# My First Half-Century in the Iron Game

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Is there a relationship between the size of a muscle and its strength? It has been stated, and generally believed, that the strength of a muscle is in direct proportion to its cross-section; but, to the best of my knowledge, nobody ever explained just which cross-section they were talking about: the relatively large cross-section near the middle of a muscle or the much smaller cross-section near the end of the muscle? Since most of our skeletal muscles are shaped a lot like a catfish with a tail on both ends, it naturally follows that the cross-section of the muscle varies from one part of the muscle to another.

Increases in muscular size that result from growth-stimulation provided by exercise do not change the length of the muscles; any such growth results entirely from increases in the cross-section of the muscle. Growth which also changes the shape of the muscle; changes that may make the muscle appear to be shorter because it has become thicker with no change in its length. You frequently hear people say things like . . . "He has long muscles like a swimmer," or "Short muscles like a weightlifter." Both of which statements are utterly stupid.

Yes, some people do have relatively short muscles, while others have longer muscles, but such differences are not a result of their exercise. However, such differences do have a great deal to do with just how big your muscles are capable of becoming. Given longer than average muscles, you have the potential for greater than average muscular size, while relatively short muscles limit your potential size.

The design of almost anything you can think of is a result of several compromises, which, in very simple terms, means that nothing is perfect, and the human body is certainly no exception, and which also explains the differences we see in a wide variety of animals. All living creatures have a design that is required by their intended functions, or, as they say . . . "Function dictates design." But it does not follow that any of these creatures have ideal designs; because all of them must conform with the simple laws of basic physics, which requirements unavoidably lead to compromises in design.

If, as noted above, it is true that a muscle is strong in direct proportion to its cross-section, then please be good enough to tell me just why most skeletal muscles are shaped as they are. A shape that appears to make no sense. Just how, for example, can we utilize the higher level of strength provided by the large cross-section near the middle of the muscle if we are limited by the relative weakness of the smaller cross-sections of the same muscle near its ends? Remember: a chain is only as strong as its weakest link, and the same thing is true of a muscle, or, at least, so it would appear.

But there is at least one thing that we can be sure of: the shape of a muscle is not an accident, its shape was dictated by its functions. Thus, if we carefully study the intended functions of a muscle, it may become possible to explain the muscle's shape. Skeletal muscles have three functions: producing force while reducing the length of the muscle (positive function), producing force while increasing the length of the muscle (negative function) and producing force with no resulting change on the length of the muscle (static function). Any resulting movement, or lack of movement, depends upon the relationship between the level of force that is produced by the muscle and the level of resistance that is encountered. And there is always at least some resistance against any movement, both internal resistance and external resistance; the only exception being movement produced in a gravity free (weightless) environment like that encountered in outer space, where there is no (or very little) external resistance.

During the last thirty years I have published several books and hundreds of articles on the subject of exercise physiology and I have always gone to rather great lengths in my attempts to avoid taking credit for other people's ideas or discoveries; nevertheless, over the years, I did make a few mistakes along those lines: I believed, for example, that I was the first person to point out the need for a variable form of resistance in exercise, only to learn, years later, that a doctor in Sweden, Gustaf Zander, was clearly aware of that requirement nearly 150 years ago, long before I was born. However, as soon as I became aware of Dr. Zander's much earlier work I quickly rushed into print in order to give him the credit that he deserved.

Unlike a long list of other people that I could name, I have never had much interest in "credit," have instead been much more concerned with trying to understand "how" and "why." If I can figure out how something works, then I may be able to understand just why it works as it does; there is, of course, a reason for everything, although such reasons are not always obvious. My work and studies were always motivated primarily by simple curiosity, and, secondly, by a hope that any resulting understanding might lead to some sort of improvement. Which does not mean that I do not resent it when others try to steal credit for my discoveries; I do resent such attempted theft, and have at least tried to prevent it when and where doing so was possible. For that reason, in attempts to prevent such thefts, I have not always published all of my discoveries; but that was not the only reason for withholding some of my ideas: some of these ideas have never been published because I cannot prove them, and because experience has taught me that even attempting to explain them to other people is usually an exercise in futility.

As Bertrand Russell said . . . "The fact that an opinion has been widely held is no evidence whatever that it is not utterly absurd." The truth of which statement can be clearly demonstrated by thousands of examples; but it is also true that flying in the face of popular opinion usually results in a crash rather than a successful flight, particularly when the people you are trying to communicate with are so stupid that they are capable of understanding almost nothing. Or, worse, are not even aware of things that they must clearly understand if anything approaching real communication is even possible. You can sometimes, although rarely, make such people believe something, but you will never make them understand it.

When such people consider themselves "expert" in the field being discussed, then you are really treading on thin ice; convincing them that their theories are wrong is almost always impossible, will usually get you nothing for your efforts apart from slings and arrows of outrage.

