge 1873), the points which would probably strike an ordinary spectator most forcibly would be these:—first, the length of the course (four and a quarter miles), and secondly, the shortness of the time in which the boats covered the distance (not quite 20 minutes), and he would probably think that the first was too long, and if he did not actually think that the second was too short (for who admits that a race can be run or rowed too quickly?) he would marvel all the same at its performance, and wonder how men *could* propel a boat over such a long course in such a short space of time. Whether the course could be shortened with advantage, and yet sufficiently test the crews, I will not here discuss, although I think it is open to discussion; and how it is possible to propel a boat over it in the above-mentioned time, is only to be explained by one means, *i. e.,* by a critical examination of the boat itself, and, let us add, a glance at its crew. In the latter he will see eight as fine young men as he probably ever saw in his life before; in the former he will see a machine bearing no resemblance to anything he ever saw afloat, either on river, lake, or sea, nor possessing in shape, or size, or bulk, or weight, any of the proportions which other boats possess: so slim for its length, so straight, so sharp! constructed at all points to cleave the water like a knife-blade! fitted out at all points to save every fraction of weight in rowing or steering gear, to utilise and concentrate every ounce of propelling power exerted by the oarsmen from stroke to bow[1].

Now although the perception of this may to some extent explain the extraordinary rapidity of the race, it will not remove from the spectator's mind the idea of its severity. To him it will still appear that the work will have been tremendous, and he is right: the work *was* tremendous, though not perhaps in the manner or of the kind which he imagines, or of what is commonly understood when the word *work* is used.

'In rowing, as in some other exercises, where the voluntary muscles of the trunk and of the upper limbs are engaged, the breath is 'held' in the lungs during the muscular effort, in order to keep the chest distended, or firm, or as it is technically called, 'fixed,' that these muscles may have firm and unyielding points of attachment during the contractile efforts—fixed fulcra for their levers; and when this is prolonged or repeated over any considerable space of time, it becomes a highly disturbing influence to respiration, and doubly so if the exercise be one which greatly augments the respiratory requirement; for the act of fixing the chest is accomplished by retaining the chest at its point of expansion, when in the natural order of respiration it would be collapsing. And while in ordinary effortless breathing, or in exercises where the lower limbs are solely or chiefly

[1] Appendices N and O.

employed, such as walking or running, the inspiration and expiration follow each other in uninterrupted succession—each occupying about the same space of time as the other, and the two constituting the entire process—in rowing, both these acts are hurried over during that time in which the muscles are relaxed, *i.e.*, towards the close of the stroke, and on the rapid forward dart of the body preparatory to another; when the breath is again held and the chest fixed during the muscular effort. Now in ordinary breathing the rate is, to a full-statured man, from 16 to 20 inspirations per minute, while the racing pace is 40 per minute, or more, and we have seen that the breathing is regulated by the stroke, a breath for each, and these are at 40 a minute! But we have also seen that although there is a breath for every stroke, still the double process of inspiration and expiration does not occupy the whole of even this brief space of time, being accomplished during the momentary muscular relaxation towards the end of the stroke and the forward reach of the body preparatory to another, greatly augmenting the rate at which this double process is performed.' Truly the spectator was right in thinking a boat-race to be tremendous work; for so it is, as regards heart and lungs, at any rate.

And now with reference to the second aspect of boat-racing, *i.e.* its demands upon the muscular energies of the body—the aspect which probably the spectator had in view when impressed by the probable amount of 'work' of the race—will he be relieved or will he be disappointed to learn that the work to be done, the muscular exertion to be undergone, is very slight indeed,—certainly not more than, if so much as, was undergone by any one of the thousands who ran the distance shouting on the banks. Perhaps his examination of the boat and boating gear has prepared him for some such revelation, perhaps it has not, but I can assure him that its accuracy has been proved, not only by my own long personal observations on its mode of action, and consequent results upon the frames of the men themselves, but by practical and theoretic tests of the most searching kind, instituted by men of unquestionable ability for the office, and of unquestionable freedom from prejudice or bias.

I have doubted whether this would be a relief or a disappointment to the ordinary spectator; nor have my doubts been restricted to him. Others whose practical knowledge of the art and exercise of rowing is great have also found it embarrassing how to receive this announcement. For myself, I regard it as an evil, although not one without a remedy. But not only is the muscular effort altogether disproportionate to that of the organs of circulation and respiration, and inadequate in its amount to develop and sustain to their full capacity the frames of the men engaged therein, when rowing is practised for exclusive exercise: it is found that this muscular exertion, inadequate as it is, is also very irregularly and partially divided, very unequally distributed among the several portions of the body.

'A little examination will prove, I think, what at first may not have been surmised, that the legs have the largest share of the work in rowing, for while all other parts employed, back, loins, and arms, act somewhat in detail and in succession, the legs act continuously throughout the stroke, and the individual efforts of each, and the concentrated efforts of all the other parts of the body employed are transmitted through them to the point of resistance—the stretcher. . . . . It will be found also that the stroke is nearly finished before the contractile efforts of the arms are in any degree engaged, namely, when the trunk reaches the vertical line, and they are called in to finish the stroke, and to turn and run out the oar on the forward reach of the body preparatory to another. Rowing thus gives employment to a large portion of the back, more to the loins and hips, and most of all to the legs; but it gives little to the arms, and that chiefly to the fore-arm, and least of all to the chest.'

At this point Dr. Morgan's views and my own do not run quite parallel, but the divergence is not so great as at first sight may appear, and seems the expression of the impatience of the Oarsman at anything which might be construed as a hint that rowing had a fault or a defect of any kind whatever, rather than the decision of the Physician on a question which he had considered. It may be a loss sometimes, perhaps, to have more qualifications than one for judging or writing on a given subject. Thus we recognise the physician when he admits the importance of the development of the chest by muscular exertion,—admits that in so doing we do not merely increase its muscular coverings, but actually expand the walls of the thoracic cavity, giving ampler space for the organs contained therein to perform their all-important functions; nay, that these organs themselves are endowed with increased bulk, vigour, and power by the same means: but here the oarsman crops up, and he contends that all these good things are to be obtained by practice at the oar, for that rowing *does* give this invaluable muscular exertion to the chest. Again, we recognise the physician, acknowledging the substantiated facts of physiological inquiry, when he admits that the chest receives its muscular action through the arms; but again the oarsman contends that in rowing the arms *do* have energetic work to perform adequate to this task; nay, that in his own experience, when captain of his college boat, 'he has seen the biceps expand and the forearm increase in girth;'—the latter probably, but the former—well, they must have rowed in very bad style to cause this development! But scarcely is this avowal made when some doubt as to the propriety of the admission seems to be felt, and the subject is disposed of by the following remark. 'This is an inquiry which I do not mean to inflict upon my readers. It is of more interest to the student of anatomy than to the general public.' Probably this is the case, possibly it is not of great interest to either, but how about the rower? It is with him we are now concerned, and we opine that it is to him of very great importance indeed.

While engaged in fault-finding I will go as far as the paragraph following that from which I have just quoted, and in which I find the same kind of partial reasoning. He proceeds to say:—

'Let us then consider in what way the chest is affected by bodily labour, when the muscles are called into activity, whether in rowing, or running, or in such a course of gymnastics as is now wisely required for young recruits. We find that, in the first place, the parts more especially exercised acquire additional bulk, grow both larger and stronger; and secondly, we observe that the circumference of the chest is increased, it becomes wider and deeper. I have looked over numerous statistics so tabulated as to show the physical value of gymnastic instruction, and these tables all agree in showing that there is under such circumstances a coincident development both of muscle and of chest.'

No doubt 'the statistics so tabulated' give the results which Dr. Morgan has seen, for are not such statistics, after being inspected by the medical officers of the army, regularly forwarded to the Adjutant-General of the forces for his information? But what has this to do with boat-racing or running? These three exercises are as different in character, and as different in their demands upon the physical energies of the human body in their practice, and in the results of their practice, as it is possible to conceive; and who that had investigated these three modes of muscular exertion, would thus run them together for the purpose of showing their value, or the results of their practice on the development of the chest? If the development of the chest is mainly due to the muscular exertions of the arms, how can running develop it, unless a man run upon 'all fours?' When organising this 'course of gymnastic instruction for recruits,' I held ever before me a principle precisely the opposite to that which regulates either good running or rowing. In these, *sameness* of action, from the start till the close of the exercise, prevails; in the gymnastic course it is *variety*, the course embracing several hundreds of exercises, requiring different degrees of effort, executed at different rates of speed, employing every portion of the frame, and notably the upper limbs and trunk of the body—exercises all tested and proved to accomplish given results, on thousands of men, and over many years of careful observation, long before they were embodied by me in the military system[1]. These three exercises should be estimated each by itself, and allowed to stand on its own feet. No real or permanent advantage can accrue to any of them by being thus lumped together, the more especially as they are in their nature so dissimilar.

I have stated that, in my opinion, the evils of boat-racing as now practised are traceable to two causes, first to a misconception of the nature of the demands which it makes on the several energies of the body; and secondly, to the system of preparation, or, as it is called, *training,* which is undertaken to enable the body to meet these special demands upon its energies.

I have also stated at some length wherein lay the first of these misconceptions, namely, in the nature and extent of the effort made by the muscular system and by the respiratory and circulatory system, respectively; showing that while the exertion was slight, if not actually inadequate to the requirements of the former, it was both in amount and character severe, if not absolutely dangerous, in the latter.

The origin of the first misconception, and the reason why it should have lived so long, and should still live, I think may be thus explained. When rowing was first adopted by lads at schools and

[1] A Military System of Gymnastic Exercises for the use of Instructors. By Archibald Maclaren, Adjutant-General's Office, Horse Guards, February 1862.

young men at universities as a regular mode of exercise, and friendly matches of speed and dexterity were organised, the boats used, probably, were not greatly different in size, in shape, or in other points of construction, from those at the time in use by professional watermen; and the manner of rowing was also, very probably, after the waterman's type. If this were the case, then rowing furnished abundant exercise, not only to those portions of the rower's frame which still receive a fair share of employment, but to those also which are at present virtually excluded from the task, or have a very inferior part to play in it; for the heavy, bulky, broad and deep boats, the clumsy, unwieldly, and unskilfully arranged oars and rowlocks, would necessitate a slow and protracted stroke, and both upper and lower limbs would have their part to play and their work to do in dragging the oar through the water. Gradually, changes and improvements would be introduced, lessening the labour, heightening the art, until labour and art in boat propulsion attained their present positions and proportions, the former reduced to a minimum, the latter standing eminently high: but just in proportion to the prominence of these conditions, are its merits as an exercise in an inverse ratio to be estimated. There was plenty of muscular exertion for the whole frame in lugging along the old-fashioned boats. There was little or no distress to heart or lungs in its protracted stroke and deliberate pace. I frankly confess that there would be little in the old style of boat-racing to create and sustain the enthusiasm at present displayed in these contests; and I am expressing no regret at the changes that have taken place, and no wish to return to their primitive, albeit safe conditions: what I do wish is to let rowing remain as it is, nay, to let it pursue its onward course of change and improvement like all other things, but to see if the old order of safety cannot be retained with these advancements, by obtaining from other sources those properties which recent changes have altogether eliminated, or reduced to inefficient proportions.

To glance at the reason why the misconception regarding the actual nature of a boat-race, as now rowed, should have so long existed, and should still exist, I think it needs but to be pointed out that only quite recently has any really critical inquiry been instituted on the subject, and when the results of this inquiry were made known, they savoured to the oarsman like the prescribed 'nasty medicines' to the child; *i.e.* whatever good they may have been calculated to effect, they were nevertheless unpalatable, and if not actually rejected were at any rate swallowed with dislike. But rowing men are not singular in this respect, in claiming for their favourite exercise, through all its changes, in all its attributes, *perfection;* they are claiming no more than all enthusiastic votaries of a special exercise claim, and many with less excuse and less right to an indulgent hearing than the oarsman. 'It gives exercise to every muscle of the body,' say they, 'No exercise whatever,' I reply, 'does this.' No single exercise gives more than employment to a portion of the body, and to that portion sometimes a very inadequate share.

The errors involved in the second misconception in a great measure originate in the first, and their nature is revealed, and the manner of their connection explained, as we proceed in making ourselves acquainted with it. Thus an oarsman at a given time will be called upon to row a race which will tax his bodily energies *such as he knows them, or believes them, to be*, to the uttermost; the effort will be quite exceptional in its severity, and he therefore desires to prepare for it, to fortify himself for it, by every means in his power. Now it need hardly be said that if he is ignorant of the nature of the demands which the effort will make upon him, he cannot rightly prepare himself for that effort; nay, he may, and probably will, go wrong, for advice will be pressed upon him at all hands, and here at any rate, 'In the multiplicity of counsel there is *not* wisdom.' When it is remembered that this preparation or training embraces the administration, or use, of all the material agents which sustain life and give health and strength, it will not be wondered at that mistakes have been made in this direction, and that men should have come to speak of the *ordeal*(!) of training as of a trial as great if not greater than the effort itself for which the training was instituted. Thus one of Dr. Morgan's correspondents who rowed bow at Putney in 1849, Rev. D. Wauchop, Wadham College, Oxford, and a friend of my own of long standing, writes: 'A curious circumstance with regard to training I would mention, and that is, that one of the most sinewy and lasting men of my friends, who had been accustomed to rowing since he was little more than a child, and who was a particularly steady and temperate man, and so good an oar as to be chosen stroke for a time, never could stand training. After a few days of it he invariably broke down, and therefore never rowed in a race.'

It will therefore be easily seen how great must be the advantages to rowing from clearing up what I have called the *first misconception*, in the light of its effects upon the health of the men engaged in it—the only light which would justify my having entered upon the subject at such length in the columns of a purely scientific journal. Thus while it was imagined that rowing entailed tremendous muscular exertions upon the oarsman, rules as to *diet*, *sleep*, and *exercise* were laid down to meet such exertions, one authority recommending men to be in bed ten or eleven hours; for diet, underdone meat in vast quantities, and without vegetables, was by another prescribed, while exercise of any or all kinds put together was cut down to less than one hour in the twenty-four! Thus did the first misconception sustain and prolong the existence of, if it did not give origin to, the second.

The errors in *sleep* and in *diet* are being rapidly cleared away. They are destined soon to be numbered among the vagaries of the past, and in this place we may already pronounce them undeserving of serious exposure or condemnation. With the other agent of health named above, however, as affected by a want of true knowledge of the exertion undergone in rowing, namely, *exercise*, the case is different. The errors on this head are still many and grave, and to the correction of them we must look, before we can expect to see any material improvement in the hygienic value of rowing; to exercise we must look to equalise the partial developments of the frame now caused by rowing as exclusive muscular exertion; to exercise we must look for that increase in vigour and power and functional capacity generally, now wanted to enable the organs of circulation and respiration to sustain the extreme effort which they are called upon to fill during a boat-race.

I will assume that I have established that in rowing the chest and upper limbs receive an inadequate share of the exercise, and therefore in accordance with the organic law regulating material development and functional capacity,—that '*these will be in relation to employment*,'—an advancement in these respects will be shown in those regions, inferior to what is observable in other parts of the body where the employment is greater. This assumption being admitted, it will also be admitted that any want of development or capacity experienced in these regions—whether in the power of the muscles aiding respiration, in the size or conformation of the thoracic cavity, or in the size, conformation or capacity of the organs which they contain,—would affect, and affect in an increasing ratio with its extent, the respiratory effort during the boat-race.

I admit that I am somewhat at issue with Dr. Morgan, inasmuch as he does not go with me so far as to acknowledge this partial division of the labour, and consequently of the reward to the parts engaged, in the act of rowing; but he *does* acknowledge that if it *did* exist, the right way to its rectification would be to supply to the parts found wanting, employment elsewhere and in other form. This is nearly all that I can desire—perhaps more than at this date I have yet a right to expect from a devoted oarsman, jealous of his craft. His language is emphatic and significant:—

'In examining patients for insurance companies, I have frequently refused the lives of young persons on the ground that their chests were narrow and shallow. In several instances, however, these thoracic defects have been corrected by a systematic course of gymnastic exercises, justifying me at a later period in recommending their acceptance. At no time and in no place could every useful variety of exercise be more advantageously carried out than at Oxford and Cambridge; they might, for the class by which they are frequented, serve as valuable national gymnasia.'

