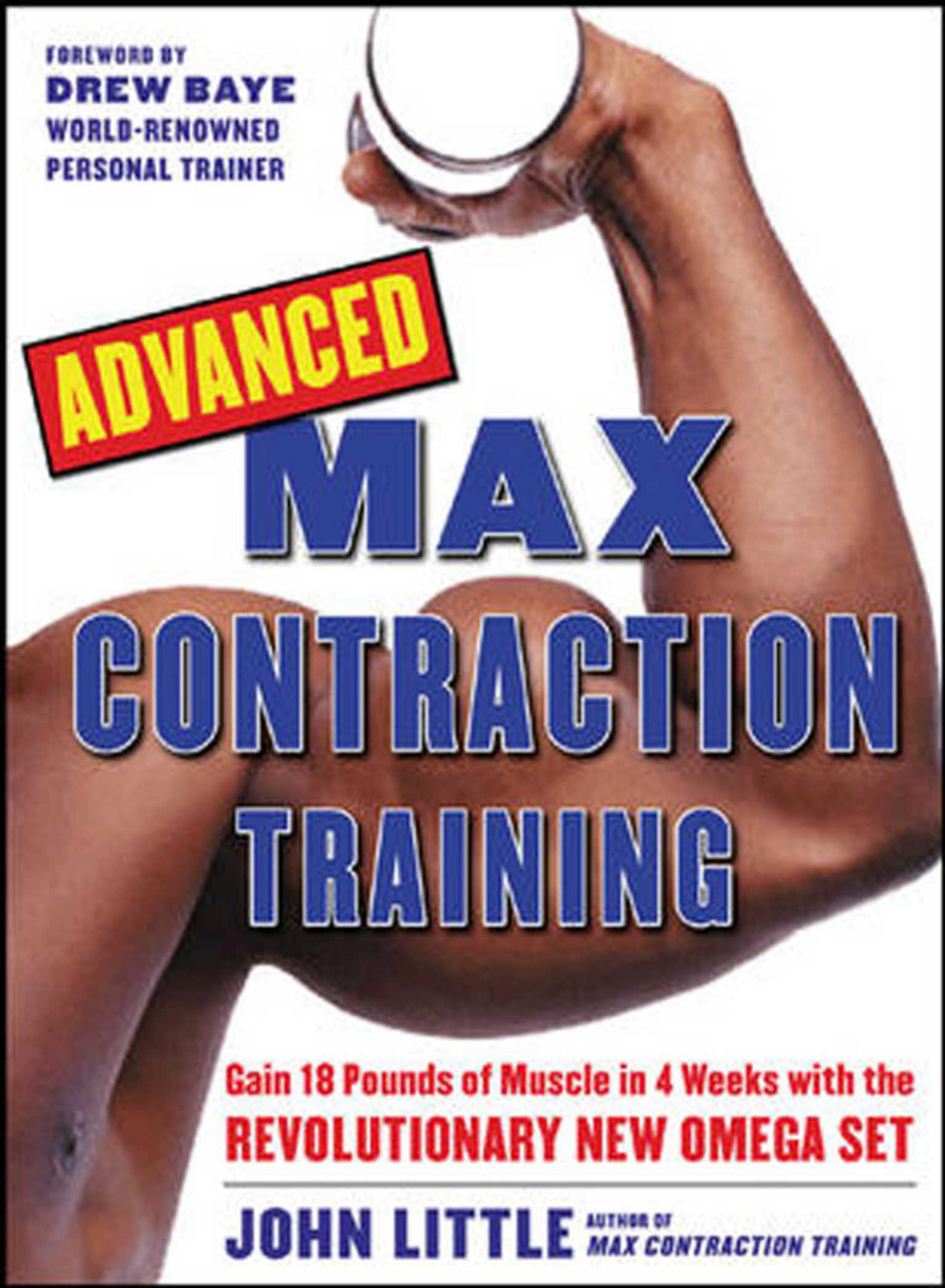
FOREWORD BY
DREW BAYE
WORLD-RENOWNED
PERSONAL TRAINER
ADVANCED
MAX
CONTRACTION
TRAINING
Gain 18 Pounds of Muscle in 4 Weeks with the
REVOLUTIONARY NEW OMEGA SET
JOHN LITTLE
AUTHOR OF
MAX CONTRACTION TRAINING

ADVANCED MAX CONTRACTION TRAINING

JOHN LITTLE

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First and foremost, as with everything I do, this book is dedicated to my wife, Terri, who was, is, and will remain my inspiration, and to our great children: Riley, Taylor, Brandon, and Benjamin, who have brought so much joy, as well as entertainment, to our lives. It is hoped that they might enjoy the health, strength, and vitality that come with keeping their minds and bodies strong.

Also, this book is dedicated to those of independent mind and spirit who believe that stronger muscles are an adjunct to one's living a fuller, richer life, rather than (as so many practitioners suppose) the be-all and end-all of existence.

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Foreword

Anything that you do to make your workout harder will be a step in the right direction.