Convincing such people is very difficult even when you can clearly demonstrate the truth of an idea in a very simple manner that should make the situation crystal clear to a retarded goat, and trying to do so when an explanation must be based entirely upon simple logic is even harder, is usually impossible. So, having learned quite a lot about such people over the years, I have chosen to keep some of my ideas to myself rather than wasting my time trying to explain them to fools.

In practice science is not "a search for the truth," it is, instead, an almost desperate attempt to get "credit," to become a "recognized expert" in a particular field. The motivation behind such an attitude is not always a desire to get rich, although that is certainly an important factor; instead, the real motive is more likely to be a desire to become recognized by their peers, to become an important personage in their field.

Winning the Nobel Prize is generally considered the ultimate achievement in any field, but even a casual look at a list of the people who have won that award should make it obvious that the selection of such winners is based primarily upon political factors rather than upon any actual contributions to knowledge. So-called "peer-review" is an oxymoron: if an idea is actually new, then the existence of peers is obviously impossible, which is why almost all of the truly valuable ideas and inventions have come from people who were totally outside the scientific community, people like Edison, Tesla, the Wright Brothers and a long list of others.

When I first became involved in exercise, in 1938, my interests in this field were strictly personal, I wanted to improve myself in a physical sense; at the time, it never occurred to me that any commercial involvement was even possible, not did I believe that I would ever write anything on the subject of exercise. Quite the contrary, since I quickly realized that almost everything that was being published, or had been published, was simply outright bullshit. Nearly sixty years later, the situation has certainly changed, but has primarily changed for the worse rather than for the better. In 1938, a few people were exposed to a trickle of bullshit, but in 1995 millions of people are being exposed to a flood of bullshit.

When I finally did get around to writing something about exercise, nearly thirty years ago, I did so in an attempt to insert a little common sense in a field where sense of any kind was almost totally lacking; thus I chose my examples very carefully, tried to limit them to things that were relatively simple and could be illustrated in such a manner that at least a few people would understand them. But, having written my first articles about exercise, I then discovered that it was very difficult to get them published; several early articles sent to Weider's magazines were never published, only one article sent to Strength and Health magazine, published by York Barbell Company, was ever published, while

several later articles were rejected by them, Scholastic Coach magazine published one of my articles and then rejected all of the later ones that I sent them. The only publications that would publish my articles were IRONMAN, the Athletic Journal, and Exercise Protocol; although, in fact, Mabel Rader did edit some of my articles because she was apparently afraid that somebody might be insulted if they were published as written. Such editing, in a few cases, changed what I had written to such an extent that it no longer made any sense. Which is why, now, that I insist that my articles be published word for word, exactly as written. If people wish to add comments afterwards, that is fine with me, but please do not try to put words in my mouth. Here and there, along the way, I have sometimes put my own foot in my mouth, have published a few statements that later proved to be wrong; but, without exception, when such mistakes came to my attention I always rushed into print in order to corrector them. Anybody who can point out one of my mistakes has done me a favor, regardless of their true motive.

A total list of my mistakes would probably extend from here to the moon, in small print, and while I regret all of them I am ashamed of none of them; but even that statement is not entirely true, because I have learned a great deal from my own mistakes, so they sometimes helped me. As somebody once said . . . "Success comes from good judgment, good judgment comes from experience, and experience comes from bad judgment."
All of which is prelude to the following statement: "Muscular contraction is progressive; when a muscle is fully extended (in its longest position) then no contraction has occurred; and full contraction can occur only when the muscle is in its shortest position. So the obvious question then is: just which part of the muscle has contracted when the muscle's length is halfway between its longest and shortest lengths? And, of course, which part of the muscle has not contracted in that position? The answer to those questions being provided by an understanding of the shape of the muscle: muscular contraction starts at the ends of the muscle and progressively moves towards the middle of the muscle as contraction and resulting movement continue."
I have been clearly aware of the truth of the above statement for at least thirty years, but never before published it because it can be demonstrated only upon a basis of what should be common sense. If that statement is not true, then the shape of a muscle would be utterly stupid. But a clear understanding of the above statement requires an understanding of the role of muscular friction in muscular function; and since most people are not even aware that a muscle has friction, it rather naturally follows that this explanation will usually fall upon deaf ears, which is why I have never before published it.

But, if that is true, as it is, then why do I even bother to publish it now? Knowing, as I do, that it will primarily result in yet more slings and arrows of outrage from today's self-appointed crowd of "experts." But, in fact, I have two reasons for publishing it now: one, in order to establish credit for this discovery, and, two, because somebody out there just may be able to take this discovery and run with it, may be provided with the required solution to a problem that might otherwise never be solved.