Dr. Morgan might have taken a wider base for his congratulations on the establishment of gymnasia than Oxford and Cambridge; the greater number now of our public schools are also so provided, namely, Uppingham, Radley, Cheltenham, Clifton, Marlborough, and Rugby. I place them here in the order in which they have been carried out, Rugby being my last organisation. From all these schools men are coming up to the Universities, after having continuously, during the most important period of their growing time, received a course of carefully systematised bodily training, carried out in buildings specially designed for this purpose, and conducted by teachers duly prepared, and bearing certificates of qualification. All these youths will bring with them not only chests 'larger and deeper,' with hearts and lungs stronger, ampler, and more vigorous, but the knowledge of what a good strong, or well-formed chest is, how it is got, and how it may be lost; and this with the similar advantages of the Universities, and shared in by University men, will surely in time enable us to overcome the evil of rowing, the danger to rowing men: for the whole question is now narrowed to one point. Give to men who now take rowing as exclusive exercise such other exercise as will develop the parts of the body which rowing but imperfectly employs, namely the chest, and you at once endow with vigour and strength the parts that are dangerously taxed in the boat-race! I have known men standing 5 ft. 9 in., with chests measuring 32 in. only, rowing in their college eights! And men standing over 6 ft. in their stockings, with chests measuring 35 in., rowing in the inter-University race at Putney! To what end can these lead? to what but danger to the men, alarm to their friends, and injury to the name and to the interests of the art to which they affect to be devoted. I repeat here what I uttered years ago—'No man of ordinary stature and fair growth should be allowed to put hand upon an oar in a racing boat until his chest has the minimum girth of 36 in.; less will not give him space adequate to the full and fair action of the vital organs within, in the work upon which he would engage; less no man of ordinary stature and fair growth need pass his eighteenth year without possessing.'

In bringing these remarks to a close, I desire heartily to congratulate Dr. Morgan on his book, both in conception and execution, and also to congratulate University Oarsmen in having a work of this character dedicated to investigations of the doubtful and disputed points of their favourite exercise. If he has not succeeded in showing that the

Putney course is quite free from danger, he has shown that it is not so perilous as it was pronounced to be,—*i. e.* not the *via mala* which it had been named. To the disputants on both sides I would say with the peace-loving innkeeper in Silas Marner, 'Ye are both right and both wrong; shake hands and be friends.'

ARCHIBALD MACLAREN.

APPENDICES.

APPENDIX A.

SLIDING-SEATS.[1]—Their Mechanism, History, and Application—Their Influence on Rowing and on the Oarsman.

[I am indebted to the Rev. T. H. T. Hopkins, M. A., Magdalen College, Oxford, for the following Paper.]

The mechanism of the sliding-seat is very simple. It consists essentially of two runners or rails formed of glass, brass, hard wood, or other suitable material on which the rower's seat slides to and fro in a direction parallel to the keel of the boat. Friction is obviated by the introduction of friction-wheels; the traverse fore and aft (which varies according to the kind of boat, and size of the oarsman, from 7 to 10 inches), is limited by stops; the seat is prevented from leaving the runners by being confined within a lateral groove or by some equivalent contrivance; the seat itself, which is just sufficiently large to accommodate the oarsman, is, in order to prevent his slipping about on it, roughened by cross-grooves or scratches, slightly hollowed out, or sometimes covered with wash-leather, or some similar material; and often a rounded ledge of wood is added to prevent the possibility of the oarsman pulling himself forward without the seat.

There are various modifications of the principle. We annex a diagram shewing the forms adopted by the well-known boat-builders Messrs. Salter of Oxford, and Messrs. Searle.

[1] For much of the matter contained in this paper we are indebted to Mr. Knollys, of Magdalen College.

The effect of this seat on the rower's work may be stated briefly as follows:—In order to obtain the necessary traverse for the oar, we require a backward and forward motion of about 3 feet each way. This reach, as it is called when speaking of the motion forward, is attained on *fixed seats* by inclining the shoulders and trunk of the body from the hips as far forward as possible, and by extending the arms straight out to their fullest stretch, the knees being at the same time somewhat bent up; on the *sliding seats* the same, or, to speak more correctly, a longer reach is attained, partly by inclining the trunk of the body forward, but not to the same extent as with the fixed seat, partly by sliding the whole body forward on and with the seat, partly by extension of the arms as in the fixed seat, the knees however being considerably more bent. We shall probably be near the mark in stating that the body of the rower on a fixed seat moves through about 90°; on a sliding-seat through about 45°.

The annexed drawings which are faithful copies from photographs, shewing the oarsman at the beginning and at the end of his stroke, both on the fixed and on the sliding-seat, may serve to illustrate our remarks. It must not however be forgotten that the body would be rather more inclined both backwards and forwards in actual hard rowing than when in attitude to be photographed. Its position in the former case is attained by a quick motion in either direction, and is a position incapable of being sustained except for the very shortest possible time. In fact, in quick, hard rowing there is no pause or *hang* at any part either of the stroke or the recovery.

It is not clearly known to whom the credit of the invention of sliding-seats is really due. America is generally allowed to be the country where it originated, but two individuals there, at least, have been named as the inventors, viz. Captain J. C. Babcock, and the American Champion sculler, the late Walter Brown, who is supposed to have first got his idea of a sliding-seat by observing Renforth and Taylor sliding *on* their seats, when he was in England in 1869 training for his race with J. Sadler.

Sliding-seats were first used in England at the four-oared race for the Championship of the Tyne, which took place in November 1871, between Winship's and Chambers' crews, both rowing without coxswains, when the former, who rowed on sliding-seats, beat the latter who rowed on fixed seats, rather easily. It is worthy of notice that when these same crews met afterwards in America, both rowing on fixed seats the conditions were reversed, as Chambers' crew beat the others twice, and lost on a third occasion by going out of their course after having had a lead of 150 yards at the turning point.

The result of the race on the Tyne did much to bring the new invention into notice; but there was a strong feeling among oarsmen that however suitable sliding-seats might be for a picked crew of practised watermen, or for scullers who had only their own form to consult, they would not prove by any means so advantageous to the rowing of amateurs in general. Nor was this prejudice surprising, for the connoisseur accustomed to that uniform swing and movement of the bodies through a comparatively large arc, exhibiting, as it did, a feature of great beauty, when simultaneously performed by a well practised crew, could not but be disappointed at the apparent lifelessness and want of energy displayed by the new style. 'Why! they are doing no work,' was probably his first exclamation. In spite, however, of this, the use of the new-fashioned seat gradually spread. Some of the

London crews were seen practising on them for the Henley Regatta of 1872, and forthwith nearly all the other competitors, most of whom were quite without previous experience of them, adopted them. One crew, we may remark, which did so increased its speed, at its first row, by 20 seconds over the Henley course, though four oarsmen out of the eight had never rowed on sliders before. Since then scarcely any important race has been rowed without them. They were used by almost every College Boat in the Oxford University Races of 1873; but the University Boat Club has forbidden their use in the Torpids on the ground that beginners can be better taught to row on fixed than on sliding-seats. It was conceded, however, that those who liked might slide *on* their seats.

The introduction, then, of sliding-seats being an accomplished fact, it becomes an important inquiry how far and in what way the physical development of the individual oarsman is affected by the change.

A correspondence on this and other points appeared in the columns of a newspaper[1] soon after the Henley Regatta of 1872, and the letters of two of the correspondents are so relevant to the subject, that coming as they do from well known and distinguished oarsmen who have had special opportunities of investigating the matter most thoroughly, we cannot do better than, with their permission, to quote them at considerable length.

The first we shall quote was from Mr. Knollys of Magdalen College, Oxford, winner of the Diamond and Wingfield Sculls for 1872. He writes:—

'The difference of sliding and fixed seats is the same as if one were to try and raise a great weight off the floor

[1] Land and Water.

between, or, over the knees. In fixed seats the muscles of the leg and those of the small of the back are used about equally, and in sliding-seats the muscles of the leg, especially those just above the knee (the extensors), are used about twice as much as those of the back.

'My idea of correct sliding is to row for about four inches in the ordinary way, and then kick as hard as one can.'

Then followed letters from several well known oarsmen, such as Messrs. Woodgate, Goldie, and Gulston, arguing that sliding-seats were not necessarily antagonistic to good form; then a letter from Mr. E. Warre from which we extract the following. 'On the occasion of a novelty being introduced into such an art as rowing, it is reasonable to expect that prejudice will lead some old hands to pronounce at once against it, and that theorists will discuss the matter without having had recourse to practice, and that men who row more than they think about rowing will advocate anything that appears to give increase of speed, without due regard to the theoretical principles, which in reality govern the true development of the art. In the present controversy two questions appear to be most prominent:—

'1. Does the sliding-seat increase pace or not?

'2. Does it interfere with good style?

To these I would add two more:—

'3. Does it introduce any new principles into rowing?

'4. Is its adoption likely to make rowing a less healthy amusement than heretofore?

'1. I have no hesitation in saying that while a man is fresh, the proper use of the sliding-seat does increase the pace of his boat. The reason of this is, I think, obvious—the man rows a longer stroke.

'After careful measurement the following results obtained shew exactly the relation of the sliding to the fixed seat, as regards the stroke.

'In a boat in which the work was set at 12 inches from the fixed thwart, a slider was placed which gave work at 11 inches at the beginning of the stroke, and a play backwards during the stroke of 5 inches. Consequently the work at the end of the stroke may be considered as set at 16 inches. The thowl being taken as the centre of a circle, the oar outside gives a radius of 9 ft. 1 inch, describing, when the motion of the stroke was gone through, an arc of 7 ft. 6½ inches with the fixed seat; while, when the slider was used the arc described by the same radius was no less than 10 ft. 0½ inch; giving thus an advantage of 2 ft. 6 inches to the sliding-seat, of which 1 ft. 6 inches was gained at the beginning and 1 ft. at the end of the stroke.

'In the face of these facts it is useless to deny the great advantages conferred by a sliding-seat theoretically. The 2 ft. 6 inches excess in the arc described means so much additional power in the water; for the struggle of the oar to perform this arc results in that compromise with the antagonistic forces, in consequence of which, while the oar-blade actually traverses only a few inches of the water, the arc described is completed by the onward motion of the boat. Hence, given two men of equal power, skill, and endurance, and all other conditions equal, and place the one on a sliding-seat and the other on a fixed seat, we may expect in one hundred strokes that the slider will outpace the other by the sum of the differences between each stroke, *i.e.* in the case given above by one hundred times the value to the boat of the extra sweep of 2 ft. 6 inches on the part of the oar. I should thus, from a theoretical point of view, answer the first question affirmatively.

'But there are sundry deductions to be made in practice which must not be lost sight of. Men are not mere machines. If you get extra pace by giving a greater sweep of stroke, you also do it at the cost of extra labour. It is a mistake to think that a mere mechanical contrivance, enabling you to lift so many more foot pounds within the compass of the stroke, will also take the weight of those foot pounds off your muscles. The slider enables you to do more work during the stroke, but it does not do the work for you. It is as well to be clear on this point. The great economy of rowing is to use weight without sacrificing more strength than is necessary. In so far as the slider enables this weight to be distributed on to the handle of the oar and the stretcher for a longer period during the stroke, it gives an absolute gain. In so far as it requires more strength to perform the motion in each stroke, it involves a relative loss. Hence, as experience gives us her lessons to read, we may perhaps discover the happy medium by which the relative loss will be reduced to a minimum without sacrificing all the absolute gain.

'But the advocates of the sliding system must not expect to see sliding crews always victorious over those who use fixed seats. Until I see a Henley course done in seven minutes by a sliding crew, I will not be rash enough to augur that the pace of that fine London crew of 1868, or of the Oxford Etonians of 1870, can be much improved upon by sliding. . . . .

'2. I come now to the question whether sliding need interfere with a good style in rowing, and to this I would answer distinctly in the negative. There was a time when men sat from 14 to 15 inches from their work, and straight backs were quite as common then as they are now. There is no need for any man to arch his back or shoulders, or to tuck up his elbows in the ugly style we saw in some cases at Henley this year. In proportion as a greater sweep of stroke is given, so is it all the more necessary that style should be attended to. Good form means economy of strength, and strength is more urgently needed with the slider than ever.

'And here I may say that erroneous notions are entertained in some quarters about the time of sliding and the use of the legs. It will be, I think, evident to every practical oarsman, that if he can by the sliding-seat get the advantage of starting at the beginning of the stroke at 11 inches from his work, to begin to slide before the beginning of his stroke is fairly accomplished is to throw away the advantage he has got. Evidently the commencement of the backward movement should not take place, till after the beginning of the stroke has brought the handle of the oar so near to the knees that notice is given them to flatten.

'The use of the legs on rowing on fixed seats is practically limited to the application of the strength by means of the suspension of the weight of the body on the handle of the oar and the stretcher. Any kicking or extra work on their own account, or for appearance sake, is positively wrong. I do not see how the sliding-seat can be said to confer a benefit by making men use their legs. On the contrary, one of the difficulties in teaching rowing with sliding-seats will be, I apprehend, to prevent novices from going back too soon, and so losing the power of their legs for the purpose of applying their weight. In fact the backward motion of the perfect slider will be so nicely graduated, as to give his legs their full value in the stroke to the end;—a lesson that many might have picked up from watching the admirable work of the winner of the Diamond and Wingfield Sculls[1].

'The labour of recovery with sliding-seats is not so great as at first sight might be supposed; still it does imply some extra work for both legs and loins, and, when the strength is failing, must add to the distress and the difficulty of keeping in time. Still there is no reason, as far as I can see, to think that good style will be at a discount or rendered unnecessary by the introduction of sliding-seats.

'3. Does the sliding-seat introduce any new principle into rowing? I mean by this, Does it generically alter the stroke? I confess that I do not see that it does in any way. There are about 28 'articuli' or distinct and consecutive motions in the stroke, and to them will be added merely the motion backwards of the whole body during the stroke, and its motion forward during the recovery. I do not think that the rest of the stroke is altered in any single particular.

'4. Is the sliding-seat likely to make Rowing a less healthy amusement than heretofore?

. . . . . 'I think it undeniable that in sliding the muscles of the legs and loins are harder worked than they are with a fixed seat. The increase of work will be in proportion to the length of the slide. Hence I think it important that the sliders should not be too long. They should also, so far from being uniform, be carefully adjusted to the length of the leg, and the power of the man. I should also say, in the interests of Rowing, that novices should first be taught on fixed seats, and that sliding-seats in eights and fours should be reserved for senior crews

[1] Mr. Knollys.

and practised oarsmen. By adhering to this, a benefit may be conferred on younger oarsmen, and perhaps some damage avoided.'

On this letter of Mr. Warre's followed another from Mr. Knollys, in which he says:—'In a race, between a crew on sliding-seats, and a crew on fixed seats, the sliding-seats would not only give an advantage as long as the crew was fresh, but would keep the crew fresh for a longer period. *One of their great advantages I think to be that they do not pump one so soon. Most men's wind gets exhausted before their muscles, and on a sliding-seat one does not get blown so soon as on a fixed one. The reason for this I take to be, that all the work is done with the body in an almost upright position. There is not nearly so much movement of the body, and none of the pressure of the legs against the abdomen and ribs when forward.* I do not think that the only use of the sliding-seat is to lengthen the stroke. I am perfectly sure that new muscles of the leg are brought into play. If any man who has only rowed on fixed seats, will take a sharp spin of half a mile on a slider, he will then feel, by the aching of some of his leg-muscles, that they are not used as they were before. The one he will feel most is the powerful one on the top of the leg just above the knee. This muscle is used to straighten the leg, that is to thrust the seat away (from the stretcher), which, of course, as the body is kept stiff, drags the oar through the water. . . .

'Mr. Warre has clearly explained what I attempted to do, as to the correct method of sliding. The slide should not be allowed to move until the hands have almost reached the knees. In this way, one gets the advantage of the *catch* at the beginning, with the work at only

11 inches from the stretcher, and then—what I consider the great advantage of the sliding-seat—the first part of the stroke lifts the boat on to the surface of the water, and then, without ceasing work and so allowing it to drop back again, the whole weight of the body and strength of the muscles are thrown upon the oar by the sliding, and the boat gives a great shoot over the surface. If anyone will get into a sculling boat and scull hard in the old way, without allowing the boat to move, and then suddenly change into sliding, he will see the difference in the movement of the boat. In the first case the boat will bob up and down, leaving a great wash behind; in the second it will move in gliding shoots, with the water behind not half so much disturbed. I would not wish the slider to *slide* back, but to *shoot* back. I should also wish to propose that sliding-seats be not allowed in any junior race.'

Mr. Knollys writes since:—

'I have not in any material point altered my views expressed above. Different muscles are used, but still more the same muscles in different degrees. In the old style the most important muscles were the glutei, the muscles of the small of the back, and the extensors (the muscles of the top of the leg above the knee), used in degree in the order placed. In sliding-seats, I should say, the extensors do half the work, the other two mentioned and the calf-muscles do the rest. I say the back and glutei cannot do as much as before, for on fixed seats the body swings through about 90°, on sliding-seats barely through 45°. The new muscles used are the calf-muscles, the shin-muscles (on the top), the latter to draw the seat forward, in which also the ham-strings help. But there is no doubt on my mind whatever, that while formerly one did all one's work with the back, only using the legs to keep firm on the seat, now the greater part of the work is done with the legs, and *a man who does not swing an inch, might be accounted a first-rate oarsman.*

'With regard to form, I am convinced that except for a very strong-backed man, and one who has also strong stomach-muscles, it is very difficult to keep a really straight back. The reason is that while before one rowed with the back, and if the back was not stiff one could not get the oar through the water, now the back is more of a *crank* and has to sustain the tremendous pressure backward of the legs at one end, and forward of the arms at the other.