—Mike Mentzer, *Heavy Duty: A Logical Approach to Muscle Building*

By the beginning of 1994 I had invested more than six years and literally thousands of hours in the gym in an effort to develop a more muscular physique. I had read and applied information from all the popular bodybuilding magazines and countless bodybuilding books, all claiming to contain a "scientific" approach to bodybuilding or the secrets to bigger muscles. Unfortunately, I had little to show for my efforts, weighing only a little more than 150 pounds—at a height of 5'8"—barely heavier than when I started training years earlier.

It was around that time I came across Mike Mentzer's "Heavy Duty" column in *Ironman* magazine. Although skeptical at first, I soon realized I had finally discovered a truly scientific, rational approach to training. Within half a year I gained nearly thirty pounds of muscle, while spending less than one hour per week in the gym! The most significant changes in my training, and the ones most responsible for finally stimulating

noticeable increases in muscle mass in both me and, later, the many clients I train, were an increase in my training intensity and the reduction in volume and frequency that such intense training requires. As Mike Mentzer wrote in 1977, in his first bodybuilding book, *Heavy Duty: A Logical Approach to Muscle Building*, "Anything that you do to make your workout harder will be a step in the right direction." Following in this vein, John Little, who was a close friend and colleague of Mike Mentzer, has continued the quest to make workouts harder and more productive. The book you're reading now represents the furthest and final step in the right direction that you can take—it is the hardest, most intense method of exercise possible.

Over the past decade I have experimented with nearly every high-intensity training protocol and technique there is—SuperSlow, negative-only, forced reps, strip sets, pre-exhaust, and so on—but none of these has been as intense or as productive for stimulating gains in muscular size as the Omega Set.

Don't just read this book. Study the information and apply it. You'll save yourself years of wasted effort and fulfill your genetic potential for muscle size in the shortest time possible.

Drew Baye
baye.com

Preface

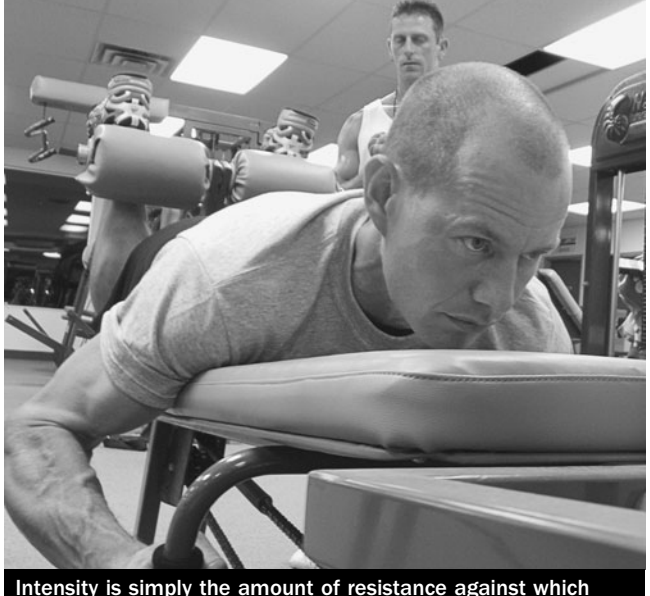
Today's advanced bodybuilder stands at a crossroads. Ignorance, deceit, and multimillion-dollar advertising campaigns cloud the skies of bodybuilding reality, all competing for his attention and all telling him to do the wrong thing.

To continue to grow bigger and stronger, the advanced bodybuilder must train harder, which requires extremely brief but intense training. But the magazines, personal trainers, and the current crop of bodybuilding champions advocate training methods that are the exact opposite. The advanced bodybuilder tries these routines, fails at his goal, and then—if he hasn't already—decides that growth drugs are the only solution. Thus begins the end of his legitimate muscle gains and, often, the end of any attempt to lead a normal and happy life.

The bodybuilding program outlined in my book *Max Contraction Training: The Scientifically Proven Method for Building Muscle*

Mass in Minimum Time presented the revolutionary technique of Max Contraction, along with specialization routines for all bodyparts. The primary audience for that book is, of course, anyone looking to increase his or her size and strength, particularly beginners and noncompetitive bodybuilders. However, as a person's training progresses, the muscles will eventually adapt to the stress of any protocol, and Max Contraction is no exception. For some, full adaptation may occur within six months, while for others, it may be six years. But adaptation will most certainly occur, and progress will most certainly stop.

This is the critical pass that few bodybuilders ever transcend. Not understanding the nature of adaptation—nor the full ramifications and implications of the mind's effect on the body—the majority of bodybuilders assume that their muscles have adapted to the protocol they have been following, whereas in truth it is the intensity of muscular contraction to which their muscles have adapted. For additional progress to be realized, a further increase in intensity—rather than a change in protocol—is required. Intensity is simply the amount of resistance against which your muscles are made to contract, which determines the amount of muscle fibers that are involved in the performance of a particular exercise. You cannot generate more or higher intensity by lifting lighter weights and/or performing more sets (which requires the employment of lighter weights).



Intensity is simply the amount of resistance against which your muscles are forced to contract, which precipitates an increase in the amount of muscle fibers that are involved in the performance of a particular exercise.

