

# Nautilus Bulletin #2

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## The Present State of the Art

Someone once said that, ". . . nothing can stop an idea that's time has come." And the time has certainly come – the time for improvements in both methods and systems of training, tools and the use of tools. The new Nautilus Machines are not the only new development on the scene at the moment – because the time is right, quite a number of people are working on totally new concepts in the field of exercise; and, as is only to be expected, each new development has its own supporters – and according to those supporters, each new development is the "best".

But the above is not meant to imply that I am talking about people attempting to copy the ideas of other people – although, of course, there is (always will be) a certain amount of that, too; rather, I am talking about new, but different, ideas – different approaches to the same problems.

The barbell is a good tool, a tool that is capable of producing an almost unbelievable degree of muscular development – but a barbell is not a perfect tool; after reading Bulletin Number 1, and after reading this far in this bulletin, intelligent readers should be aware of most of the basic shortcomings of the barbell – so I will not again list those shortcomings here. But I will outline the problems involved in providing an actually perfect form of exercise.

The main trouble seems to stem from the fact that humans are "rotary animals: powered by "reciprocal muscular structures," living on a planet with "reciprocal resistance".

In effect, we are designed to work against rotary resistance – yet, in practice, we seldom encounter anything except reciprocal resistance. Did you ever wonder, for example, why screws are designed with a "right hand" thread? Because most people are right handed, and because right handed people have more power for making clockwise movements than they do for making counterclockwise movements. When you are turning a tool in a clockwise fashion, with your right hand, then the primary function of the biceps is aiding the work – and you are strongest.

And why is your thumb located on the "top" of your hand instead of on the "bottom"? Because, with the thumb located as it is, it serves as an anchor for the entire hand during clockwise movements of the right hand. Try twisting your hand hard in a counterclockwise direction and see what happens; in such cases the thumb is of little or no assistance for maintaining a firm grip – to be of assistance for movements in that direction, the thumb would have to be located at the bottom of your hand, directly opposing your little finger.

Nor would a centrally located thumb – opposed to your middle finger – be a satisfactory compromise; during twisting movements to the right (clockwise) with the right hand, it is the top of the hand that needs to be anchored – the bottom of the hand is pressed even harder against the object being gripped during such movements, but the top of the hand would be pulled loose if it was not anchored by the thumb as it is. The left hand is provided for strong counterclockwise movements – and for that reason, it is a mirror image of the right hand, rather than a duplicate.

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Before it is even possible to design a rational exercise tool, it is necessary to fully understand exactly what the actual functions of human muscular structures are – it is not enough, not nearly enough, to design a tool that will simply provide resistance; a pick and shovel will provide more work than you can stand, but will do very little in the way of building muscular size-strength.

Normal levels of muscular size-strength occur as a part of normal growth, and little or nothing in the way of exercise is required for reaching such normal levels of development; but we are here concerned with abnormal levels of size-strength – we wish to build maximum-possible levels of size-strength, and in the shortest possible period of time, and as a result of the least possible effort. In short, we are looking for the most productive method of exercise.

A healthy body will provide levels of size-strength that it (the body) feels is adequate to provide for normal requirements – and a bit more, as a reserve for emergency utilization. And so long as the existing levels are adequate, so long as impossible demands are not made upon the body, no additional size-strength will be provided – because it is not required. Thus, to produce growth in excess of normal growth, we must make demands in excess of normal demands – and then, if it can, the body will provide the size-strength required to meet these demands. But, please note that "IF IT CAN."

The body is a very complex factory, constantly making literally hundreds of delicate chemical changes – converting fuel and oxygen into the many chemicals needed by the various parts of the system; in a healthy body the system works perfectly – being capable of meeting all requirements and still maintaining a reserve ability for emergency use. But there is always a limit to the amount of such chemical conversions that the body can make within a given period of time – and if you exceed that limit, the body will eventually be overworked to a point of total collapse, or even to the point of death.

You could, for example, run for ten minutes – and then rest for twenty-three hours and fifty minutes – and then run for another ten minutes, and so on; because, in twenty-three hours and fifty minutes, the body can easily recover from a ten minute run.

And you could run for thirty minutes – and then rest for twenty-three hours and thirty minutes, and so on.

And you could run for one hour – and then rest for twenty-three hours, and so on.

But you could not run for sixteen hours – and then repeat such a run after only eight hours of rest. And if you tried to, you would steadily (and quickly) grow weaker – because you would be exceeding your recovery ability.

If you started out with daily runs of ten minutes, and gradually increased the amount of daily running, your "running ability" would increase – up to a point; having reached that point, you could then continue with daily runs of a certain length (which length would vary on an individual basis) – and afterwards your "running ability" would remain unchanged. So long, at least, as you DID NOT INCREASE YOUR SPEED.