'As for the sliding, the common fault is sliding too soon. As I have before said, feel the water well before sliding, take it quietly but firmly, and after that get to the end of your stroke as soon as possible. I should like to see no splashing, but the oar in quietly and out quietly, not too much dropping of the hands but only of the wrists. So that you continue to go back with the body all the time, the quicker you slide, the quicker the oar will go through the water. I would have as soon said in the old system, "Put your weight on very slowly," as I would now "Slide slowly." And though it would not perhaps pay for a crew to slide with a jerk, yet in a sculling boat, I think that after the body has got back a bit, and is well stiff, to slide with a jerk gets the greatest power on, as a man with a sledge-hammer weighing 10 lbs. can give a blow weighing 7 tons.

'The common faults of sliding are to slide too soon and to lose control over the slide, to allow it to hesitate in its course, and to move when back, and so on. It should only make one continuous firm movement back, and one similar movement forward. I should say that taking the movement of the oar through the water as the stroke, about $\frac{1}{4}$ should be rowed without sliding, then by the end of the slide the body will be back, and the last $\frac{1}{4}$ is done with the arms.'

The able letters which we have quoted seem to us to be almost exhaustive of the subject.

Perhaps however Mr. Knollys has somewhat underrated the part which the muscles of the back have still to play. It is very true, that they are no longer engaged in swinging the body through so large an arc as formerly, but are they not now almost, if not quite, as much exercised in resisting the 'tremendous pressure backwards of the legs at one end, and forward of the arms at the other?' It may be that the new system will demand back muscles equally strong with the old, but may at the same time not give them sufficient motion to enable them to get that strength. If this be so, long practice in heavy boats will be more than ever necessary to supply the oarsman with these muscles which the newly modified form of rowing requires but does not create.

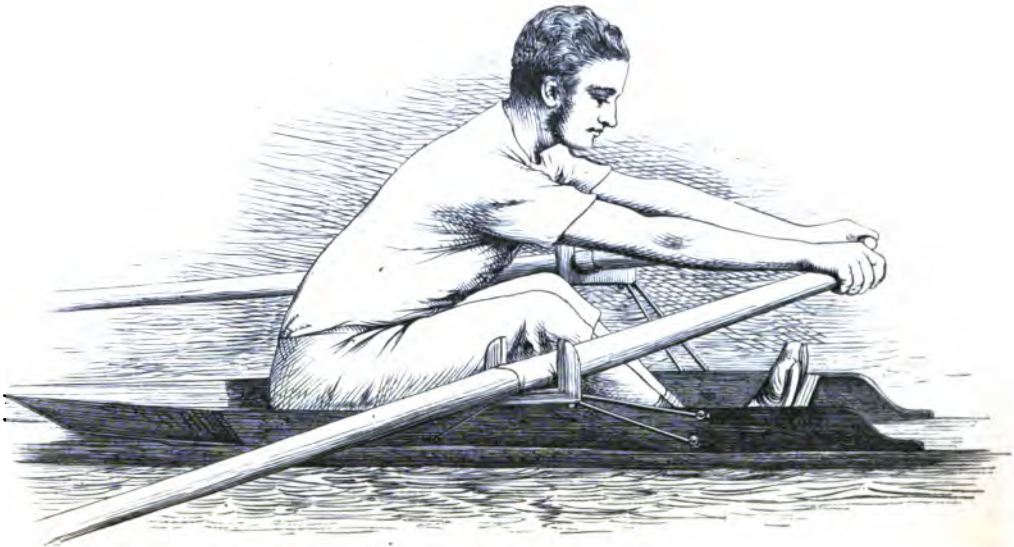
Again, it seems to be taken too much for granted, that the force exercised through the lengthened arc of the sliding-seat stroke, is equal in intensity to that exerted through the shorter arc with the fixed stroke. May it not be the case that the *vis viva* of the quickly moving body in the old style is of more, or at all events of as much avail for useful work as the more sustained but slower motion of the new?

Mr. Warre has very clearly shown that the increased length of stroke, presuming the intensity of the force to be the same, will demand increased expenditure of muscular strength. It must however be remembered that only half the oarsman's time, roughly speaking, is consumed in the backward or useful part of his stroke, the other being devoted to the recovery—or in other words, to carrying the body back into the position for again doing useful work. Now any plan which will enable the body to carry back a greater load at every journey, so to speak, will of course render fewer journeys necessary, and so relieve the oarsman of part of his unproductive labour which fatigues quite as much as the productive.

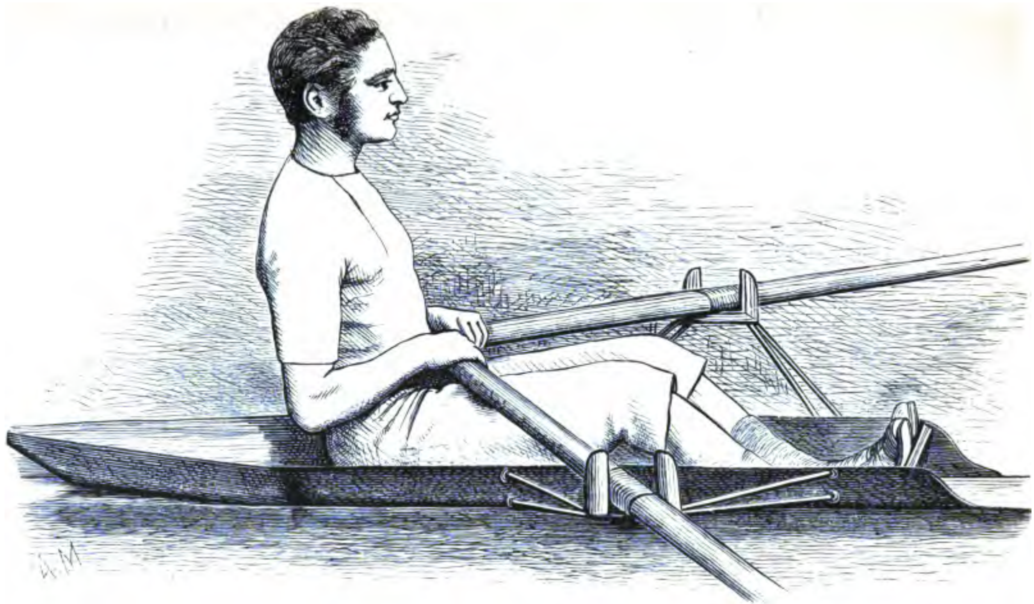
The great gain however of the new system seems to us to be contained in that part of Mr. Knollys' letter which we have italicized, and to consist in the fact that the stomach-muscles are relieved from a considerable portion of the work which was formerly thrown on them in getting forward; while the pressure on the ribs and abdomen which, transmitted upwards through the diaphragm, exercises so powerful an influence on the vital organs above, is very greatly lessened.

We quite agree with Mr. Warre in thinking that 'good form will never be at a discount,' for by *good* form or style we mean 'that method which enables the oarsman to use his powers to the best advantage[1];' but we think it quite open to question whether with sliding-seats a straight back is *essential* to good form. It cannot, we think, be as essential as formerly, for if 'a man be accounted a first-rate oarsman who does not swing an inch,' the *necessity* for straight backs seems to us to have vanished. Under the old system, when the distance through which the oar passed depended on the radius, which the body, swinging on the hips, gave, it was a matter of vital importance to keep the back straight, in order to make this radius as

[1] Principles of Rowing and Steering.

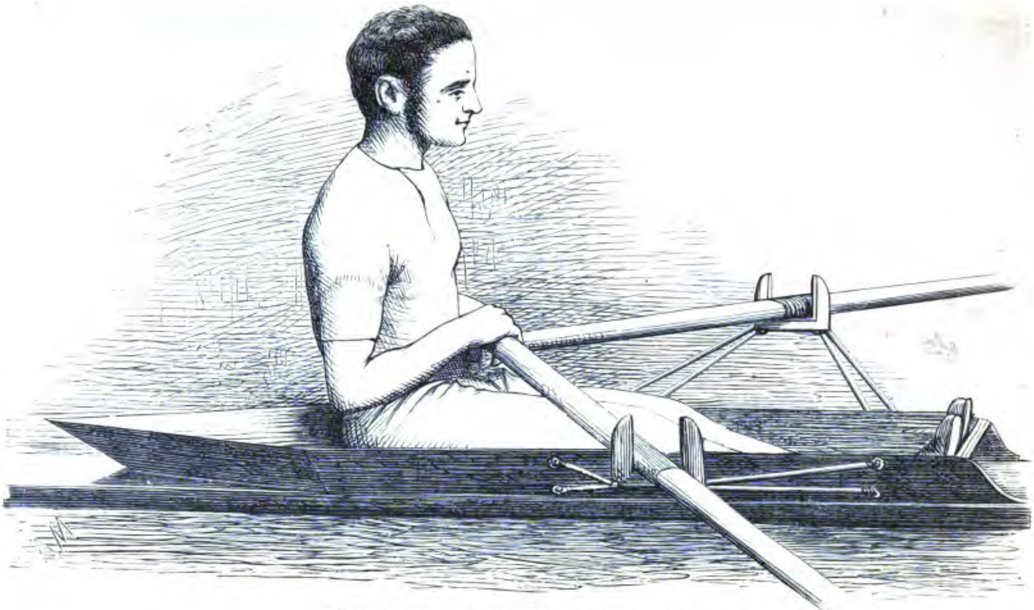


THE FIXED SEAT—BEGINNING OF STROKE.



THE FIXED SEAT — END OF STROKE.

THE SLIDING SEAT — BEGINNING OF STROKE.



THE SLIDING SEAT — END OF STROKE.

long as possible. Now, however, that the traverse of the oar depends, if not entirely yet in a great measure, on the backward motion of the whole body, the efficiency and length of the stroke will depend much more on the stiffness than on the straightness of the back. With regard to appearance, a straight back may be very desirable, but with regard to efficiency we much doubt whether it is indispensable.

At the same time, however, we must confess to a predilection on our own part for the *straight* back, and should consider it as a *point* in the perfect oarsman; so that, given two oarsmen, equally good in other respects, we should prefer the one who could row with a straight back to the one who could not. In no case should *round shoulders* or anything beyond a *slight* curving of the back be tolerated.

We would only observe, in conclusion, that, while considering the influence of sliding-seats on the Rowing and the Rowers, we must not lose sight of the fact that the invention is a very recent one, and that there are many minutiæ connected with the construction and application of seats which experience alone can perfect. It took many years to discover the proper interval between thwart and thowl, yet no point perhaps in the construction of a boat affects the oarsman so vitally as this; it may take as many more to establish the proper length for the slide, or the limits within which that length may vary. Many other details, too, there are, the adjustment of which is absolutely necessary for perfect rowing, and which no theory will ever settle for us. Till practice has done so, the system of sliding-seats cannot be said to have attained its full development, or be in a fair position for comparison with its older rival.

APPENDIX B.

PRACTICAL TEST TO ASCERTAIN THE ACTUAL FORCE EMPLOYED IN THE PROPULSION OF AN EIGHT-OAR BOAT IN RACING TRIM AND AT RACING SPEED.

[I am indebted to the Rev. T. H. T. Hopkins, M.A., Magdalen College, Oxford, for the following results of an experiment made by him with the dynamometer. These results, it will be observed, correspond exactly with those arrived at in the following investigation made by Professor Haughton.]

An Eight-oared Racing-boat, weighted with sand-bags to represent an 11 st. 4 lbs. crew (the weight for which she was built), and steered by an 8 st. coxswain, was towed over part of the Oxford course, where the water is straight, broad, and deep. The Four-oared Boat by which she was towed was itself towed by men on the bank, and kept in a straight course by a coxswain. The Eight-oar was kept as nearly as possible in a line with the Four-oar by the coxswain placed on board for that purpose.

The tow-line from the Four to the Eight-oar was fastened to the bow-oar's thwart in the Eight exactly in a line with the keel, and the strain measured by a dynamometer (a Salter's spring-balance), interposed between the end of the tow-line and the Four-oar.

The distance traversed was ..	560 yards.
Time occupied	6 min. 20 sec.
Average strain on dynamometer	7 lbs.

There was a slight side-wind, but not enough to ruffle the water, or seriously interfere with the experiment.

The strain was measured when the keels of the two boats were as nearly as possible in the same straight line.

The course was against the stream, which is very slight.

The facts are, I think, trustworthy for the speed at which the experiment was made.

The rate at which the boat travelled would be according to the above data, one mile in 19 min. 20 sec. We may call this three miles per hour.

If a constant force of 7 lbs. propels a boat, at the rate of three miles per hour, what force would be required to propel it over the same course at the rate of nine miles per hour, which is about the pace of a good Eight over this course?

If we assume the formula 'that resistance (or, in other words, the force required) varies as the square of the velocity,' then it will follow that a force of 63 lbs. is required to propel a boat at the rate of nine miles per hour (about one mile in seven minutes).

This formula, however, though true within limits, is probably only approximately so at high speeds. Whether the difference between three and nine miles per hour would seriously interfere with it, it is impossible to say without actual experiment.

It must be remembered also that the whole of the force measured in the above experiment was available force; whereas, even in theoretically perfect rowing, there is only one moment, viz. when the oar is at right angles to the keel of the boat, that the force expended by the rower is all used in directly propelling the boat. Neither the beginning nor end of the stroke produce anything like the same effect, though they equally tax the strength of the rower.

If then we really wish to know the force exerted by the rower, we must ascertain how much force is unavoidably wasted in other directions, besides the actual direction required; how much is wasted in friction of oar in rowlock, &c.; how much in lifting his body from the inclined to the perpendicular position, &c.; and all this supposes the rower, boat, &c., to be theoretically perfect. If, however, we consider that no boat ever is so; that coxswains will deviate from the right course, more or less; that boats will roll from time to time; that bodies will catch the wind; that corners have to be turned and waves rowed through,—we shall have to add a very large per centage to the force required as theoretically estimated.

T. H. T. H.

APPENDIX C.

CALCULATIONS TO DEMONSTRATE THE FORCE EMPLOYED IN THE PROPULSION OF AN EIGHT-OAR BOAT IN RACING TRIM AND AT RACING SPEED.

[I am indebted to the Reverend Professor Haughton of the University of Dublin, well known for his valuable works on muscular action, for the following important calculation.]

Investigation of the Work done by the Crew of an Eight-oar, at the rate of one knot in seven minutes [a].

The resistance offered by the water to the motion of the boat is divisible into the following parts, due respectively to—

1. The distortion of the particles of water.
2. The introduction of currents.
3. The production of waves.
4. The production of frictional eddies.

In the case under consideration, the first three causes of resistance may be neglected, in consequence of the 'fair' form of the boat and of the limited speed at which she is driven; and the whole resistance may be regarded as due to the production of frictional eddies.

[a] Length of boat, 56 ft.
Greatest width, 2 ft.
Greatest depth, $12\frac{1}{2}$ ins.
Weight, including oars and other gear, 350 lbs.
Thickness of plank, $\frac{1}{8}$ in.
Length of course, 1 mile.
Mile to be rowed in 7 minutes.
Extreme distance which oar traverses, 8 ft.
Oar in the boat, 3 ft. 5 ins.
,, out of the boat, 9 ft.
Average weight of crew, 11 st. 4 lbs.
Weight of coxswain, 8 st.

In discussing the amount of resistance due to this cause, I shall adopt the principles laid down by Professor Rankine in his Treatise on Ship-building (fol. Mackenzie, London, 1866), pages 78 *et seq.*, from which it appears that,

$$\text{The eddy resistance} = fw \frac{c^2}{2g} \surd q^2\, ds\,; \quad (1).$$

where ds denotes the element of the boat's skin;

- q, the ratio which the velocity of gliding of the water over that portion bears to the speed of the boat;
- c, the speed of the boat;
- g, gravity;
- w, the specific gravity of the water, or weight of one cube foot;
- f, the co-efficient of friction (= 0·0036).

In this equation $\surd q^3\, ds$ is the *augmented surface* of the boat's skin, and is supposed to sum up together the skin resistance, and that due to the excess of water in front, and to the deficiency of water behind.

From the value of the co-efficient of friction employed (which is deduced from Professor Weisbach's experiments on the flow of water in iron pipes), it follows from the preceding equation that *at ten knots the eddy resistance is one pound avoirdupois per square foot of augmented surface; and varies for other speeds as the square of the speed.*

The whole difficulty of the calculation of the eddy resistance turns upon the calculation of the *augmented surface*, which is effected by Professor Rankine on the assumption (conformable to repeated experiments) that the augmented surface, and its resistance, is the same as that of a trochoidal ribbon, whose length is the length of the boat on the plane of floatation, whose breadth is the *mean immersed girth* of the boat, and whose co-efficient of augmented surface is

$$1+4\ \sin^3\ w+\sin^4\ w,$$

where w is the angle of greatest obliquity to the horizon formed by a tangent to the trochoid.