Here, though, a question of logic arises: As a Max Contraction is, by definition, a maximum contraction, how does one progress beyond "maximum"? This is a fair question, and the simple answer is that one can't. How, then, is an advanced bodybuilder to make additional gains in muscle mass? (I define an "advanced bodybuilder" as any individual who has been training for more than six months to a year—not merely the genetic freaks whose pictures adorn the bodybuilding magazine covers and who are loaded up with steroids and other growth drugs, which have little or nothing to do with proper bodybuilding exercise.) Simply performing exercises with a resistance to which the muscles have already adapted will not produce any additional improvement in levels of size and strength. And if the contractions performed in the exercises are truly "maximum," then there is no margin for

improvement. However, several relevant questions must be asked at this point:

1. Are voluntary muscular contractions truly "maximum"—or do inhibitory barriers exist within the human mind and body that serve to militate against an actual maximum contraction?
2. If such barriers exist, can they be overcome, allowing the advanced bodybuilder to more thoroughly stimulate his muscles and induce greater levels of muscle strength and growth?
3. If such barriers exist, is there a new method or technique that will assist the trainee in overcoming them, allowing him to better realize the full potential from every Max Contraction set, working it to its last ounce of growth-inducing stimulation to better engage or activate all of the available fibers from a given exercise, and thereby stimulate at least *some* additional muscle growth beyond what he is currently experiencing?

The answers to these questions are as follows: 1. Yes and no—depending on the individual, the contractions may be maximum; and yes, barriers—both physiological and psychological—to additional muscular progress do exist. 2. Yes, they can be overcome. 3. Yes, again: there is a new technique (premiered in this book) that will allow advanced bodybuilders to surmount these barriers and realize their full muscular potential.

Overcoming these inhibitory mechanisms of the body can mark the first step toward maximum gains in size and strength in human beings. Never before has there been a concerted effort to even determine what these barriers are or how they might be disengaged or bypassed to allow trainees to fulfill their genetic potential for bodybuilding, whatever that potential may be. In addition, in the years since *Max Contraction Training* was first published, I have been able to perform far more research in the area of recovery ability and its crucial role in the development of size and strength. The conclusion I've drawn has caused me to completely revise my previous approach to training frequency (training three days per week on alternate days, then two days per week, then one day a week—for beginners, intermediates, and advanced trainees, respectively). I now have evidence that, for advanced trainees, the time spent recovering and adapting from a workout, with minor variations, should be at least one week and in some instances two to three weeks, depending on the individual's innate adaptability to exercise. The stresses on the muscular systems of the body from a maximum-effort protocol such as Max Con-

traction are so great that such periods off between workouts are an absolute necessity to ensure full recovery and adaptation between workouts.

After years of researching the dilemma of the advanced bodybuilder, I believe that the book you are now holding offers the first scientific and practical solution—the Omega Set, an ultra-intense variation on the Max Contraction theme, engineered specifically and exclusively for the advanced trainee. Although the data are still preliminary, advanced trainees have gained up to ten pounds of muscle in four weeks by employing this revolutionary new protocol.

For advanced trainees, the time spent recovering and adapting from a workout should be at least one week and in some instances two to three weeks.

In addition, this book suggests solutions to the physiological and psychological obstacles that await the advanced bodybuilder on the path to future progress. Unlike most "advanced" bodybuilding books that simply counsel the advanced trainee to add more and hope for the best, this book clearly and unambiguously reveals the precise cause-and-effect relationship between advanced training methods and advanced training results. *Advanced Max Contraction Training* breaks new ground in bodybuilding training and represents the final (omega) word in high-intensity training.

Acknowledgments

I extend my thanks to the many individuals who have helped me with my research over the years, the results of which have led to the creation of this book: Mike Mentzer, who first taught me the fundamentals of exercise science and who encouraged me to apply reason and experiment further; Cary Howe, who, apart from being a great brother-in-law, has fully grasped the concept of high-intensity training and was very helpful in the development of the glycogen theory; Sally and Gordon Sisco, who contributed in many ways and thus made the research possible; Joe Ostertag, who was among the first to push his training frequency out to one month—with terrific results—and who, as the cocreator of Body Comp Weight Analysis Centre, provided a means by which I could fact-check the rate and volume of muscle growth; Fred Schultz, of Gravenhurst, Ontario, who took

many of the photographs; Joe Ross, Tim Santowski, and Jeremy Hymers, who served as the models for this book; and all of the clients at Nautilus North Strength & Fitness Centre in Bracebridge, Ontario, who have openly embraced a more rational and efficient approach to training, knowing that any amount of training beyond the precise amount required is a waste of time and life—for time is what life is made up of.

All opinions without scientific base are worthless.

—Plato, *The Republic*

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PART 1

The Obstacles

Many obstacles—both physical and mental—await to assail the advanced trainee.