But, having reached a point where your daily runs exactly matched your tolerance for running, if you then started running for the same period of time but ran FASTER – then, obviously, you would also be running MORE, and would thus be exceeding your tolerance for running. In which case, your running ability would gradually be reduced – and, finally, if you continued running, you would reach a point of collapse.

Because you would be making demands on your system for chemical changes which the body could not provide – you would be exceeding your recovery ability. The result would be, could only be, "negative growth" – and actual loss of muscular size-strength.

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The "recovery ability" of the body provides normal growth – and it also provides abnormal growth, if such abnormal growth is required, and if the recovery ability is able to meet the requirements.

It should be clearly understood that it is easily possible to totally exhaust the recovery ability, or even exceed the recovery ability, while doing absolutely nothing to stimulate abnormal growth. Obviously, then, to be productive, an exercise must stimulate abnormal growth as much as possible – while disturbing the recovery ability as little as possible; an ideal exercise would be infinitely hard – and infinitely brief – would provide maximum-possible growth stimulation, while leaving the recovery ability in the best possible shape to meet the requirements for growth.

A barbell is far more productive than previously-existing exercise tools simply, and ONLY, because it provides harder exercise – but a barbell still leaves a lot to be desired; because, while barbell exercises are harder than free-hand exercises (for example), they still are not as hard as they should be.

With the relatively unimportant exceptions of such movements as wrist curls, side raises, shoulder shrugs, and a few other barbell (or dumbbell) exercises, most barbell exercises work only a part of human muscular structures; in most cases, a barbell literally cannot provide resistance for all of a muscular structure – because barbells provide reciprocal resistance, and most major movements are made in a rotary fashion such that a barbell provides no resistance at all during a large part of the movement.

Picture, if you can, a large rubber band that has been stretched to twice its normal, relaxed length – and imagine that the rubber band is an extended muscle, the biceps muscle of the upper arm; a stretched rubber band, or an extended muscle, has power potential, or "stored power," power that has not been used, power that cannot be used without reducing the length of the rubber band (or muscle).

While the similarity of a stretched rubber band to an extended muscle is not exact, there is enough of a similarity for the following example.

So long as the rubber band remains in a stretched condition, then it is literally impossible to use up (or reduce) its power potential – and as long as a muscle remains extended, then it is impossible to make use of the entire power potential of the muscle. Muscle fibers perform work by reducing their length – and it should be obvious that a maximum reduction in length of all of the fibers in a particular muscle would unavoidably result in a maximum reduction of the overall length of the muscle. But a muscle cannot reduce its length without producing movement of the involved body-part –and if maximum possible muscle-length reduction has occurred, then it obviously follows that maximum possible body-part movement will also have occurred. Thus it is immediately apparent that ALL of a muscle cannot be involved in any form of work in any position except a position of full contraction – full muscular contraction, with its related full body-part movement.

Thus a position of full contraction is an obvious prerequisite for total involvement of a muscle. ALL of a muscle cannot become involved in work in any other position.

However, while a position of full contraction is an obvious requirement for "total work," it does not follow that such a position will produce total work. Because muscle fibers do not become involved unless they are actually needed. Thus it also logically follows that a second prerequisite for total work is an imposed resistance heavy enough to require the involvement of all of the available muscle fibers.

But regardless of its weight, a barbell imposes absolutely no resistance on muscles in their fully contracted positions – disregarding the above listed minor exceptions.

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With Nautilus Machines we have introduced exercises that provide resistance in all positions – continuous resistance that works a muscle from a position of full extension to one of full contraction.

But continuous resistance is not enough – although it is a long first step in the right direction. Since the strength of a muscle – both the "input of strength" and the "output of strength" – is not constant, is not the same in all positions, it is obvious that the resistance must vary in exact accord with variations in the output of strength.

One current approach to solving this problem – NOT the Nautilus approach – involves the use of the "inertia reel" principle; by limiting the speed-of-movement, it was felt that maximum-possible resistance would be provided in all positions. Which works fairly well in theory – but not well at all in practice.

With that system, there is no actual resistance; instead, even a very small effort will move the bar – but the bar will only move at a certain speed, regardless of how hard you are pushing (or pulling). In theory, then, if you pull (or push) as hard as possible in all positions – throughout the movement – the resistance will always be "right," will always be maximum-possible resistance in any and in all positions. One of the obvious shortcomings of the system, however, is the fact that you are limited to a particular speed-of-movement – the speed-of-movement can be set at almost any speed you like, but once set it becomes constant throughout the movement. The people who are producing such devices, of course, point directly to this actual shortcoming as one of the major "advantages" of such resistance – which, under the circumstances, I suppose, is all they can do except admit the truth of the matter.

Another shortcoming of this system is the fact that such "resistance" is not omni-directional; in effect, you still have no resistance at the end of the movement – you have no resistance in the fully contracted position, no resistance in the only position where it is even possible to involve all of a muscular structure.