Applying the foregoing principles to the sections of the Oxford Eight-oar when loaded with its crew, I have found the following results:—

1. Length of the plane of floatation = 52 ft.
2. Girth of central immersed section = 31 ft. 5 ins.
   Mean immersed girth = 21 ins. = 1·75 ft.
3. Sine of obliquity . . . . = $\frac{1}{4}$ „

Hence the co-efficient of augmentation is

$$1+4\ (\tfrac{1}{4})^2+(\tfrac{1}{4})^4=1{\cdot}254,$$

and the augmented surface

$$=52\times 1{\cdot}75\times 1{\cdot}254=114{\cdot}11\ \text{sq. feet.}$$

The speed of the boat is assumed to be one *knot* in seven minutes, or $\frac{60}{7}$ knots per hour; hence by the rule already laid down, the resistance per square foot of augmented surface is

$$\left(\frac{60}{7}\right)^2\times\frac{1}{100}=\frac{36}{49}\ \text{lb. av.},$$

and finally the total resistance is

$$114{\cdot}11\times\frac{36}{49}=83{\cdot}84\ \text{lbs.}$$

Exactly speaking, this result should be 81·36 lbs., as the eddy resistance taken above as 1 lb. is really only $\frac{625}{644}$ lb.

This calculation, reduced from the speed of one *knot*

(2000 yards) in seven minutes, to the racing speed of one *mile* (1760 yards) in seven minutes, gives

$$81{\cdot}36 \times \left(\frac{1760}{2000}\right)^2 = 63{\cdot}00.^{b}$$

This resistance is overcome through the space of one mile (5280 ft.) in seven minutes; and therefore the total work done

$$= \frac{63{\cdot}00 \times 5280}{2240} = 148{\cdot}50 \text{ tons lifted a foot.}$$

The work done per man is 18·56 foot-tons in seven minutes, and 2·65 foot-tons each minute.

Professor Haughton also gives the following rule (which is exact):—

> 'The work done per minute by a boat's crew varies as the *cube* of the velocity. Thus a double speed requires an *eightfold* work per minute.'

The rule is thus proved:—

The work done varies as resistance, multiplied by space described.

Resistance varies as square of velocity.

Space described (in a given time) varies as velocity.

Therefore

Work done (in given time) varies as *cube* of velocity.

It may be useful to some readers to explain what is meant in Professor Haughton's calculation by so many 'tons lifted a foot' (called foot-tons). This is the usual method adopted in this country for estimating the amount, and comparing the various forms, of labour. The process

[b] The practical experiment by dynamometer, calculated up to this speed, gives 63·00 lbs. also. See Appendix F.

is shewn clearly by Dr. Parkes in the work already alluded to (*Practical Hygiene*), by the case of a workman in a Copper-rolling Mill, who was said occasionally to raise a weight weighing 90 lbs. to a height of 18 inches, 12,000 times a-day; that is 90 × 12,000 = 1,080,000 lbs = 482 tons lifted 18 inches = 723 tons lifted only 1 foot[c].

The work done per man in rowing one mile at racing speed is, by the foregoing investigation ..	18·56 foot-tons.
The work done by one of the crew weighing 158 lbs. (11 st. 4 lbs.) in racing costume, walking one mile, would be	18·62 „ „[d]

Now it is stated by Dr. Parkes (page 331) 'that looking at all these results (of the various calculations given of work done in different modes of labour), we may perhaps say, as an approximative, that every healthy man ought, if possible, to take a daily amount of exercise, in some way which shall not be less than 150 tons lifted a foot, equivalent to a walk of about nine miles.'

[c] It will be seen that the work actually done would be the same whether the weight be lifted in pounds or in hundredweights, or, if it were possible, all at once.

[d] The formula for calculating this is—

$$\frac{(W + W') \times D}{20 \times 2240};$$

where W is the weight of the person; W′, the weight carried; D, the distance walked; 20, the co-efficient of traction; and 2240, the number of pounds in a ton. The result is the number of tons raised one foot. From *Practical Hygiene.*

APPENDIX D.

TABLE SHEWING RATES OF SPEED OF RACING-BOATS.

The average speeds of winning boats over the Henley course, taken on the times of the Grand Challenge Cup, Stewards' Cup, Silver Goblets, and Diamond Sculls, of the last ten years, in which the times[1] of the races are recorded, are as follows:—

	min.	sec.				min.	sec.
Eight-oar .	7	50	.	about 1 mile in		5	58
Four-oar .	8	54	.	„	„	6	46
Pair-oar .	9	44	.	„	„	7	25
Sculling-boat	9	52	.	„	„	7	31

The highest recorded speeds ever attained over the same course are:—

Boat.	Club or Crew.	Average Weight of Crew exclusive of Coxswain.	Year.	Time.	Remarks.
		st. lbs.		min. sec.	
Eight-oar	Oxford Etonians.	11 10¾	1870	7·17	'Won a good race by a length and 10 ft.'
Four-oar	Oxford Etonians.	12 5¼	1870	8 5	'A magnificent struggle to the finish.'
Pair-oar	Warre and Arkell	11 13	1859	9 0	The steering in this race was magnificent.
Sculling	Michell	—	1865	9 5	

[1] The times are taken from the 'Rowing Almanack.'

The Henley course is 1 mile 2 furlongs 20 poles long, and is the fairest course for comparisons of speed; there being but little stream, and the races being rowed always *up* stream. It is moreover the only course in which first-class racing-boats of all kinds have been contending for any number of years, on the same day, and consequently generally under the same conditions. The speed on this, as on other courses, is greatly affected by the wind.

If University crews, picked and trained with the same care as for the Putney race, had appeared oftener at Henley, it may be fairly assumed that the average speed of Eights would have been higher.

T. H. T. H.

APPENDIX E.

TRAINING TACTICS.

(1866.)

TABLES SHEWING IN OUTLINE THE PRINCIPAL FEATURES OF SEVERAL SYSTEMS OF TRAINING RECOMMENDED FOR ROWING.

No. 1. *THE OXFORD SYSTEM. Summer Races.*

The racing course at Oxford, from the White Willow to the Winning-post above the University Barge, is reckoned at $1\frac{1}{4}$ miles; but this is not quite correct: the distance (ascertained from actual measurement) is 1 mile 251 yards; but as the greater number of the boats are placed above the Willow, and taking into consideration the number of boats (about twenty), the length of each boat (56 ft.), and the difference between them (two lengths[1]), the actual course rowed over in the races, in average work, may be reckoned at a mile. The races are rowed at 7 o'clock, on eight consecutive nights, about the middle of the Summer Term.

A Day's Training[2].

Rise about 7 a.m...	.. ..	(So as to be in Chapel, but early rising not compulsory.)
Exercise	A short walk or run. ..	(Not compulsory.)
Breakfast, 8.30 ..	Meat, Beef or Mutton.	(Underdone.)
	Bread or Toast, dry }	(The crust only recommended.)
	Tea	(As little as possible recommended.)
Exercise (forenoon).	None.	

[1] This year (1866) the distance between the boats was reduced to a length and a half.

[2] As has been stated elsewhere great improvements have been made in diet since this table was compiled. This will also apply to the Cambridge system, page 223.

A Day's Training (continued).

Dinner, 2.0 p.m. ..	Meat; much the same as for Breakfast	
	Bread	(Crust only recommended.)
	Vegetables (none allowed)	('A rule, however, not always adhered to.')
	Beer, one pint.	
Exercise..	About 5 o'clock start for the river, and row twice over the course, 'the speed increasing with the strength of the crew.'	Crews are taken over the long course to Nuneham and back, once or twice during their practice.
Supper, 8.30 or 9.0	Meat, cold.	
	Bread; perhaps a Jelly or Watercresses.	
	Beer, one pint.	
Bed about 10.		

Summary

Sleep	About nine hours.
Exercise ..	Walking and Rowing about one hour.
Diet	Very limited.

N.B. It must be remembered that perhaps no two Colleges train precisely alike, differing however almost solely in diet. In one College I find that although beef and mutton form, as usual, the staple of all three meals, yet the 'mode of their presentation' is judiciously varied on different days of the week,—as chops, haunch of mutton, loin of mutton; steaks, sir-loin of beef, ribs, &c. Here also abundance and choice of vegetables is given,—as potatoes, cabbage, brocoli, spinach, and stewed-rhubarb; with sago, tapioca, and jelly; also watercresses every day, morning, noon, and night. The dietary of this College, and that of the one tabulated, represent, perhaps, the two extremes of variety and restriction.

Winter Races.

The Winter, or as they are called, the Torpid Races, take place in Lent Term. They are rowed over the same course as the Summer Races, and about the same number of boats start. The races are rowed at 3 o'clock on six consecutive days, about the middle of the Term.

A Day's Training.

Rise about 7.30 ..	.. ..	(Early rising not compulsory.)
Exercise	A short walk or run	(Not compulsory.)
Breakfast, 9.0	As for summer races.	
Exercise (forenoon)	None.	
Luncheon about 1.0.	Bread, or a sandwich. Beer, half a pint.	
Exercise..	About 2 o'clock start for the river, and row twice over the course.	Crews are taken over the long course to Nuneham perhaps once or twice during their practice.
Dinner, 5.0 .. .. (In Hall.)	Meat, as for summer races. Bread. Vegetables, as for summer races. Pudding (Rice), or Jelly. Beer, half a pint.	
Bed, 10.30.		

N.B. It is particularly impressed on men in training that as little liquid as possible is to be drunk, water being strictly forbidden.

Summary.

Sleep	As for summer races.
Exercise ..	As for summer races.
Diet	Nearly the same as for summer races; luncheon being about equivalent to supper.

No. 2. THE CAMBRIDGE SYSTEM. Summer Races. (1866.)

The racing course at Cambridge is a little longer than the course at Oxford, being reckoned at 1 mile 487 yards. The races, as at Oxford, are all 'bumping' races; the length of the boats and the distance between each is also the same. The number of boats however is fully double that in the Oxford Summer Races. They are separated into two divisions of twenty boats each: the first division rows only for six nights in the Summer Term; the second division rows for three nights in the Lent Term, and for five nights in the Summer Term. In the Summer Term both divisions begin rowing on the same day, the second division at 2.30 p.m., and the first division at 7 p.m.; each division numbering twenty boats[1]. It will be seen that the second division of the Cambridge Racing Eights thus corresponds to the Oxford Torpids; except that the former row in both Summer and Winter Races, the latter in the Winter only.

On the Cam men have to row about 1½ miles before they reach the *top* of the course, or winning-post, the starting-point being about 1¼ miles lower down. Thus the rowing to the starting-point and then rowing home somewhat exceeds the rowing twice over the Oxford course, as followed in training practice.

A Day's Training.

Rise at 7 a.m.		
Exercise	Run 100 or 200 yards 'as fast as possible.'	'The old system of running a mile or so before breakfast is fast going out, except in the case of men who want to get a good deal of flesh off.'

[1] In 1864 there were three divisions, of 20 boats each, making in all 60 eight-oared racing boats—nearly 500 oars.

A Day's Training (continued).

Breakfast 8.30 ..	Meat, Beef or Mutton. Toast, dry. Tea, two cups, or towards the end of training a cup and a half only. Watercresses occasionally.	Underdone.
Exercise (forenoon)	None.	
Dinner about 2 p.m.	Meat, Beef or Mutton. Bread. Vegetables—Potatoes, Greens. Beer, one pint. *Dessert*—Oranges, or Biscuits, or Figs; Wine, two glasses.	Some Colleges have baked Apples, or Jellies, or Rice-puddings.
Exercise	About 5.30 start for the river, and row to the starting-post and back.	'Most men get out for a little time before rowing back.'
Supper about 8.30 or 9.	Meat, cold. Bread. Vegetables—Lettuce or Watercresses. Beer, one pint.	
Bed at 10.0.		

Summary.

Sleep	Nine hours.
Exercise	About an hour and a quarter[1].
Diet	Limited.

N.B. On Sundays men generally take a long walk of five or six miles.

[1] Reckoning half an hour in rowing to and half an hour in rowing from the starting-point, and a quarter of an hour for the morning's run—in all, say, one and a quarter hours.

Winter Races.

The Winter Races are rowed over the same course as the Summer Races. They take place in Lent Term and are rowed on three consecutive nights.

A Day's Training.

Rise about 7.0 a.m.	
Exercise	As for Summer Races.
Breakfast, 8.30.	As for Summer Races.
Exercise (forenoon)	None.
Luncheon about 1.0	A little cold Meat. Bread. Beer, half-pint, or Biscuit with glass of Sherry; perhaps the yolk of an egg in the Sherry.
Exercise	About 2.0 o'clock start for the river and row over the course and back.
Dinner about 5.0 or 6.0 p.m.	As for Summer Races.
Bed about 10.0 p.m.	

Summary.

Sleep	Same as for Summer Races.
Exercise	Same as for Summer Races.
Diet	Nearly the same as for Summer Races; luncheon being about equal to supper.

No. 3. *H. CLASPER'S SYSTEM*[1].

A Day's Training.

Rise between 6.0 and 7.0 a.m.	
Exercise	A country walk of four or five miles.
Breakfast, 8.0	Meat, Chop or Couple of Eggs. Bread. Tea. ('We never drink coffee.')
Exercise	Rest for half an hour, and then a brisk walk or run. If morning exercise has not been heavy, a row on the river, terminating about 11.0 a.m.
Dinner, 12.0	Meat, Beef or Mutton (broiled). Egg-pudding, with currants in it if desired, or other light farinaceous pudding. Ale, one glass. Wine, one glass (Port) or Ale, two glasses, without Wine.
Exercise	Rest for an hour, and then on the river again for a hard row. 'Rowing exercise should be taken twice every day.'
Tea	'Tea, with toasted bread sparingly buttered, with one egg only—more has a tendency to choke the system.'
Supper	Not recommended. When taken, to consist of new milk and bread, or gruel, with raisins and currants and a glass of Port Wine in it.
Bed about 10.0.	

Summary.

Sleep	Between eight and nine hours.
Exercise	Walking and Rowing about four or five hours.
Diet	Limited.

[1] *Training.* Mode employed by HARRY CLASPER. Rowing Almanack for 1863.

No. 4. *C. WESTHALL'S SYSTEM*[1]. *For Amateurs.*

[A course of preliminary training is prescribed, to be varied according to the condition and habits of the individual. 'If a man is fleshy, and of a full habit of body, a dose or two of mild purgative medicine should be taken, and slow walking exercise only taken on the days the doses have been administered; after the medicine has done its duty, if the amateur is very fleshy, a Turkish bath or two may be taken with advantage, the usual precautions against cold being used. The subject, after one or two of these sweats, is prepared for more arduous work, which may be taken at a fair pace in the form of good sharp runs and fast walks, which, like all other training, will become easier of accomplishment at each repetition.']

A Day's Training

FOR ROWING.

Rise at 6 a.m	Or earlier in the summer. Cold bath and rub down.
Exercise	Sharp walk about a mile out, and run home; or A row of a couple of miles at three-parts speed. A dry rub down.
Breakfast (time not stated)	Meat, Mutton Chop or Steak (broiled). Bread, stale, or Toast. Tea, half a pint.
Exercise	(Not stated.)
Dinner, 2.0 p.m.	Meat (as at Breakfast). Vegetables, none; 'except a mealy potato.' Bread, stale. Beer, one pint.
Exercise (afternoon).. ..	Rowing. If Dinner be late, Luncheon to be taken, to consist of Meat, Beef or Mutton, hot or cold.

[1] *Training for Running, Walking, Rowing, and Boxing.* By C. WESTHALL, the pedestrian Champion of England. London: S. O. Beeton, 248 Strand, W.C.

A Day's Training (continued).

	Bread.
	Beer, one glass.
	(If Dinner be early, 'Tea with viands and liquids as at Breakfast' to be taken.)
Supper	Half a pint of thin Gruel, or dry Toast and a glass of Ale.
Bed	Time not stated.

N.B. It is added 'that the above Rules are of course open to alteration according to circumstances, and the diet varied successfully by the introduction of fowls, either roast or boiled—the latter preferred;' and 'it must never be lost sight of that sharp work, regularity, and cleanliness are the chief, if not the only rules to be followed to produce thorough good condition.'

Summary.

Sleep ..	..	Say eight hours (not stated fully).
Exercise ..	..	Say four or five hours (not stated fully).
Diet ..	..	Limited.

No. 5. *STONEHENGE'S SYSTEM*[1].

TRAINING FOR ROWING.

A Day's Training.