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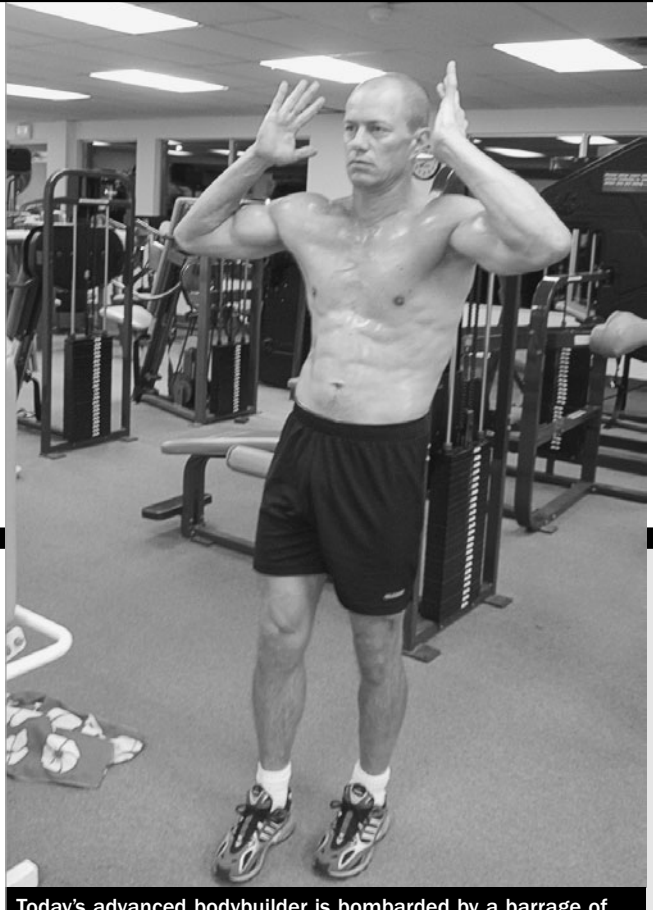
1

The Crossroads



Today's advanced bodybuilder is bombarded by a barrage of deceptive claims and multimillion-dollar advertising campaigns engineered not to produce more muscular gains, but to divest him of his hard-earned dollars.

One must perform those exercises with *maximal* or near maximal resistance to bring forth the greatest strength increments. The muscles will adapt only to the load placed upon them; a minimal overload will bring about minimal strength gain, whereas a maximal overload will bring about a *maximal* strength gain.

Dr. David R. Lamb, *Physiology of Exercise: Responses and Adaptations*, Second Edition

The advanced bodybuilder stands at a crossroads. His present training protocol has ceased to produce meaningful gains. A hundred alternate approaches to training and equipment now assail his senses, and the "word at the gym" about the "real world" of bodybuilding, consisting of supplements and/or anabolic drugs, begins to beckon him. Where is he to go from this point?

As I pointed out in *Max Contraction Training: The Scientifically Proven Method for Building Muscle Mass in Minimum Time* (to which this book is but an addendum), for a workout to be productive, it must, of course, stimulate an adaptive response from the body. But that is only half of the equation. If an adaptive response is to take place, other factors must be weighed, such as adequate recovery time and, secondarily, nutritional intake.

I do not subscribe to the notion (as certain champions are paid to espouse) that "bodybuilding is 85 percent nutrition," for the simple reason that it's false. I've seen far too many bodybuilders put on too much muscle while employing typical diets—ranging from home-cooked meals to fast food, and even diets that consist of a lot of skipped meals and just eating "normal" regular food. In addition, I've read nothing in the legitimate scientific literature to suggest that anything other than training is the trigger mechanism that sets the adaptive response of the body into motion for more muscle mass. The question at this point becomes: What type of training, then, is best suited for the advanced bodybuilder to set the adaptive response of his body into motion for another round of muscle mass gains?

Our bodybuilder believes from what he has read and what he sees around him in the gym that there is just one option: to train for progressively *longer* periods (such as most bodybuilders do—going from the three-workout-per-week schedule that accompanies their first barbell set to the multiple-set, split routines advocated by most champion bodybuilders). There is a second option,

We now have evidence that, for advanced trainees, the time spent recovering and adapting from a workout should be at least one week and in some instances two to three weeks, depending on the individual's innate adaptability to exercise.

however, that requires that he find a way to train *harder*, to make his muscles contract against greater resistance, to perform more intense contractions. This, of necessity, will drain his muscles faster, resulting in shorter workouts. As the more intense workouts drain or inroad the muscles to a more extreme degree, it follows that it will take him longer to recover from an intense workout than it does from a less intense workout. Thus, there will have to be a long period of "off time" between his workouts. Hence the high-intensity training trinity: Intense, Brief, and Infrequent.

Some might be tempted to interject, "But he could use the 'best of both.' He could compromise: he could train somewhat intensely *and* somewhat longer." This is equivalent to admitting that there is an efficient and an inefficient way to train and that one should mix the two. It's true that one could do this—but why? How would adding inefficiency to efficiency result in anything except *reduced* efficiency? You can mix productive and unproductive, but that only compromises and dilutes the productive effects you were (and are) capable of obtaining from exercise.

So, our bodybuilder is left with two options: train longer or train harder. Both have their advocates, and, indeed, the former approach is the most widely practiced—by both the champions (who are few) and the failures (who are legion). However, if the "train longer" approach is followed to its logical conclusion, as the bodybuilder reached the upper limits of his genetic potential, he would have to have advanced to training four, five, six, ten, or more hours a day, seven days a week. The intensity of such workouts would obviously be very low (to allow for so many hours of doing it), and the training would be performed daily, which would not allow adequate time to reload the muscles or recover from the energy output of the training. This scenario would have to be predicated on the assumption that recovery ability has no significance on the muscle growth process. Simple observation (not to mention common sense) indicates that this cannot possibly be true; if energy is lost during a workout, it must be regained at some point, and if one is constantly expending energy via training, there is no opportunity for the body to replenish what it has expended.