Thirdly, there is no "negative work" provided by such a form of resistance; in effect (in a curl) you can only curl "upwards" – but having reached the top, there is no resistance for the downwards movement.

Which, as is only to be expected, the supporters of such devices point to as yet another "advantage" – but which, in fact, may well be either an advantage or a disadvantage, and at this point in time NOBODY knows whether it is an advantage or a disadvantage. BUT – we do know that "negative work" causes far more muscular soreness than "positive work" does; which means that such resistance probably wouldn't cause as much muscular soreness in a previously untrained individual – but which may also mean that it isn't as productive as it should be.

"Negative work" is lowering a weight – "positive work" is raising a weight. If you curled a dumbbell "up" with your right hand, and then placed it on a table that was level with the top position of the curl – and if you then took the dumbbell in your left hand and lowered it back to the low starting position – your right hand would be performing positive work (raising) and your left hand would be performing negative work (lowering), and the right hand would be working about five to seven times as hard as your left hand was.

If you curled a dumbbell in such a fashion until you reached a point of exhaustion, your left arm would be much more likely to become sore as a result of such work than your right hand would – even though the left arm did much less work. Nobody seems to know "why" this is true – but it is true. Nor does anybody know "why" a muscle becomes sore in the first place – although we do know how to make a muscle sore, we don't know what actually takes place with the muscle to create soreness; and, since there are no nerves in a muscle that are capable of registering pain, it may well be that it isn't the muscle itself that actually gets sore. But if not the muscle, then what does get sore? We don't yet know.

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We easily could have incorporated such a form of resistance into the Nautilus machines – but we long ago rejected the idea; because careful tests with such "restricted speed" resistance clearly indicated that it was vastly inferior to a form of resistance that can be moved at any speed –and since speed is a result, and a factor, of power production, it should be obvious that limiting speed of movement to any arbitrarily selected speed is certainly not desirable.

Also, since even a very small amount of effort will produce the same speed of movement that a maximum effort would have produced, there will always be a temptation on the part of the trainee to do less than he should – or he may work at a reduced level without even being aware that he is doing so.

In short, if there are any actual advantages to this type of resistance then I am not aware of them – advantages insofar as productivity is concerned, I mean. However, since such exercise machines do not require any actual weight, they are much lighter and thus the freight is quite a bit less – so, if you are primarily interested in saving a few dollars in freight charges, then you should buy such a machine; but if you are interested in results, you should not.

And, since the machines of this type that have come to my attention are very flimsy in construction, they are also lower in price than other types of machines – which makes it possible for salesmen of such machines to offer fairly low prices while still making a profit of 30 per cent to 40 per cent on each sale; and since, with such windfall profits at stake, many people would lend their support to almost anything, it is not surprising that many people who should know better (and probably do know better), and who should be interested in results (but apparently aren't), are giving such glowing testimonials for such equipment.

Normal human movements involve several factors – raising weight, lowering weight, acceleration of weight, deceleration of weight, supporting weight –and all of these factors except supporting weight are possible at any speed within a very wide range of speed varying from almost imperceptible movement to movement that is too fast to follow with the eye. All of which factors are fully provided for in Nautilus machines.

Nautilus machines may – and usually will – make a previously-untrained subject very sore if he uses the equipment to a point of exhaustion during his first few workouts; and such soreness may be (or may not be) a disadvantage – but Nautilus machines certainly will stimulate muscle growth to a greater degree than any other device that we are aware of, and will do so within a very limited "amount" of training, so that the recovery system of the body is not exhausted to the point that growth becomes impossible.

The inertia reel principle of physics can be used by anybody – in any of several ways – and it has been used for many years, we used it during the Second World War as a restraining device for shoulder straps in bombers, a device that would permit movement at normal speed but would stop sudden movement in event of a crash; so it certainly isn't new, not even new to me – and its only advantage is one of cost and light weight, which slight advantage is more than negated by its inherent and unavoidable disadvantages insofar as productivity is concerned.

Our primary interest is in function – productivity, the ability to produce maximum-possible results in the way of muscular size-strength increases; and we will use literally ANYTHING that will increase productivity in our machines – which does make our machines heavier, and which does make our machines somewhat more expensive, but which also makes them literally many times as productive as any other tool intended for the same purpose.

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And if you think not, then train for one full year in any fashion you like – using anything except Nautilus equipment – and then come to DeLand and try to follow one of our better trainees through a workout, using whatever resistance you can; and – a very few minutes later – you will be on the floor, in a state of outright shock.

Which, of course, is not a "requirement" – since, with the use of a fairly short break-in period of training at below-maximum intensity, anybody can train properly with Nautilus equipment without encountering shock, without getting sick, and without much in the way of muscular soreness.

Thus, at the moment – at the present state of the art – if you can't use Nautilus equipment, then use a barbell; and if and when ANYTHING comes along that will improve productivity, it will immediately be incorporated into Nautilus equipment.