Rise at 8.0 a.m. ..	According to season and weather. Cold bath.	
Exercise, 8.30 to 9.0	Walking or Running.	'Let all take a gentle run or smart walk.' 'In most instances a smart run of three miles will be about the best distance.'
Breakfast, 9.0 to 9.30	Oatmeal Porridge, with Meat (Beef or Mutton, broiled) and Bread. Tea or Coffee, *or* Table Beer, one pint.	'Tea is preferred to Coffee. Cocoa is too greasy.'
Exercise, 9.30 to 11.30	Billiards, Skittles, Quoits, or other light exercise;	
11.30 to 1.30	Rowing.	
1.30 to about 2.30	Running. Rubbed dry and linen changed.	'According to circumstances.'
Dinner, 2.30 to 3.0 or 3.30	Meat—Beef (roast) or Mutton (boiled Mutton occasionally), Roast Fowl, Partridges, or Pheasants (allowed), or Venison (nothing better). Bread (*ad lib.*) Puddings occasionally, made of bread, eggs, and milk, and served with preserved fruits.	'It is generally directed that the steak or chop should be underdone; this I am sure is a fallacy.'

[1] Article 'Boat-racing,' in *British Rural Sports*, by STONEHENGE. London: Routledge, Warne and Routledge, 1861.

A Day's Training (continued).

	Vegetables, — Potatoes (one or two only), Cauliflowers, and Brocoli (only as an occasional change).	If training is protracted, fish allowed (Cod or Soles).
	Beer, from a pint to a pint and a half.	
	Wine, a glass or two, Port or Sherry.	
After Dinner, until 5.0 or 6.0	A gentle stroll or book.	
Exercise, 6.0 to 7.0	Rowing.	
Supper, 8.0	Oatmeal Porridge with dry Toast, *or* Chop, with glass of Port.	
Bed at 9.0 or 10.0.		

Summary.

Sleep	.. ..	Ten or eleven hours.
Exercise	.. ..	Say four hours (exclusive of Billiards, &c.)
Diet	.. ..	Varied.

No. 7. THE AUTHOR OF ROWING AND STEERING'S SYSTEM[1].

CREW ON MONTH'S TRAINING.

[This System is for the Thames, on the course from Putney to Mortlake, reckoned at 4 miles, 3 furlongs.]

A Day's Training.

Rise at about 7.0 a.m.	.. ..	(Glass of cold Water recommended.)
Exercise	The crew meet at 7.0, walk and run for four or five miles; or, in later practice, quick run of two miles.	
	Wash and dress.	
Breakfast, 9.0. . ..	Meat (broiled).	
	Bread (brown) and Butter.	
	Tea, two cups.	'Cocoa made of the nibs boiled for four hours is better than Tea for breakfast.'
	Smoking allowed (conditionally).	'Smoking is barred. For though here also a man's habits are to be taken into account, the subjects of training in match boats are usually too young to have contracted a custom of smoking so inveterate as to have made tobacco indispensable to the body's internal functions, though it is not unfrequently so in older men. After breakfast is the only time allotted to the pipe.'
Luncheon at 1.0 ..	Beef Sandwich with half a pint of Beer, *or*	
	Biscuit and glass of Sherry, *or*	
	Egg in Sherry.	
Exercise	At 2.30 go out to row, and row over the whole course.	'This altogether depends on the state of the crew.'

[1] *The Principles of Rowing and Steering.* Slatter and Rose, High Street, Oxford.

A Day's Training (continued).

Dinner at 6.0 p.m.	Wash in tepid water.	
	Meat (roast, broiled, or boiled).	'Any kind of wholesome meat thoroughly cooked.'
	Vegetables—'The green foods permissible contain in their list spinach—the very best of all; sea-kale, asparagus, but without melted butter; turnip-tops, young unhearted greens, but not solid cabbages; brocoli, carrots, parsnips, and cooked celery. Turnips are also favoured, and peas condemned; also cucumbers, and all salad mixtures. But boiled beet-root is good, and Jerusalem artichokes; and French beans stand next to spinach in virtue.'	The course is varied daily, so that no two days together shall see the same articles on the table.
	Pudding	'Light puddings may be eaten.'
	Bread.	
	Beer, one pint.	
	Wine, two glasses of old Port or Sherry, or three of Claret.	
	Biscuits and dried fruits, as cherries, figs, &c., allowed.	'All fresh fruits are avoided.'
	Jellies	'Plain jellies are innocuous.'
	Water	'As much spring water as they have a mind to.'
Supper, 9.0	Oatmeal Gruel.	If desired.
Bed at 10.0		

N.B.—On Sundays a brisk walk of three hours or so is taken.

Summary.

Sleep	Eight or nine hours.
Exercise	About three hours.
Diet	Very varied.

TABLE

Shewing the Chief Points in the Preceding Systems of Training.

System.	Sleep.	Exercise.		Diet.																
				Solids.									Fluids.			Stimulants, &c.		Substitutes.
				Meat.	Fish.	Vegetables.		Puddings and Jellies.	Fruit.		Bread.							
	Hours.	Kinds.	Hours.	Kinds.	Kinds.	Raw. Kinds.	Cooked. Kinds.	Kinds.	Fresh. Kinds.	Dry. Kinds.	Bread.	Toast.	Water.	Beer. Pints.	Tea. Cups.	Wine. Glasses.	Tobacco.	Gruel. Pints.
No. 1. Oxford System Summer Races	9	2	1	2 Underdone.	0	1	1—5	1—3	0—1	0	Stale.	Dry.	0	2	1—2	(i)	0	0
Winter Races	9	2	1	2	0	1	1—5	1—3	0—1	0	,,	,,	0	1	1—2	,,	0	0
No. 2. Cambridge system Summer Races	9	2	1½	2	0	2	2	3 (d)	1	1	,,	,,	0	2	1½ or 2	2	0	0
Winter Races	9	2	1½	2	0	2	2	3 (d)	1	1	,,	,,	0	1½	1½ or 2	1	0	0
No. 3. H. Clasper's System	8 or 9	3	4 or 5	2	0	0	(c)	1	0	0	,,	,,	0	½	(h)	0	0	½
No. 4. C. Westhall's System	8	3	4 or 5	2	0	0	1	0	0	0	,,	,,	0	1½ or 2	½	0	0	½
No. 5. Stonehenge's System	10 or 11	3	4	6(d) Well done.	2 (b)	0	3	1	0	0	,,	,,	0	3 or 4	0	3	0	(l)
No. 6. 'Rowing and Steering'	8	3	3 or 4	(a)	0	3	12	2	(e)	(f)	Brown	,,	ad lib. g	1 or 1½	2	2 or 3	(k)	(l)

(a) Any kind of wholesome meat. (b) Conditionally. (c) Not stated. (d) Allowed. (e) Condemned. (f) Allowed. (g) At night.
(h) Quantity not stated. (i) Some Colleges allowed. (k) Allowed. (l) Quantity not stated.

APPENDIX F.

Digestion of Food.

Although the term Digestion is sometimes used to mean all the different processes attending the conversion of food into blood, yet the sense in which it is more usually employed is limited to the process which actually takes place within the stomach; and all observations of the complicated process of blood-making, in the living human body, after the food has passed from the mouth, have been limited to this stage. I say observations, for from an accident which happened to an American youth (a gun-shot wound, in which a portion of the side and with it a portion of the walls of the stomach were torn away) actual observations have been made. An aperture, measuring 2½ inches in circumference, remained unclosed after the wound in other respects had become completely healed, and through this aperture the attendant physician was enabled to watch from day to day over a series of several years the process of digestion of almost every article used as human food.

These observations were published in a collected form [1], with tables shewing the time which each separate article of food experimented on required for chymification; and it is from these tables and observations that almost all our actual knowledge on the subject is drawn. The following

[1] *Experiments and Observations on the Gastric Juice and the Physiology of Digestion.* By W. Beaumont, M.D., U.S. Army. Reprinted by Andrew Combe, M.D. Edinburgh, 1838.

table is compiled from those of Dr. Beaumont, with some abridgement and re-arrangement.

But while accepting these statements as facts shewing what, on actual observation, was the actual process and result in a living human stomach, yet it must never be forgotten that it was but *one* stomach; and we all know how greatly digestion varies with different individuals, and how viands that are most easy of digestion with one person will be the very opposite with another.

Nor must it be forgotten that the nutritive value of any article of food and its digestibility do not necessarily bear any direct relation to each other.

A. M.

TABLE SHEWING THE DIGESTIBILITY OF CERTAIN ARTICLES OF FOOD.

	Article of Food.	Mode of Preparation.	Time of Digestion.
			hours. min.
MEAT.	Beef	Boiled	2 45
	„ steak	Broiled	3 0
	„ lean	Roasted	3 30
	„ with mustard and vegetables	Boiled	3 30
	„ „	Fried	4 0
	„ hard salt	Boiled	4 15
	Lamb	Broiled	2 30
	Mutton	Boiled	3 0
	„	Broiled	3 0
	„	Roasted	3 15
	Veal	Broiled	4 0
	„	Fried	4 30
	Pig, sucking	Roasted	2 30
	Pork, steak	Broiled	3 15
	„ salted	Broiled	3 15
	„ „	Boiled	4 30
	„ „	Fried	5 15
	Venison	Broiled	1 35
	Tripe	Boiled	1 0
	Liver	Broiled	2 0
	Gelatine	Boiled	2 30
	Heart	Fried	4 0
POULTRY.	Turkey	Boiled	2 25
	„	Roasted	2 30
	Goose	Roasted	2 30
	Chicken	Fricaséed	2 45
	Fowls	Broiled	4 0
	„	Roasted	4 0
	Ducks	Roasted	4 0
	„ wild	Roasted	4 30

TABLE (*continued*).

	Article of Food.	Mode of Preparation.	Time of Digestion. hours. min.
FISH.	Trout	Boiled	1 30
	„	Fried	1 30
	Cod	Boiled	2 0
	Oysters	Raw	2 55
	„	Roasted	3 15
	„	Stewed	3 30
	Flounders	Fried	3 30
	Salmon, salted	Boiled	4 0
EGGS, &c.	Eggs	Raw	2 0
	„	Roasted	2 15
	„	Soft-boiled	3 0
	„	Hard-boiled	3 30
	„	Fried	3 30
	Milk	Raw	2 15
	„	Boiled	2 0
	Butter	Melted	3 30
	Cheese	Raw	3 30
SOUPS, &c.	Barley broth	. . . . . .	1 30
	Hash (meat and vegetables)	Warmed	2 30
	Soup (Chicken)	Boiled	3 0
	„ (Mutton)	. . . . . .	3 30
	„ (Beef)	. . . . . .	4 0
FARINACEOUS SUBSTANCES.	Bread (wheaten)	Baked	3 30
	Beans	Boiled	2 30
	Rice	Boiled	1 0
	Sago	Boiled	1 45
	Tapioca	Boiled	2 0
VEGETABLES.	Potatoes	Roasted	2 30
	„	Baked	2 30
	„	Boiled	3 30
	Parsnips	Boiled	2 30
	Carrots	Boiled	3 15
	Turnips	Boiled	3 30
	Cabbage	Boiled	4 30
FRUITS :—	Apples (sweet)	Raw	1 30
	„ (sour)	Raw	2 0

APPENDIX G.

TABLE SHEWING THE AVERAGE AMOUNT OF FOOD TAKEN BY MEN OF MEAN HEIGHT (5 FT. 6 IN. TO 5 FT. 10 IN.) AND WEIGHT (140 LBS. TO 160 LBS.), UNDER DIFFERENT CONDITIONS OF ACTIVITY [1].

A man will take on an average in 24 hours:—

Condition of activity.	Water—free food in ounces.	Water in ounces.
When nearly at rest	18—5	70 to 90
When in moderate and usual exercise	23	70 to 90
Under great exertion	26 to 30	80 to 100, or more.
Undergoing enormous exertion	30 to 36, or even 40	Uncertain.

These are all averages, and there is a wide range. From day to day a man takes different amounts. Much depends also on the kind and digestibility of food. A larger quantity of indigestible food is taken; much is then lost by passing out undigested by the bowels. Of the water, about one-fourth or one-fifth is taken as water, the rest is contained as water in the so-called solid food.

[1] From *Practical Hygiene*, by E. H. PARKES, M.D.

APPENDIX II.

PER-CENTAGE TABLE, SHEWING THE APPROXIMATE COMPOSITION OF VARIOUS ARTICLES OF FOOD[1].

The three middle columns (Mineral, Complement, Water) with either the four preceding columns (Proximate Principles), or with the four following columns (Organic Elements), make together 100 parts.

Food.	Plastic.	Fat.	Saccharine.	Gelatine Acid, &c.	Mineral.	Complement.	Water	N.	H.	O.	C.	C. from Plastic.	C. from Respiratory.
Almonds	25·3	56·8	10·0	—	—	4·2	3·7	4·0	9·1	16·3	62·7	13·7	49·0
Apples	·2	—	13·6	·1	—	2·2	83·9	·03	·97	7·6	5·3	·1	5·2
Apricots	·6	—	19·0	1·4	—	1·6	77·4	·1	1·4	11·3	8·2	·3	7·9
Arrowroot	—	—	100·0	—	—	—	—	—	7·1	56·5	36·4	—	36·4
Artichoke	1·9	·1	18·8	—	1·8	·7	76·7	·3	1·4	10·3	8·8	1·0	7·8
Asparagus	·6	—	5·4	—	·4	—	93·6	·1	·4	2·9	2·6	·3	2·3
Bacon	8·4	62·5	—	—	·5	—	28·6	1·3	7·8	7·8	54·0	4·5	49·5
Barley-meal	12·3	1·8	71·4	—	2·5	3·0	9·0	1·9	5 6	38·7	39·3	6·7	32·6
Beans	20·2	·7	42·6	—	2·5	15·4	18·6	3·2	4·4	25·9	30·0	10·9	19·1
Beef	19·0	14·0	—	—	2·0	—	65·0	3·0	3·0	5·7	21·3	10·2	11·1
Beef, cooked	21·8	8·8	—	—	2·4	—	67·0	3·5	2·5	5·9	18·7	11·7	7·0
Beef, shin	17·0	·5	—	19·0	1·5	—	62·0	7·5	2·6	7·3	19·1	9 2	9·9
Beef-tea	3·1	—	—	—	2·5	—	94·4	·5	·2	·7	1·7	1·7	—
Bones	—	1·3	—	29·4	·6	68·7	—	5·2	2·2	7·5	15·8	—	15·8
Bread	10·0	·7	45·3	—	1·0	1·0	42·0	1·6	3·8	25·9	24·7	5·4	19·3
Broth	·5	—	—	1·5	1·0	—	97 0	·46	·14	·4	1·0	·3	·7
Butter, pure	—	100·0	—	—	—	—	—	—	11·9	14·1	74·0	—	74·0
Buttermilk	3·7	—	—	—	—	—	96·3	·6	·3	·8	2·0	2·0	—
Cabbage	1·2	·1	6·2	—	·7	—	91·8	·2	·5	3·5	3·3	·6	2·7
Carp	18·4	·8	—	—	2·9	—	77·9	2·9	1·4	4·4	10·5	9·9	·6
Carrots	1·1	·3	11·9	—	·7	3·2	82·8	·2	·9	6·4	5·8	·6	5·2
Cauliflower	·1	—	8·1	—	—	1·8	90·0	·02	·58	4·2	3·4	·05	3·35
Cheese	30·8	25·6	2·4	—	4·7	—	36·5	4·9	5·4	11·9	36·6	16·6	20·0
Cherries	·6	—	21·4	2·0	·1	1·1	74·8	·1	1·7	12·9	9·3	·3	9·0

[1] This and the two following tables are taken from *A Manual of Diet and Regimen*, by the kind permission of the Author, Horace Dobell, M.D., &c., &c (Published by Churchill and Sons, 1865.)

PER-CENTAGE TABLE (*continued*).