Anyone who has ever spent much time in a commercial gym will admit that advocates of the "train longer" approach invariably hit a wall.

Moreover, physiology studies aside, observation reveals to us that common laborers who perform long hours of low-intensity muscular work do not typically display a massive musculature. And anyone who has ever spent much time in a commer-

cial gym will admit that advocates of the "train longer" approach invariably hit a wall. These trainees do not progress from workout to workout, and their gains in size and strength typically plateau quickly; people can work out for only so many hours before it becomes obvious that they are "pacing" themselves simply to be able to put in more time.

So, if stalled gains in muscle mass cannot be jump-started by adding sets to the workout, or by switching to a less intense protocol (changing to a more intense protocol would be a step in the right direction, but because there is nothing more intense than a "maximum" contraction, you would have nowhere to go but down from Max Contraction), we are left with finding a means that will allow us to train harder, not longer.

It's too seldom noted that when a bodybuilder embraces the volume approach, not a ripple is stirred along the surface of the waters of bodybuilding. On the other hand, when a bodybuilder embraces the harder or high-intensity training approach, the waters churn with alarm; we are told that such an approach doesn't work and can't build bigger muscles. When individuals are pointed out, such as Mike and Ray Mentzer, Casey Viator, and Dorian Yates, who all employed high-intensity training and built massively muscled physiques, we are told that these men are "exceptions" or "genetic freaks" and/or the ever popular "on steroids"—and that such training works for them only because of these factors. Why the discrepancy? Certainly *all* bodybuilding champions are genetic freaks (and the vast majority are on growth drugs of some sort). So, how can anyone justify labeling an advocate of the high-volume approach as "right" and the advocate of a high-intensity (low-set) approach as "wrong"? This position is even less sustainable given that in the realm of science, which has no vested interest one way or the other, more and more studies are piling up in favor of intense, brief, and infrequently performed training sessions. (Please see Chapter 5 as well as pages 79–80 of *Max Contraction Training* for specific studies and examples.)

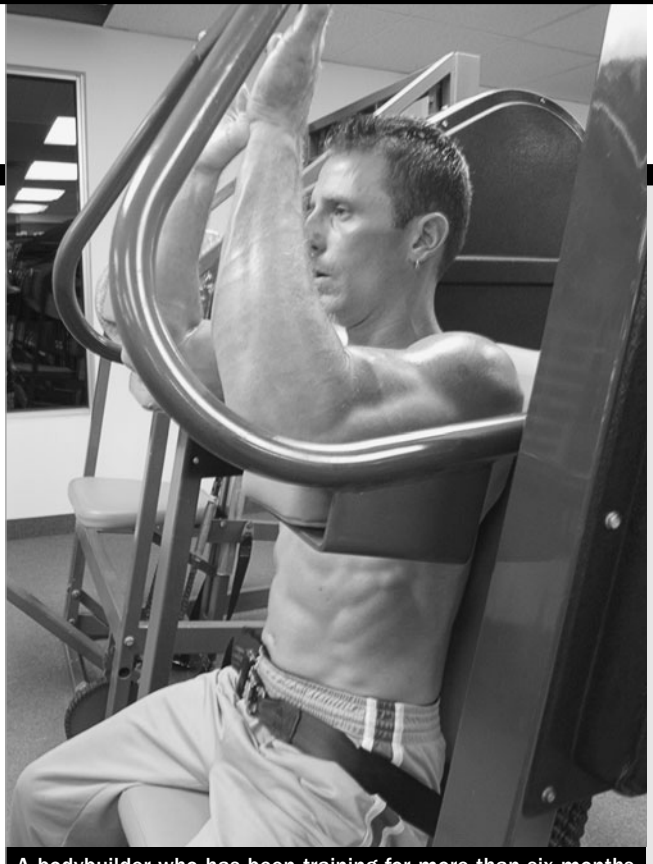
That being said, the advanced bodybuilder who likewise has chosen to train more intensely and less frequently in order to perpetuate his gains in muscle mass and strength is now faced with two major barriers that will have a direct bearing on his future success—or failure:

1. The physiological barrier (the body's resistance to change)
2. The psychological barrier (the fear and reticence regarding engaging in maximum muscular contraction)

The following chapters examine each of these barriers in turn, for it is only once we understand the nature of particular problems that we can begin to devise any meaningful solutions to them.

2

The Physiological Barrier



A bodybuilder who has been training for more than six months to a year must understand the physical barriers to continued muscular gains that nature has placed in his path if he is to devise a means to circumvent them.