And just what, you may be wondering, does this bit of information provide in the way of practical knowledge? How can we apply it in practice? Well, among other things, it tells us that we can exercise all of a muscle only in certain positions; in order to exercise all of a muscle the exercise must provide the ability to reach a position of full muscular contraction, and that we must have resistance in that position; if not, then we are exercising only part of the muscle, and the smallest part of the muscle at that.

A simple example of full muscular contraction can be provided in the following manner: one, supinate your right arm as far as possible; that is, twist the hand as far as possible in a clockwise direction; two, then bend your arm as far as possible around the axis of the elbow; three, then raise your elbow above the shoulder as far as possible so that your hand is then behind your head; four, then, having reached that position, twist, bend and raise your arm as hard as possible. The result will be full contraction of the biceps muscle. something that can be experienced in no other position. Do not then be surprised if your muscle goes into an immediate cramp, because, after all, you are then asking the muscle to do something that it has never previously experienced.

I spent several years, and a lot of money, trying to develop a compound curling machine that would provide proper, full-range, variable resistance for an exercise that would work all three of the functions of the biceps muscles, twisting, bending and raising, and eventually abandoned the project because the prototypes that we produced were never able to provide the required functions. During the last twenty-five years, we designed, built, tested, and usually rejected,

literally thousands of prototype exercise machines. Eventually we discovered a lot of things that worked very well, but along the way we discovered thousands of things that did not work at all, or worked very poorly.

Because of what I called "indirect effect" when I first wrote about it twenty-odd years ago, some people (not all people but some people) will produce full-range benefits from exercises that do not provide full-range resistance; but any such muscular gains, in either size or strength, are never proportionate throughout the full length of the muscle. That is, the "worked" part of the muscle will grow more than the "unworked" part does.

For the purpose of testing strength, static (isometric) testing procedures are an absolute requirement because all dynamic testing procedures are biased by nonmuscular torque produced by gravity, by muscular friction and by stored energy, and are thus utterly meaningless for any purpose; but for exercise purposes I have always favored dynamic procedures even though I am aware that isometric exercises are also capable of producing good results. However, in the case of the biceps muscles, since no full-range dynamic exercise for these muscles exists, I would suggest that you add some static, isometric, exercise to your program for these muscles. Having completed your other exercise for these muscles, move into the position of full contraction of the biceps muscles outlined above and then contract the muscle as hard as possible and maintain that contraction for about fifteen seconds. Repeat that static contraction only two or three times during each of two weekly workouts; having added this static exercise to your program, together with a normal curling exercise, you have done everything possible for your biceps muscles.

Most people apparently go through life believing, and acting upon, things that they have read or been told, and it seldom of ever enters their minds that most of their supposed knowledge is nothing apart from pure bullshit. But a few people, damned few as it happens, do sometimes notice things that everybody else overlooked; of these few, a small percentage of them then go on to the next step, start wondering about what they have noticed, and eventually one of them may even try to make sense out of what they have noticed.

But, rather than being blessed and admired, such people are usually cursed and ridiculed. In 1912 Alfred Wegener was the first person to suggest that the continents had drifted apart, whereupon he was damned and ridiculed by everybody else in the scientific community, all of whom believed that his suggestion was ridiculous. He died in 1930, still being ridiculed by the rest of the scientific community; but if he had lived another thirty years he would have become a scientific hero, because, in 1960, the scientific community eventually got around to realizing that he had been right. At the age of three, the first time I ever saw a globe of Earth, I realized that the continents had drifted apart; and, initially, I assumed that everybody understood that, since it is self-evidently true, only to find that even mentioning it as a possibility produced nothing apart from ridicule. So I shut up about it until much later.

Quite a lot on this subject has been written during the last few centuries, but I believe that Edgar Allen Poe said it best about 150 years ago when he published the following brief article:

**The Hunting of the Slan**

I have sometimes amused myself by endeavoring to fancy what would be the fate of any individual gifted, or rather accursed, with an intellect very far superior to that of his race. Of course, he would be conscious of his superiority nor could he (if otherwise constituted as man is) help manifesting his consciousness. Thus he would make himself enemies at all points. And since his opinions and speculations would likely differ from those of all mankind - that he would be considered a madman, is evident. How horribly painful such a condition! Hell could invent no greater torture than that of being charged with abnormal weakness on account of being abnormally strong.

In like manner, nothing can be clearer than that a very generous spirit - truly feeling what all merely profess - must inevitably find itself misconceived on every direction - its motives misinterpreted. Just as extremeness of intelligence would be thought fatuity, so excess of chivalry could not fail of being looked upon as meanness in its last degree - and so with other virtues. This subject is a painful one indeed. That individuals have so soared above the plane of their race is scarcely to be questioned; but, in looking back through history for traces of their existence, we should pass over all biographies of "the good and the great," while we search carefully the slight records of wretches who died in prison, in Bedlam, or upon the gallows.

Edgar Allen Poe: Marginalia
(Southern Literary Messenger, June 1849)