Food.	Plastic.	Fat.	Saccharine	Gelatine Acid, &c.	Mineral.	Complement.	Water.	N.	H.	O.	C.	C. from Plastic.	C. from Respiratory.
Chestnuts	2·8	—	41·1	—	1·9	—	54·2	·4	3·0	22·0	18·5	1·5	17·0
Chicken	21·6	1·9	—	—	2·8	—	73·7	3·5	1·7	5·2	13·1	11·6	1·5
Chocolate	8·8	38·8	49·2	—	1·8	1·4	—	1·4	8·3	30·7	56·4	4·8	51·6
„ (liquor)	·44	2·0	2·4	—	·09	·07	95·0	·07	·43	1·54	2·8	·2	2·6
Cocoa seeds	16·7	53·1	18·7	—	—	6·3	5·2	2·7	8·5	18·2	59·1	9·1	50·0
„ (nibs)	13·3	58·8	23·1	—	2·7	2·1	—	2·13	9·8	20·57	63·2	7·2	56·0
„ (liquor)[1]	·5	3·0	1·0	—	—	—	95·5	·08	·4	·92	3·1	·3	2·8
Cod	16·5	·6	—	—	2·5	—	80·4	2·6	1·2	4·0	9·3	8·9	·4
Coffee seeds	13·0	13·0	15·0	3·0	7·0	37·0	12·0	2·13	8·5	13·37	25·0	7·0	18·0
„ roast, sol., &c.	·8	—	20·5	5·5	—	73·2	—	·23	1·77	13·1	11·7	—	11·7
„ (liquor)[1]	·05	—	1·39	—	—	—	98·86	·008	·092	·74	·60	—	·6
Cream	3·5	4·5	—	—	—	—	92·0	·56	·8	1·24	5·4	1·9	3·5
Cucumber (peeled)	·1	—	1·7	—	·5	0·6	97·1	·02	·12	·91	·75	·05	·7
Currants	·9	—	6·8	2·7	·3	8·0	81·3	·1	·6	5·5	4·2	·5	3.7
Dates, flesh	—	·3	73·4	—	—	2·3	24·0	—	4·9	40·3	28·5	—	28·5
„ kernel	·6	·8	38·9	7·1	—	39·6	13·0	·1	3·3	24·1	19·9	·3	19·6
Egg	15·0	10·8	—	—	2·5	—	71·7	2·4	2·3	4·5	16·6	8·1	8·5
„ white	13·9	—	—	—	2·8	—	83·3	2·2	1·0	3·2	7·5	7·5	—
„ yolk	16·9	29·8	—	—	2·0	—	51·3	2·7	4·7	6·7	32·6	9·1	23·5
Figs	5·0	·9	57·0	—	3·4	15·0	18·7	·8	4·2	30·9	27·0	2·7	24·3
Fish	16·6	·8	—	—	2·9	—	79·7	2·7	1·2	3·9	9·6	9·0	0·6
Flour (wheat)	14·2	1·0	69·8	—	1·2	1·3	12·5	2·2	5·5	38·3	39·0	7·7	31·3
Gooseberries, ripe	·9	—	7·0	2·7	·3	8·0	81·1	·14	·6	5·66	4·2	·5	3·7
„ unripe	1·1	—	1·9	1·9	·2	8·5	86·4	·18	·32	2·3	2·1	·6	1·5
Greengages	·3	—	26·8	·6	—	1·2	71·1	·05	1·85	15·2	10·6	·2	10·4
Green Vegetables	1·0	·2	7·8	—	·7	·8	89·5	·16	·6	4·34	3·9	·5	3·4
Groats, dry	4·0	1·2	74·2	—	—	7·6	13·0	·6	5·2	37·7	35·9	2·2	33·7
„ as gruel	4·0	—	59·0	—	—	24·0	13·0	·6	4·1	30·1	28·2	2·2	26·0
Gruel (groats)	·4	—	5·9	—	—	—	93·7	·06	·44	3·1	2·7	·2	2·5
„ (oatmeal)	1·1	·4	4·0	—	·3	0·7	93·5	·2	·4	2·3	2·6	·6	2·0

[1] See Note to Tea.

PER-CENTAGE TABLE (*continued*).

Food.	Plas-tic.	Fat.	Sac-cha-rine.	Gela-tine Acid. &c.	Mine-ral.	Com-ple-ment.	Water.	N.	H.	O.	C.	C. from Plas-tic.	C. from Respi-ratory.
Haddock	14·6	·6	—	—	2·6	—	82·2	2·4	1·1	3·4	8·3	7·9	·4
Ham	35·0	32·0	—	—	4·4	—	28·6	5·6	6·2	11·0	44·2	18·9	25·3
Horse-radish	·1	—	4·7	—	1·0	16·1	78·1	·02	·32	2·46	2·0	·05	1·95
Indian Corn Meal	8·1	4·5	70·0	—	·8	2·8	13·8	1·3	5·6	36·8	38·9	4·4	34·5
Kidney	21·2	·9	—	—	1·4	—	76·5	3·4	1·6	4·9	12·2	11·5	·7
Lamb	19·6	14·3	—	—	2·2	—	63·9	3·1	3·0	5·9	21·9	10·6	11·3
Lard	—	100·0	—	—	—	—	—	—	11·1	9·8	79·1	—	79·1
Lentil	29·7	—	39·2	—	1·4	15·2	14·5	4·8	4·6	26·4	33·1	16·0	17·1
Liver	26·3	3·9	—	—	1·2	—	68·6	4·2	2·3	6·4	17·3	14·2	3·1
Meat (butchers')	19·4	14·2	—	—	2·1	—	64·3	3·1	3·0	5·8	21·7	10·5	11·2
„ (cooked)	22·5	8·9	—	—	2·5	—	66·1	3·6	2·6	6·0	19·2	12·2	7·0
„ (gravy)	15·0	3·7	—	13·8	1·4	7·0	59·6	5·8	2·4	6·1	17·7	8·1	9·6
Milk (new)	5·0	3·5	4·2	—	·6	—	86·7	·8	1·1	3·6	7·2	2·7	4·5
„ (skimmed)	2·8	—	3·5	—	·8	—	92·9	·45	·45	2·5	2·9	1·5	1·4
Mutton	21·0	14·3	—	—	2·0	—	62·7	3·4	3·1	6·2	22·6	11·3	11·3
„ (cooked)	24·9	8·8	—	—	2·5	—	63·8	4·0	2·7	6·6	20·4	13·4	7·0
„ (neck)	13·0	6·8	—	7·6	1·4	14·0	57·2	4·0	2·2	5·0	16·2	7·0	9·2
Oatmeal	15·0	5·8	53·2	—	3·0	9·6	13·4	2.4	5·0	30·6	36·0	8·1	27·9
Onions	·5	—	5·2	—	·5	—	93·8	·08	·38	2·84	2·4	·3	2·1
Oysters	12·6	—	—	—	·2	—	87·2	2·0	·9	2·9	6·8	6·8	—
Parsnips	2·1	—	14·5	—	1·0	3·0	79·4	·3	1·1	8·0	7·2	1·1	6·1
Peaches	·2	—	21·2	1·8	—	1·9	74·9	·03	1·57	12·6	9·0	·1	8·9
Pearl Barley	4·7	—	78·0	—	·2	7·6	9·5	·8	5·4	39·9	36·6	2·5	34·1
Pears (ripe)	·1	—	9·6	·1	—	3·9	86·3	·02	·6	5·28	3·9	·05	3·85
Peas (dry)	21·9	1·5	46·9	—	2·7	13·3	13·7	3·5	4·8	28·5	33·5	11·8	21·7
„ (green)	2·7	—	6·6	—	·1	12·5	78·1	·4	·6	4·1	4·2	1·5	2·7
Pigeon	23·0	1·9	—	—	2·7	—	72·4	3.7	1·8	5·5	13·9	12·4	1·5
Pork (fresh)	17·5	16·0	—	—	2·2	—	64·3	2·8	3·1	5·5	22·1	9·4	12·7
Potatoes	1·4	·1	15·7	—	1·1	7·1	74·6	·2	1·1	8·1	7·8	·8	7·0
„ (peeled)	1·7	—	23·0	—	1·1	1·6	72·6	·3	1·6	12·4	10·4	·9	9·5

PER-CENTAGE TABLE (*continued*).

Food.	Plastic.	Fat.	Saccharine.	Gelatine Acid, &c.	Mineral.	Complement.	Water.	N.	H.	O.	C.	C. from Plastic.	C. from Respiratory.
Prunes (flesh)	3·9	—	78·6	—	4·5	—	18·0	·6	5·6	41·7	34·6	2·1	32·5
Pudding (flour)	7·7	7·4	23·3	—	·9	·3	60·4	1·8	3·0	14·0	19·6	4·1	15·5
„ (rice)	5·4	5·4	16·3	—	·7	·4	71·8	·8	2·1	10·2	14·0	3·0	11·0
„ (suet)	7·1	13·0	34·9	—	·6	·6	43·8	1·14	4·3	20·96	28·6	3·8	24·8
Radishes	1·2	—	7·4	—	1·0	1·3	89·1	·2	·6	4·1	3·7	·6	3·1
Rice	5·1	·4	81·7	—	·5	3·3	9·0	·8	5·8	41·4	39·2	2·7	36·5
Rump-steak	21·7	1·9	—	—	2·4	—	74·0	3·5	1·7	5·2	13·2	11·7	1·5
Rye Flour	12·1	2·9	69·6	—	2·6	1·8	11·0	1·9	5·7	37·7	39·3	6·6	32·7
Sole	17·0	·8	—	—	2·5	—	79·7	2·7	1·3	4·0	9·8	9·2	·6
Suet	—	100·0	—	—	—	—	—	—	11·7	9·3	79·0	—	79·0
Sugar (crystallized)	—	—	90·0	—	—	—	10·0	—	5·3	42·3	42·4	—	42·4
Soup (invalid)	4·3	—	2·9	14·1	1·2	—	77·5	3·2	1·5	6·0	10·6	2·3	8·3
Sweetbread	28·0	·4	—	—	1·6	—	70·0	4·5	2·0	6·5	15·4	15·1	·3
Tea (leaf)	4·6	1·7	28·9	26·7	1·7	36·4	—	·74	3·5	27·96	29·7	2·5	27·2
„ (sol. &c.)	·5	—	19·0	22·5	1·0	57·0	—	·14	2·2	19·7	20·0	—	20·0
„ (infus.)[1]	·007	—	·32	—	·02	—	99·66	·001	·02	·16	·14	—	·14
Treacle	—	—	75·0	—	—	—	25·0	—	4·7	37·0	33·3	—	33·3
Trout	16·6	·8	—	—	4·3	—	78·3	2·7	1·2	3·9	9·6	9·0	·6
Turnips	1·2	·2	7·6	—	1·0	—	90·0	·2	·6	4·2	4·0	·6	3·4
Veal	17·7	14·3	—	—	2·3	—	65·7	2·8	3·0	5·4	20·8	9·5	11·3
Vegetable Marrow	·5	—	6·4	—	3·9	—	89·2	·08	·42	3·5	2·9	·3	2·6
Venison	20·4	8·0	—	—	2·8	—	68·8	3·3	2·4	5·4	17·3	11·0	6·3
Vermicelli	47·5	—	38·8	—	1·2	—	12·5	7·5	6·0	29·7	43·1	25·9	17·2
Whey	—	—	4·6	—	·7	—	94·7	—	·3	2·5	1·8	—	1·8

[1] One pint of Coffee contains Caffeine, gr. 4·37; one pint of Tea contains Theine, gr. 61.

APPENDIX I.

DIET TABLES, constructed to shew how the essentials of a normal diet may be secured, whether the diet be complicated and expensive, or simple and cheap[1].

Liquid Food. ozs.	Dry. ozs.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccharine. ozs.	Carbon. ozs.
	6	Meat, Poultry, or Game (cooked) .	3·97	1.35	·53	. .	·42
	4	Fish	3·19	·66	·03	. .	·02
	10	Bread	4·20	1·00	·07	4·53	1·93
	8	Potatoes	5·81	·14	. .	1·84	·76
	2	Rice	·18	·10	·01	1·63	.73
	2½	Sugar	. .	. .	. .	2·50	1·05
	2½	Butter	. .	. .	2·50	. .	1·85
5		Milk	4·34	·25	·17	·21	·22
16		Coffee	15·77	. .	. .	·22	·10
16		Tea	15·95	. .	. .	·05	·02
17		Water	17 ·0	. .	. .	. .	. .
54	35		70·41	3·50	3·31	10·98	7·10
					In Plastic matter . .		1·89
						TOTAL	8·99

Liquid Food. ozs.	Dry. ozs.	Food for 24 hours.	Water ozs.	Plastic. ozs.	Fat. ozs.	Saccharine. ozs.	Carbon. ozs.
	16	Bread	6·72	1·60	·11	7·25	3·09
	3	Peas	·41	·65	·04	1·40	·65
	4	Bacon	1·14	·33	2·50	. .	1·98
	2	Cheese	·73	·61	·51	·05	·40
8		Milk	6·94	·40	·28	·34	·36
20		Coffee	19·71	. .	. .	·28	·13
	1	Sugar	. .	. .	. .	1·00	·42
35		Water	35·00	. .	. .	. .	. .
63	26		70·65	3 ·5 9	3·44	10·32	7·03
					In Plastic matter . .		1·94
						TOTAL	8·97

[1] See Note, p. 58.

APPENDIX K.

A SYSTEM OF MEASUREMENTS TO DETERMINE THE RATE OF GROWTH AND DEVELOPMENT.

Height (*without boots*). The position of *Attention*. The heels together, the knees braced back, the chin raised, the head held steady, the shoulders square to the front; the heels, hips, shoulders, and head touching the pillar of the standard. The height to the eighth of an inch to be reckoned.

N.B. This measurement, when repeated, should always be taken at the same time of the day, and after the same amount of bodily exertion.

Weight (*in working costume*, i. e. *in light shoes, flannel trowsers, flannel shirt or jersey*). The weight to a quarter of a pound to be reckoned.

N.B. This measurement, like the preceding, when repeated, should always be taken at the same time of day, and with reference to any circumstances which would affect its accuracy.

Chest (*over the jersey or naked breast—skin measurement*). The position of *Attention*, but with the arms horizontally extended, the palms of the hands held upwards and open, the fingers straight. The tape should be passed around the chest in the line of the nipple, and the girth to the quarter of an inch to be reckoned.

N.B. Care must be taken that the chest is not inflated beyond its due expansion during ordinary breathing.

Where a single measurement is taken the above line is the best as gauging approximately at once the muscular and respiratory capacity; but when the latter quality is of primary importance (as in rowing), a second measurement should be taken lower down the chest, the tape being passed, in front, over the ninth rib. A third measurement, to test the elasticity and mobility of the chest, as shewn by the extent of its expansion on the fullest inspiration beyond the point of the preceding measurements, may be taken on either of the above lines. To take these measurements with perfect accuracy is always difficult, as the mere act of attention and state of consciousness or expectation of the person being measured, will affect the breathing and therefore the actual girth of chest at the time. For this reason it is always desirable, whenever it can be done, or when any doubt as to the accuracy of the measurements exists, to draw the attention by question or remark to some other subject than that of the work on hand.

Fore-Arm. (*All measurements of the upper and lower limbs to be skin measurements.*) The arm extended as in the preceding measurement, but with the hand tightly closed. The tape to be passed around the thickest part of the arm, and its girth at that point reckoned.

N.B. With men who have taken little exercise this line will always be found near the elbow joint, but as the limb becomes developed, and the numerous muscles of the fore-arm acquire bulk and power from exercise, the greatest girth will be found from two to three inches below it: unless this circumstance be kept in view the actual increase will not be perceived.

Upper-Arm. The hand closed as in preceding measurement, but with the arm bent at the elbow, and the hand brought down towards the shoulder; this should be slowly and gradually done, the contractions beginning with the muscles of the palm, bending the joints of the fingers, the clenching of the fist, and bringing the fore-arm down upon the upper-arm. The tape to be passed in a straight line around the thickest part of the arm; this will always be found over the ridge of the very prominent muscle on the upper surface (the biceps). It is by the contractions of this muscle chiefly that the arm is bent in the position of the measurement, and with its antagonistic muscle on the obverse side of the arm (the triceps), by which it is again extended, forms the bulk of the upper arm[1]. The tape measurement, therefore, at this point, *cæteris paribus*, is an accurate gauge of its power.

N.B. When the whole arm is fully developed, the difference in size in an adult of medium stature will be about two inches between the fore and upper arm, and it will almost invariably be found that when the upper-arm is feeble, the upper region of the chest will be feeble also. With a chest of forty inches the arm would probably be twelve inches and fourteen inches.

Certain measurements of the lower limbs should also be taken and recorded when it is desired to ascertain their present condition or rate of development; the measurements which will shew these most accurately, and at the same time most directly correspond with those of the upper limbs, are the following:—

Calf. The limb to be held stiff and straight, the heel raised from the ground, the toes pressed strongly down and the knee braced back. The tape to be passed around the thickest part of the calf, and as the position of this line will somewhat vary with different men, and

[1] See Appendix M.

with the same limb in different stages of development, one or two points should be tried, and that which shews the greatest girth selected.

Thigh. The limb placed as in preceding measurement. The tape to be passed in a horizontal line around the thickest part of the limb, which will be at the highest point of the thigh admitting of horizontal measurement.

A. M.

APPENDIX L.

TABLE

Shewing the state of growth and development of men on arriving at this University; the averages being those of the first 100 names on the book of the Gymnasium, all 19 years of age or under.

Height	5 ft. 8¼ ins. ..	(68·257 ins.)
Weight	9 st. 7 lbs. ..	(132·970 lbs.)
Chest	33 ins.	(32·953 ins.)
Fore-arm	10 ins.	(9·792 ins.)
Upper-arm ..	10¾ ins.	(10·702 ins.)

The greatest developments being:—

Height	6 ft. 6 ins.[1]
Weight	12 st. 2 lbs.
Chest	39 ins.
Fore-arm	11¾ ins.
Upper-arm	12¾ ins.

The smallest developments being:—

Height	5 ft. 2 ins.
Weight	7 st. 0 lbs.
Chest	27¼ ins.
Fore-arm	8½ ins.
Upper-arm	8¾ ins.

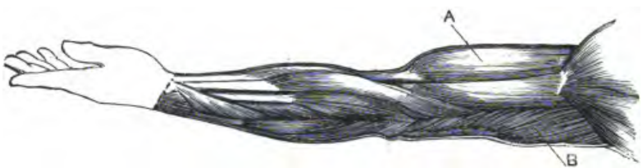
A. M.