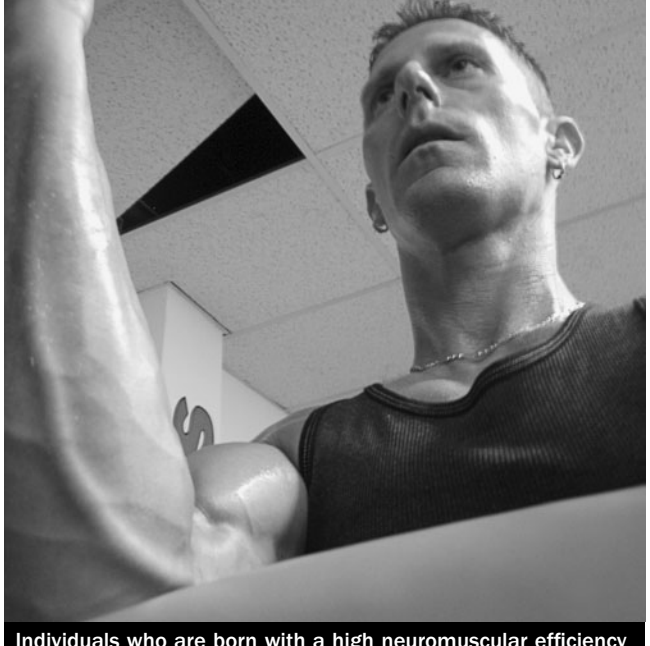
Nature, to be commanded, must be obeyed.

Francis Bacon, *Novum Organum*

Not long into his investigation, the serious student of muscle physiology discovers that the advanced bodybuilder must recognize and understand a host of physiological barriers if he is to devise a means to overcome them. It seems that the body has conditioned itself over eons to resist change whenever possible, with the result that change is one of the most difficult requests for the body to fulfill, and it cannot be induced by mild effort or low-intensity exertion.

PHYSIOLOGICAL BARRIER #1: NEUROMUSCULAR EFFICIENCY

Poor neuromuscular efficiency can be a limiting factor in the recruitment and stimulation of muscle fibers. Neuromuscular efficiency refers to the central nervous system's ability to engage groups or bundles of muscle fibers through voluntary effort. Some individuals have a significant genetic advantage in having been born with high neuromuscular efficiency and thus are able to contract many fibers at one time, resulting in their being able to lift tremendously heavy poundages, while others are able to contract only a small percentage of their available muscle fibers despite their greatest conscious effort. Neuromuscular efficiency can be improved to some degree through training, but someone with greater neuromuscular efficiency will always be able to involve—and hence stimulate into growth—more muscle fibers than someone who is not so fortunate in this regard.



Individuals who are born with a high neuromuscular efficiency are able to contract many fibers at one time, resulting in their being able to lift tremendously heavy poundages and stimulate many more muscle fibers into new growth.

PHYSIOLOGICAL BARRIER #2: THE GOLGI TENDON ORGANS

The second physiological barrier that appears on the scene as the trainee attempts to perform more intense muscular contractions takes the form of the Golgi tendon organs (GTOs), which are nerve sensors located at the point where muscles attach to tendons. When inordinate stress is imposed on muscles, these sensors relay messages of alarm, which can cause the brain to terminate the contraction of a muscle. The GTOs are connected in series to as many as twenty-five extrafusal fibers. These are sensory receptors that are also located in the ligaments of joints and are mainly responsible for detecting inordinate degrees of muscle tension (i.e., contraction). The GTOs

respond as a feedback monitor, discharging impulses under one of two conditions:

1. Tension created in a muscle when it contracts
2. Tension created when a muscle is passively stretched

When stimulated by excessive tension or stretch, the Golgi receptors transmit their signals quickly to bring about a termination (or reflex inhibition) of the tension within the muscles they supply. This occurs because the inhibitory spinal interneuron immediately overrides the motoneurons supplying the muscle. Thus, the GTOs function as protective sensory mechanisms.[1]

If the change in tension or stretch is too great, the power of these sensors' discharge increases, which further depresses the activity of the motoneurons and thus reduces the tension (or contractile power) generated within the muscle fibers. If the muscle contraction produces little tension (light weights, full range), the Golgi receptors are only mildly activated and exert little influence. The ultimate function of the GTOs is to protect the muscle and its connective-tissue harness from injury due to an excessive overloading or stretching. If you move up in weight too quickly, there is a greater likelihood that the GTOs will kick in and either diminish the intensity of your contraction or terminate it outright and, hence, your muscle growth stimulation along with it. However, if you can raise the threshold of your GTOs, you will be able to contract your muscle with more intensity, which will lead to greater gains in strength and size.

An awareness of this phenomenon is one of the reasons that I have newcomers to Max Contraction Training start with a sixty-second contraction, rather than a one- to six-second contraction. The longer time of contraction (TOC) allows them to build up to more intense contractions gradually and thus not activate the inhibitory mechanism of the GTOs prematurely. This gradual overloading to a maximal state does not engage the GTOs to work against a person's strength- and size-building objectives.

If, for example, you were to go from 100 pounds on the pec deck to 500 pounds, you would be unable to sustain the contraction for even one second—even though your pecs had the potential to contract against this resistance for several seconds. That's because the GTOs would kick in, and the contraction would not even be initiated; it would be perceived by the brain as such a quantum leap in tension as to be potentially dangerous. If, instead, the resistance were raised gradually over time and the TOC correspondingly lowered gradually, the GTOs would not perceive the gradual increase in the intensity of muscular contraction to be threatening. This is simply the "progressive overload" principle—as opposed to the sudden overload principle!