[1] The chest in this case was only 36 inches, the age 18.

APPENDIX M.

MUSCULAR ACTION.

Diagrams shewing the appearance of Muscles when *relaxed* and *contracted*.

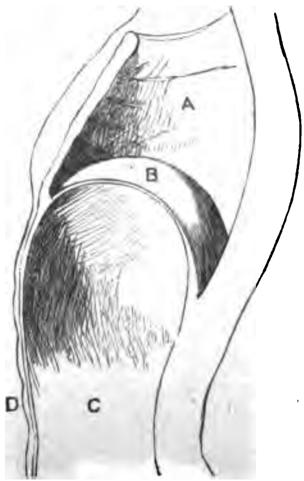


A. Biceps—relaxed.
B. Triceps—contracted (extending the fore-arm).

A. Biceps—contracted (flexing the fore-arm).
B. Triceps—relaxed.

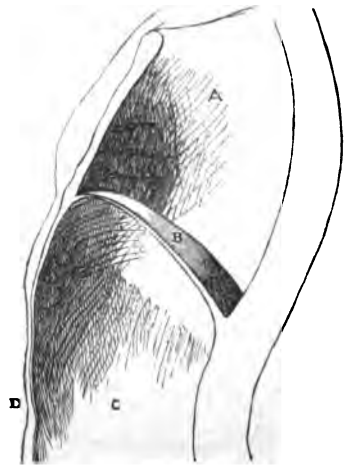
RESPIRATORY ACTION.

Diagrams shewing the position of the Diaphragm, the relative expansion of the Chest, and the distension of the Abdomen, on *Expiration* and *Inspiration*.



EXPIRATION.

A. Chest or Upper Cavity—depressed.
B. Diaphragm—elevated.
C. Abdomen or Lower Cavity—flattened.
D. Muscles of Abdomen—contracted.



INSPIRATION.

A. Chest or Upper Cavity—expanded.
B. Diaphragm—depressed
C. Abdomen or Lower Cavity—distended.
D. Muscles of Abdomen—relaxed.

APPENDIX N.

TABLE SHEWING THE BREADTH, LENGTH, WEIGHT, &c., OF RACING-BOATS.

Description of Boat.	Breadth, extreme at top of gunwale In Inches.	Length, not including Rudder. In Feet.	Weight, &c.
EIGHT-OARED RACING-CUTTER, outrigged, covered in fore and aft with canvas, built of cedar.	24 to 26	56	To carry an 11st. 4lbs. crew complete, with rudder, cushions, &c., 283 lbs. Oars additional 68 „
EIGHT-OARED GIG, outrigged, built in streaks.	26 to 28 [1]	56	(Not known.)
FOUR-OARED RACING-BOAT (light), outrigged, cedar-built, canvassed.	20 to 20½ (st. lbs. 10 7 crew | st. lbs 11 4 crew)	42	Boat and Fittings, 165½ lbs. Oars, 34 „
TWO-OARED RACING-BOAT (light), outrigged, cedar-built, canvassed.	16 to 18	34	Boat and Fittings, 75 lbs. Oars, 17 „
SCULLING RACING-BOAT [2] (light), cedar-built, canvassed.	10 to 13	30 to 31	Boat and Fittings, from 35 to 40 lbs. Sculls about 12 lbs.
PAIR-OARED GIG, outrigged, built in streaks.	28	26	(Not known.)
PAIR-OARED GIG, inrigged, built in streaks.	40	20 to 22	Boat (oak), 223 lbs. Oars, 17 „
WHIFF [3], built in streaks.	25	20	Boat (deal) 85 „ Sculls, 12 „
PUNT, medium size.	38	22	Boat (oak and deal) when new probably about 350 lbs.
PUNT, racing merely.	18	25	(Not known.)

[1] Regulation minimum of width for Torpid Races.

[2] The dimensions of the boat used by the winner of the Diamond Sculls (1866) and of the Wingfield Sculls (1866) are as follows:—

Extreme length ..	33 feet.	Weight, including Sculls, &c. ..	36 lbs.
Extreme width ..	10½ ins.	Thickness of plank	⅛ in.

[3] Intermediate between the old Wh]erry, or Funny, and Sk[iff;—hence its name.

Remarks on preceding Table.

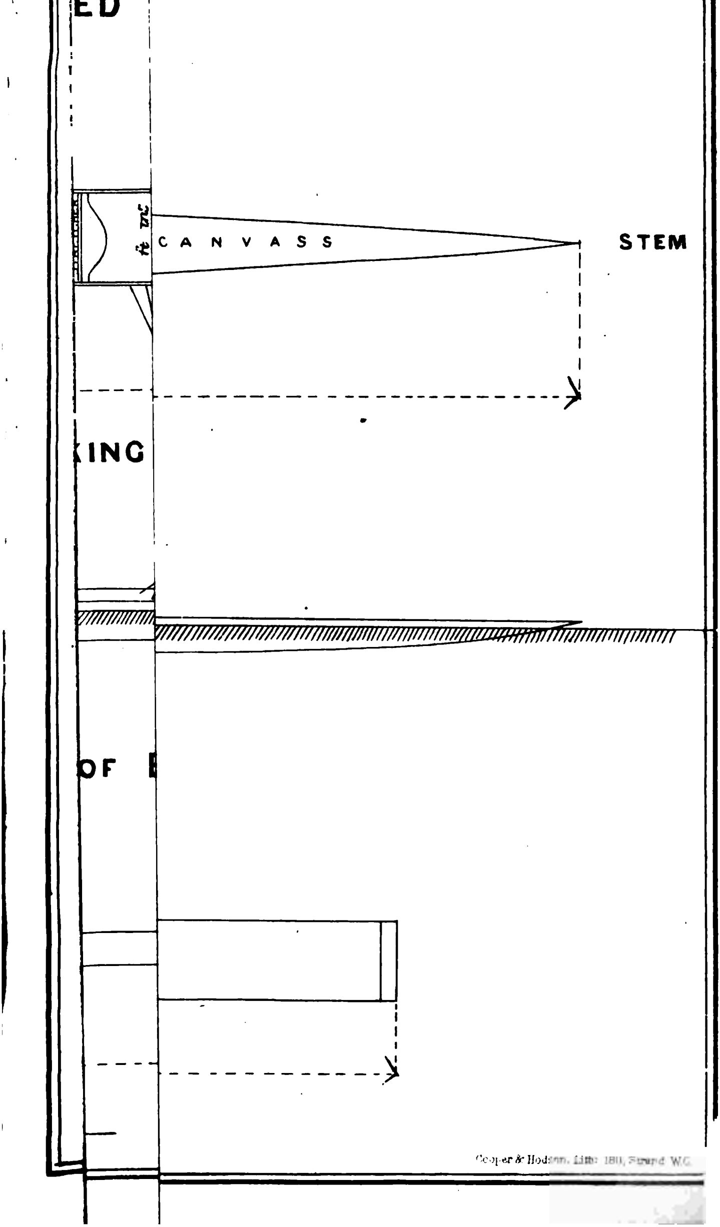
The boats weighed were fair specimens of the class; none of them quite new. A boat, though always taken out of the water and housed after use, will nevertheless, after a little time, gain appreciably in weight. A 35 lb. sculling-boat would probably gain something like 3 or 4 lbs. after about a month's use.

Sculling-boats have been built rather lighter than the weight here given, but have not proved stiff enough to allow of a long steady stroke. They jump instead of progressing continuously. The same remark applies to the other racing-boats; want of stiffness causes a boat to lose its form, and is far more detrimental to speed than a moderate increase of weight would be.

The weight (exclusive of his own) which each man has to carry (including a coxswain in the eight, four, and pair oar gig—say 112 lbs.) will be approximately as follows :—

Racing Eight	58 lbs.	per man.
Racing Four	78 „	„
Racing Pair	46 „	„
Sculling-boat ..	46 to 48 „	„
Pair-oared Gig	176 „	„

T. H. T. H.



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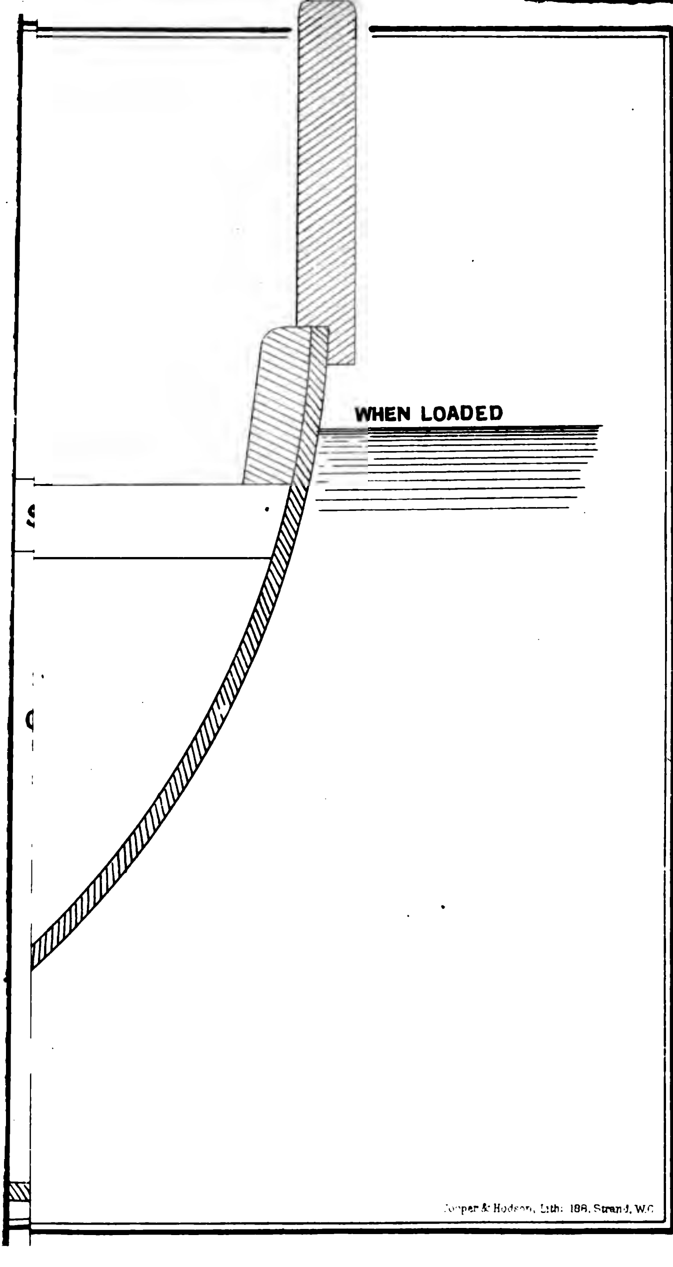

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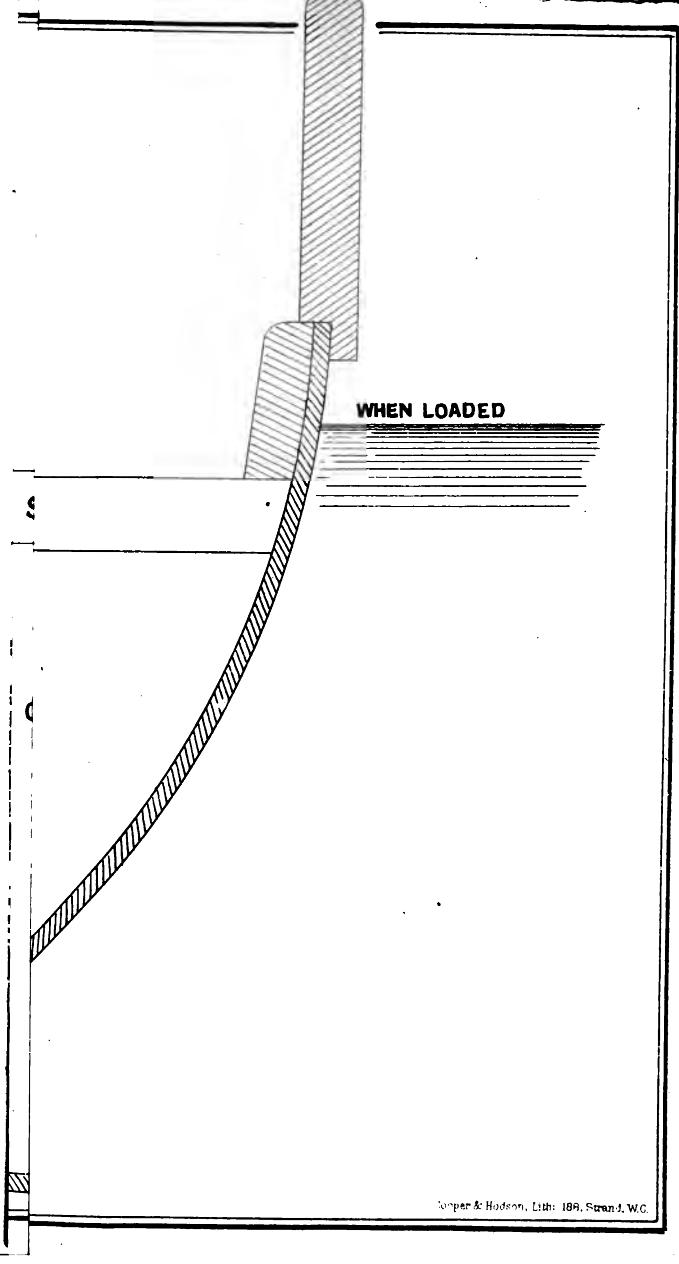

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OPINIONS OF THE PRESS

ON

1. TRAINING, IN THEORY AND PRACTICE,
2. PHYSICAL EDUCATION,

BY ARCHIBALD MACLAREN.

A New Edition of the work on Training is nearly ready, in Crown 8vo. cloth price 6s.

Those who have no ambition to be crack oarsmen, skilful boxers, or noted pedestrians, will find themselves amply repaid for a perusal of Mr. Maclaren's very sensible remarks upon the ordinary agents of health—exercise, diet, sleep, air, bathing, clothing—which are of universal application. On the other hand, the rules are laid down by which the same universal principles are carried to their widest limit in the production of extraordinary results.

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We have seldom seen one of its class more satisfactory in style and matter, and better calculated to advance the interests of Rowing and Training in general.—*Globe.*

In the volume before us, the author has gone so thoroughly into the subject of Exercise in its various forms for the development of the muscular system, that we cannot but pronounce it one of the most concise and elaborately prepared works we have seen on this all-important matter.

Englishmen are, as a body, fond of exercise, and those manly sports, such as cricket, rowing &c., are in no other country so popular or more resorted to in leisure hours. But, as Mr. Maclaren remarks, 'the use often becomes abused,' and in these pages the reader is shown to what extent he may go without injury to his constitution, and the bounds over which if he steps by an immoderate love of work, that constitution may be irreparably sacrificed.

In the opening chapter the author asks—'What does exercise do towards the life, health, and strength of the body? How do lifting and carrying, pushing and pulling, running and jumping, do us good? In fine, what is exercise?' He then endeavours, in a lucid and common-sense manner, to solve the problems which have been so often mooted on the training of youth, and concludes his ably written treatise with an appendix of some forty pages, with tabular forms on diet, weight, duration, &c., which to the younger portion of our readers especially, will be found an invaluable guide.—*Medical Press and Circular.*

Not that Mr. Maclaren objects to the development of rowing as an art; he merely warns modern oarsmen that the exercise which was once so valuable is no longer sufficient. Chests, he tells us, have remained stationary in girth at the very time when they ought to have been expanding. The exercise of rowing a college race is not enough to keep a healthy man in good order, and under the system of Training pursued a powerful man falls off in girth and tension, muscle and stamina. This is not owing to the faults of Training, but to its inadequacy. The Training generally adopted at Oxford and Cambridge gives only an hour or an hour and a quarter of daily exercise.—*Pall Mall Gazette.*

A book on this subject, from one so thoroughly competent to deal with it as Mr. Maclaren would certainly merit attention even were it less novel in character than the one now before us. Confining himself to one, and that one the principal of the athletic sports pursued at the Universities, Mr. Maclaren proceeds to adapt his system to it, and at the same time by thoroughly instilling the theoretical reasons for every step in the process, he makes its application to Training for any purpose easy in the extreme. Men who have been reared under the old system will be rather startled on first perusing Mr. Maclaren's book, so thoroughly does he upset the received notions regarding diet, &c.; but the most bigoted cannot fail to be struck with the correctness of the reasoning by which each step is supported.

All rowing men, and in fact all men who contemplate Training for any object whatever, should read this book, which is an instance of enormous pluck on the author's part, coming forward as he does to tilt boldly at those usages which have now, for so long, been almost superstitiously observed by aspiring athletics and their mentors, and any interference with which will be sure to draw upon the head of the innovator a shower of attacks, from all quarters: these attacks, however, we believe Mr. Maclaren to be quite capable of meeting, and we wish him and his system all success.—*Land and Water.*

After all the nonsense that has been written about Training it is a comfort to get hold of a thoroughly sensible book at last, free from even the modified admixture of traditionary folly, which some recent books have not succeeded in shaking off.