Building a wider sphere of tolerance and reducing the parameters of inhibition for the GTOs takes time. It is only by gradually conditioning your muscles to contract against heavier and heavier weights that the

set point of the GTOs will be advanced a little higher and your GTOs will not then be stimulated to forward inhibitory messages to the brain. This delayed inhibitory response promotes an increased strength of contraction of the muscle, which, in turn, promotes greater muscle mass gains due to the greater poundages against which your muscles will then be allowed to contract.

PHYSIOLOGICAL BARRIER #3: THE NEEDLESS SQUANDERING OF ADAPTATION ENERGY

For the beginner, just about any form of resistance exercise will represent an increase in intensity to the overall system—but not all forms of resistance exercise utilize the same quantity of energy from the body. The stronger one gets, the more energy is used up, and the harder it becomes for the body to part with more of it.

The body, over a million or so years of evolution, has become tremendously adept at conserving energy, which is one reason obesity is such a problem today. While conserving energy (or storing fat) was useful when meals were scarce, we now live in an age in which most of us are literally "minutes" away from thousands of calories that are readily available for consumption at any time of the day or night. And while our bodies have developed an awesome capacity to store energy, they have also conversely (but for the same biological reasons, presumably) cultivated a strong disinclination to expend energy. This condition reflects an evolutionary hedge against future needs and dearths—particularly a type of energy that can be accessed only in dire emergencies and that will allow the organism to continue to function despite the most demanding circumstances. Dr. Hans Selye, the preeminent stress researcher, called this "adaptation energy," and it is precisely this adaptive energy that must be tapped for the advanced bodybuilder to continue to make gains in muscle mass and strength. According to Selye, this adaptation energy is something quite apart from caloric energy, being inherited by each individual, and it does not exist in infinite supply:

> Although we have no precise scientific method for measuring adaptation energy, experiments with laboratory animals offer rather convincing evidence that the capacity for adaptation is finite. Our reserves of adaptation energy could be compared to an inherited fortune from which we can make withdrawals; but there is no proof that we can also make additional deposits. We can squander our adaptability recklessly, "burning the candle at both ends," or we can learn to make this valuable resource last long, by using it wisely and sparingly, only for things that are worthwhile and cause least distress.
>
> As I have said, we have no objective proof that additional deposits of adaptation energy can be made beyond that inherited from our parents. Yet, everyone

knows from personal experience that, after complete exhaustion by excessively stressful work during the day, a good night's sleep—and, after even more severe exhaustion, a few weeks of restful holidays—can restore our resistance and adaptability very close to what it was before. If this is the case, we must distinguish between *superficial* and *deep* adaptation energy. Superficial adaptation energy is immediately available upon demand, like money in a bank account that is readily accessible by writing out a check. On the other hand, deep adaptation energy is stored away safely as a reserve, just as part of our inherited fortune may be invested in stocks and bonds, which must first be sold to replenish our checking account, thus furnishing another supply of immediately usable cash. Still, after a lifetime of constant expenditure, even our last investments will be eventually exhausted if we only spend and never earn.[2]

If an advanced bodybuilder trains too long or too frequently, his limited reserves of adaptation energy will be squandered in merely satisfying a needlessly increasing energy debt, rather than being applied to build new muscle.

A bodybuilder who elects to train with lots of sets, many days per week, is "burning the candle at both ends." And, as Selye explains, this will deplete his reserves of superficial adaptation energy. If the bodybuilder continues to train in such an exhaustive fashion, over time, this will lead to a gradual draining of his deeper reserves of adaptation energy, causing them to be squandered in the attempt merely to replenish his growing debt of superficial adaptation energy. This is energy "squandered recklessly," as all of his adaptation energy will eventually have been used up—not in the creation of larger and stronger muscles, but in covering the energy expended in his needlessly lengthy and too frequent workouts. If, instead, this same

bodybuilder uses his adaptive energy "wisely" (specifically to energize the production of additional size and strength) and "sparingly" (with short bursts of intense training performed infrequently), only a small portion of that energy will go toward offsetting the energy cost created by his workouts (which will be briefer and far less frequent), leaving more energy available to go toward producing additional size and strength increases.

The ultimate size to which a muscle can grow is regulated by a protein called *myostatin*.

PHYSIOLOGICAL BARRIER #4: THE MYOSTATIN GENE

Before the turn of the present century, Michel Georges, a scientist at the University of Liege, in Belgium, isolated a gene called GDF-8 that encoded for a protein called *myostatin*. He did so in an attempt to determine what genetic component was responsible for the phenomenal muscle mass of a rather bizarre-looking animal—the Belgian Blue bull. The Belgian Blue carries three times the muscle mass of a normal bull. It did not get this way by working out, nor by eating expensive supplements; all it did was walk about in a typical farmer's field and eat grass—just like any other bull. And yet, as a result of the selective breeding practices of cattle farmers in Belgium, the bull is endowed with triple the muscle (or sellable beef) of a regular bull.