Mr. Maclaren deals a death-blow to a good many old axioms with regard to Training.

Such mistakes, and many more, Mr. Maclaren is at pains to set before his readers in sensible colours, and it will be very well if his book meets with a large sale, as it most probably will do. In the Appendix are valuable papers on the resistance of the water to a boat in rapid motion and the different mechanical questions connected with rowing.

Among other tables appended to the book is one which gives at a glance the principles of various systems of Training, as regards the three great items of sleep, exercise, and diet.—*John Bull.*

In an able and thoroughly scientific treatise, which we cordially commend for careful perusal to rowing men and all followers of gymnastic sports, Mr. Archibald Maclaren examines the system of Training carried out at our Public Schools and Universities, and shows in what particulars it is merely vexatious, and in what respects actively injurious. On several matters pertaining to drink and food, physic and exercise, he is an utterer of doctrine which will certainly provoke discussion and inquiry at Oxford and Cambridge, and will no less certainly result in the explosion of some hurtful misconceptions, and in the modification of several long-established theories and rules.—*Athenæum.*

This is a book containing sound and useful instruction even for those who never handled an oar or took part in any systematic gymnastic exercise. For them, perhaps, most of all; as they, more than any others, are in need of such wholesome advice as Mr. Maclaren here gives concerning the right use of one's limbs and their healthy development by means of good food, proper rest, fresh air, water, and the like.

The book is, in fact, a very sensible and readable exposition of the laws of health, as illustrated and enforced in the condition of health required for successful boating.

In that way Mr. Maclaren tells how men may best fit themselves for success in rowing. Most of his book is as useful in showing how they should proceed to keep themselves in health when they have passed from school and college amusements to the serious business of life.—*Examiner.*

The author writes with especial reference to rowing, the exercise which exacts the greatest devotion from its cultivators; and we can only hope that those who have the responsibility of training crews on the Cam and the Isis will attend to his very sensible remarks.—*Saturday Review.*

Mr. Maclaren enters into a lengthy examination of the effect which varied exercises have upon those portions of the body which they bring into play, and very clearly and forcibly points out the practical results in Training. Another question which he discusses with a good deal of scientific knowledge and much common sense is that of diet in Training. He explodes a great number of fallacies which still exist on this subject, such as the person under Training stuffing himself with beefsteaks, and then engaging in some stiff exercise 'till it is worked into him.' There can be no doubt that the subject discussed by the author is one of very great importance, not only to rowing men and professional athletes, but to all who, having sedentary employments, wish to preserve the organs of the body in a healthy state. The book is agreeably written and beautifully printed.—*Glasgow Herald.*

As a general summary of the main principles of the modern system of Training, we can unreservedly recommend Mr. Maclaren's manual, which is both instructive and interesting.—*Court Journal.*

Mr. Maclaren's skilful and practised hand has been turned to the production of a most elaborate work, which treats upon a subject daily assuming greater importance, now that athletic exercises, in whatever rational form they present themselves, are looked upon almost as a condition to, and not a mere pastime of, collegiate life. Of Mr. Maclaren's ability to undertake the task of monitor in the art of Training, both in theory and practice, he has already given conclusive evidence, both practically and theoretically, and hence the present elaborate work bears with it its own recommendation emanating as it does from such a source. The whole subject of Training is treated on in a masterly, comprehensive and conclusive manner, and when the value of what is here advanced becomes thoroughly known, athletes in general, and rowing men in particular, will not consider their libraries complete without the addition of this volume, which is typographically well-executed, and handsomely bound. Exercise, diet, sleep, air, bathing and clothing are the heads under which the subjects are classified, and the Appendix includes several valuable diagrams, tables, and explanatory notes.—*Oxford University Herald.*

. . . The author's next subject is diet, for which his prescribed régime ought to be observed by all who set any store on the invaluable blessing of good health.—*Morning Post.*

Some of Mr. Maclaren's lessons are obviously sound, and one or two shrewd almost to wisdom. Among them is, we suspect—we write without special physiological knowledge—his remark that wind depends on exercise, and the consequent expansion of the respiratory organs, very much more than on any article of diet.—*Spectator.*

Without criticising the plans of exercise and diet, which occupy a considerable part of the volume, it is sufficient to say that Mr. Maclaren is fully against the error of treating all young men alike. They must be treated according to their constitution and capacity, and forced out by moderate degrees. Some men think that they have but an allotted allowance of strength, and they keep themselves idle in order to reserve their powers for a particular purpose. Nothing can be more wrong. Physical exercise will brace the body to greater ends, just as study will produce study, and its rewards. But only up to a certain point. Beyond that disease sets in.—*Illustrated Times.*

'PHYSICAL EDUCATION' forms a volume of the Clarendon Press Series, and is richly illustrated. Price 7s. 6d.

Few men have done more for physical education than the writer of this book. By his Gymnasium at Oxford he has promoted in an extraordinary degree the health and vigour of the young men of the better classes, while by his excellent athletic code for the army, and by his influence with successive War Ministers, he has aided largely in introducing that admirable athletic training which is transforming the stiff, slow-moving grenadier of old times into the vigorous, rapid and enduring soldier of modern days. But these services, great as they are, are the least of his merits; he has written on his subject largely, and has written so well and so sensibly, without exaggeration and without claptrap, that he has succeeded in gradually bringing the whole nation to consider the important subject of physical training. Himself a physiologist, and conversant with the scientific part of his subject, he has been more able to set forth principles and to convince by reason than his predecessors, and his influence has been so much the wider, and will be so much the more enduring.

The work before us is one which should be in the hands of every schoolmaster and schoolmistress. It is marked in every line by good sense, and is so clearly written that no one can mistake its rules. We would recommend especially to the consideration of every parent the chapter on growth and development; it will be seen what powerful reasons there are for training every part of the muscular system as carefully and as systematically as the mind should be trained. In the injunctions against partial and incomplete work, either of body or mind, we recognise the true philosophy of this subject, and the sooner that philosophy becomes an integral part of the national creed the better.

The work consists of two parts: the first is the chapter on growth and development to which we have referred, and the second is the explanation of the principles and practice of the various exercises. All the different plans are passed in review, and are illustrated by woodcuts. A great number of the exercises, and much of the apparatus, have been invented by Mr. Maclaren himself, for the purposes of bringing into use sets of muscles untouched by other exercises.

We earnestly hope that the book will find, not only many readers, but earnest disciples. It will be for the benefit of the state, as well of the individuals, if such be the case.—*Lancet.*

It will be no news to the readers of this Magazine to tell them that to Mr. Maclaren, of Oxford, more than to any man living, is the cause of physical education indebted for the rapid strides it has of late effected in this country. His magnificent Gymnasium at the University, and the marvellous results there produced, constitute only a small portion of the work he has been for many years accomplishing. The British Army is now trained on his principles, and in Gymnasia invented by him. His last effort is worthy to be placed on a level with any of his former achievements. It is only a little book; but it contains the refined wisdom and experience of a quarter of a century; it throws open to all the world the knowledge obtained in endless studies, experiments and meditation.

The work is a complete manual of the art and science of physical exereise.—*Macmillan's Magazine.*

The great value of Mr. Maclaren's book is that it exactly follows the *via media* between the party who are all for brain, and those who are all for muscle. It is, indeed, a plea for the healthy development of the body, but it recognises throughout the paramount importance of developing the mind. We have not often read a more temperate sensible essay than that 'On Growth and Development,' which occupies the first hundred pages of the book. Every student, every schoolmaster, and every parent should read it carefully; and as a further recommendation we may add that it is written in a style that is at once simple, unpretentious, and refined. It is evidently the work of one who has mastered not only the practice but also the theory of his subject, and has no small literary power. The following passage, where Mr. Maclaren is urging the importance of not neglecting the education of the body through anxiety for that of the mind, will serve at once as an instance of his principles and of his style of writing:—

'Year by year, almost day by day, we see men falter and fail in the midst of their labours—men to whom labour is life, and idleness is death—men who with a negation of self and self-comfort even unto martyrdom, devote themselves to great purposes and great works, and before their completion fail; men who run the life-race with feet winged with the purest faith and hearts full of the noblest hope, and who, with the goal in view, falter and fail; and all for want of a little bodily stamina—a little bodily power and bodily capacity for the endurance of fatigue or protracted unrest or anxiety or grief.'

In recommending once more Mr. Maclaren's book to our readers, we may say that the type and the execution are excellent; that it forms one of the Clarendon Press Series, and so has received a *quasi* 'imprimatur' from the sister University.—*Cambridge Gazette.*

It was a happy idea of the editors of the Clarendon Press Series to enlist the services of Mr. Maclaren for the preparation of a manual on a subject so unquestionably his own. His article on the same topic in *Macmillan*, a year or two ago, guaranteed his theoretical and literary capacity, and for practical experience he can point with pardonable pride to a life spent in spreading physical education amidst high and low, military men and civilians, lads and grown persons; and so well has he justified the choice by the 'system' which lies before us, that we have no doubt of its becoming *the* handbook of gymnastics wheresoever English men and English boys have patience to 'go to book' for hints and information on a subject so important. Jackson's book, which men used to con when they went into training, is out of date; the 'Original' Walker's 'Art of attaining High Health' deals rather with *diet* than *exercise.* Now *exercise* is Mr. Maclaren's theme *par excellence;* and in the first and only reviewable part of his volume he discusses this in its twofold aspect with a definiteness and largeness of view which, if now and then a little obscured by over-fine writing, still indicates a thorough grasp of his topic, and is calculated to correct current errors in regard to it.

We are not prepared to acknowledge the cogency of the examples he cites of excessive mental culture in early boyhood, or of over-weening and exclusive brain-work at the Universities. Experience teaches us that boys of eight years old 'who read eight hours a day, and study Greek, Latin, French, and German, with history, geography, arithmetic, and instrumental music,' are as rare, and as little likely to have many imitators, as the young men 'who sit with wet towels round their foreheads, and sip their green tea' by the light of a 'lamp lit at the setting of the sun, and scarcely extinguished at its rising.' But still we admit there was room for scientific definitions and distinctions as to physical exercise, and that, in a matter which concerns parents as well as their sons, it is an advantage to have a man of experience like Mr. Maclaren to say what is and what is not essential to the 'sound body,' which in these days claims more attention, we verily believe, than the 'sound mind.' What we want is some standard and measure of combining attention to both which shall prevent boys from either developing through parental dread of 'undue cerebreal development,' into unlettered Nimrods, or, on the other hand ending a brief career of excessive mental exertion by an utter loss of health and vigour, which should have been guarded against by timely regard to health and exercise. Our sons in these days appear less afraid of this latter issue than of the former; and in the interest of every *paterfamilias* we therefore tender our gratitude to Mr. Maclaren for explaining, with much emphasis, that *exercise* is of two kinds—*recreative* and *educational;* the first embracing our 'school games, sports, and pastimes;' the second having for its object a systematised distribution of the resources of the body, so that each part of the growing frame shall have all its wants supplied (see p. 39). It is a curious fact, avouched by Mr. Maclaren's wide experience, that recreative exercise develops the 'lower half of the body to the neglect of the upper,' whereas that which he designates 'educational exercise' expands the chest, gives increased muscular power, and has a vast and beneficial influence upon the organs employed in respiration, circulation, and nutrition. It would seem that he thinks, as we think, that 'recreative exercise' needs no enforcement and no weight of argument to recommend it to the favour of 'young England' in the present day; whereas the 'systematised exercises' which rectify malformation, and go far to cure abnormal growth of all kinds, are really the signs and tokens of a pursuit of health which deserves to be preached by a crusade of philanthropists. This systematised bodily culture, recognised now in the British Army (the first detachment of instructors in physical education for which were non-commissioned officers sent to Oxford to qualify under Mr. Maclaren's training—a training by the way, which so developed them that in five months they could not get their tunics to meet down the middle by a hand's-breadth), has been very slow to make its way into our great schools and seminaries—Radley and Magdalen College schools being exceptions to the general neglect.

The bulk of the volume is made up of the 'Practical System of Gymnastic Exercises' of which the principles and rules are clearly stated while the exercises themselves are illustrated by engravings. It will need no word of ours to persuade those who really 'go in' for 'cultivation of the body' to test and examine the practicability of these for themselves.—*Contemporary Review.*

The earlier part comprises a careful treatise on the necessity of physical culture, both to develope the full powers of the human frame and to remedy natural defects, which is written in so scientific a spirit and is so instinct with sound sense, that it might, with some modifications, and with great advantage, be printed in a different form, with a view to wider circulation than it is likely to obtain as an introduction to a system of gymnastics.

How well adapted is the training he advocates to adjust, regulate, and place under control the entire available resources of the strong and take up the comparatively unformed, undeveloped, and altogether negative frame of the youth, and cultivate him into an energetic, active and strong man, Mr. Maclaren has proved by practical experiment.—*Nonconformist.*

Many works have recently been issued which deal more or less directly with the subject of physical education; still there is room for one by a man as well known as Mr. Maclaren. When we noticed his former work on Training, we expressed our satisfaction with the views of the author as sound, rational, and founded on a proper scientific basis. We can fully confirm our previous good opinion, and endorse the present volume as likely to do as much good as the last.—*Medical Times.*

'A System of Physical Education' by Archibald Maclaren, of the Gymnasium, Oxford, is published at the Clarendon Press, Oxford. It is one of the, if not indeed *the* most complete volume of this kind we have seen. Independently of the varied exercises it offers, and the number of good illustrations it contains, it has also an amount of information on physical education which is both sound and useful.—*Manchester Examiner.*

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UNIVERSITY OARS.. **Being a Critical Enquiry into the after Health of the men who Rowed in the Oxford and Cambridge Boat Race from the year 1829 to 1869, based on the personal experience of the Rowers themselves. By John E. Morgan, M.D., M.A. Oxon, F.R.C.P. late Captain of the John + (Coll. Univ.), Physician to the Manchester Royal Infirmary, Author of 'Deterioration of Race,' etc.**

EXTRACT FROM PREFACE.

I would here remind my readers of a leading article which appeared in the 'Times' of October the 15th, 1867 (when a somewhat lively correspondence had been excited by the able letters of the late Mr. Skey), and from which I quote the following remarks: 'The controversy excited by Mr. Skey's letter to this journal may be productive of great benefit, if it elicits the facts which can alone decide it. When an eminent surgeon appeals to his own experience and that of his professional brethren in support of the opinion that many a constitution is injured by the University Boat-Races, his protest cannot be set aside by allegations of "palpable ignorance." The first question is not, whether Mr. Skey understands the principles and practice of rowing, but whether its effects are such as he describes in a minority of cases: and, if so, in how large a minority. Now this is a question upon which no evidence but medical evidence can be of much value. . . . It does not appear that any statistical enquiry into the subject has ever been made by the medical profession. . . If we knew the proportion of these University champions who have since died, or become disabled, and if we also knew the mean percentage of mortality and illness among men of the same age within the same period, we should be in a position to judge, with some approach to certainty, whether these matches do or do not tend to shorten life and weaken the constitution.'

It will be seen from the foregoing extract that at the time this correspondence was carried on, such statistics as those which I have collected were felt to be needed, but did not then exist. . . . .

For the satisfactory treatment of this subject two qualifications seemed to me to be imperatively demanded. First, some knowledge of physiology; and second, some acquaintance with the art of Rowing as it is practised at our Universities. To both of these qualifications I may lay some slight claim. As physician to a large hospital, I have

necessarily enjoyed large opportunities of gaining an insight into the laws which regulate our health; while my rowing experience began at Shrewsbury and was matured at University College, Oxford, where I was for three years captain of the John +, a boat which has often played a prominent part in the struggles of the Isis, and which has served as the training-school for no fewer than ten of the crews which during the last thirty years have won the University Fours.

OPINIONS OF THE PRESS ON 'UNIVERSITY OARS.'

Dr. Morgan's book presents in a most admirable manner full and accurate statistics of the duration of life, and of the causes of death of all the men who have rowed in the Oxford and Cambridge boats from 1829 to 1869, and also gives letters addressed to the author by nearly every individual of the number.—*Daily News.*

We think that all lovers of the English race, all who desire to see cultivated among our young men a spirit of manly endurance, wholesome emulation, and who are philosophical enough to recognise the fact that vigorous physical development is more often than otherwise an index of good mental and moral attributes, are under great obligations to Dr. Morgan for his book.—*Medical Times.*

There is so much that is readable and interesting in the work, that we cannot do better than recommend any one interested in the subject—and who is not?—to read the book for themselves.—*Medical Press and Circular.*

Dr. Morgan has a clear, vigorous, and agreeable style of writing, and he deals with objections in a good-humoured tone, while the good sense and moderation of his views will commend them to unprejudiced readers.—*Illustrated London News.*

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