The economic implications were so compelling that the scientific community was solicited to determine just what factor, what genetic component, had resulted in the Belgian Blue's inordinate degree of muscle mass. Georges subsequently determined that the Belgian Blue had a deletion of a gene called GDF-8, which is responsible for the production of a protein called myostatin, which regulates how much muscle mass this animal could carry. Once word of this discovery got out, it wasn't long before members of the bodybuilding community openly speculated on whether such a gene also existed in humans. Then, following conversations with Drs. Sejin Lee and Alexandra McPherron at Johns Hopkins University, Doug McGuff, a bodybuilding researcher who also happens to be an emergency room physician, informed the bodybuilding world

that research into myostatin had moved from cattle to mice. The mice that had been bred not to produce myostatin had phenomenal muscle size, while those with an abundance of the protein had very little muscle mass at all. According to McGuff:

> This led to additional studies, including human studies. Researchers have shown that the HIV virus attaches to the myostatin gene and is responsible for muscle wasting in AIDS patients. Myostatin is thought to be overexpressed in some forms of muscular dystrophy. It may also be responsible for muscle wasting due to aging and chronic diseases.[3]

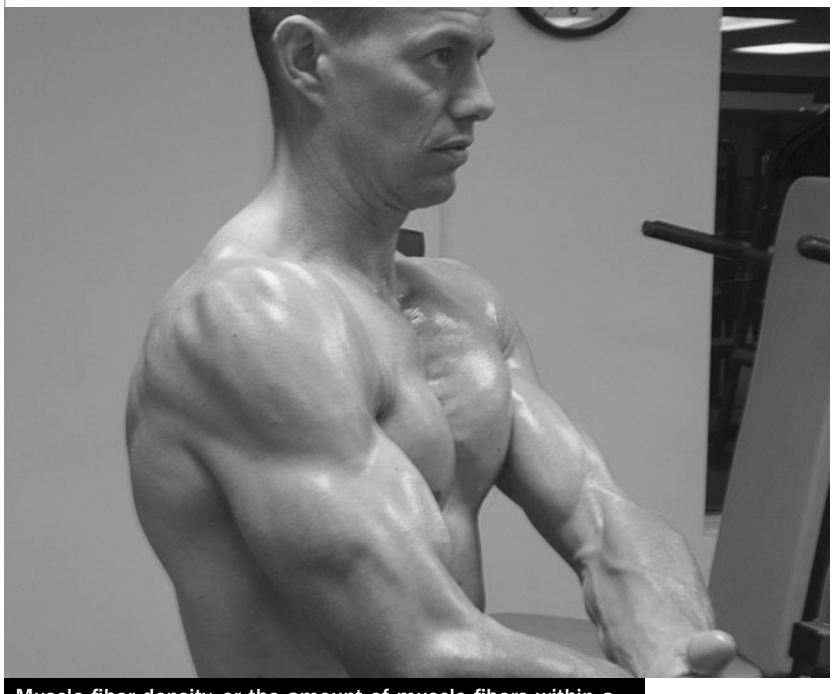
The higher this concentration of myostatin, the less muscle we can develop, and conversely, the lower the concentration, the bigger our muscles will become.

Additional research by Victor Conte, of the infamous BALCO laboratories, revealed that at least one former champion bodybuilder possessed a mutation that resulted in the deletion of his myostatin gene, proving, in McGuff's words, that "champion bodybuilders possess some sort of genetic gift that allows them to become much more muscular than the average person." He adds, "It seems that champion bodybuilders may owe much more to their genetics than they do to their training, supplement or drug use."[4]

This bit of data is both exciting and for some, no doubt, depressing at the same time, as it suggests that each of us has some concentration of myostatin in our bodies that serves to determine how much muscle mass we can ultimately build. Unfortunately, this level was established prior to our birth, and barring scientific intervention via technology that is not yet perfected, the higher this concentration of myostatin, the less muscle we can develop, and conversely, the lower the concentration, the bigger our muscles will become. In other words, you can build muscle only to a certain threshold that your genetic encoding has set to be sufficient for you. Your desire to have bigger muscles is superseded by your genetic endowment. This condition can be improved upon to some degree with proper scientific training practices, but even so, the end result may be considerably less than you had hoped. This is a fact of nature of which we must be cognizant if we are to seek realistic gains from our efforts in the gym.

PHYSIOLOGICAL BARRIER #5: POOR MUSCULAR GENETICS

Muscle fiber density, or the amount of muscle fibers within, say, a square inch of



Muscle fiber density, or the amount of muscle fibers within a square inch of muscle, and the length of the muscle from its point of origin to its insertion site are two primary genetic factors in the muscle-building equation.

muscle, and muscle length, or the length of the muscle from its point of origin to its insertion site, are two of the principal genetic factors in the muscle-building equation. Muscle length determines the size a muscle can become, because a muscle's width will never exceed its length, and the longer the muscle, the greater its mass potential. Muscle fiber density is important because you cannot stimulate muscle fibers that don't exist, so the more muscle fibers you have packed into a given inch of muscle, the greater the potential thickness or size.

Bone size is another genetic factor that plays a role in determining one's potential for building big muscles. Bones are what muscles are anchored to, and they form the "frame" of one's physique to hold the muscle. (For more details on this component of muscle building please see pages 31–35 of *Max Contraction Training*.)

What might be viewed as discouraging news from the perspective of the advanced bodybuilder is that the majority of males simply do not possess the requisite abundance of these genetic factors to allow them to build inordinately large "bodybuilder-type" muscles. In fact, physiologists have calculated that the odds are roughly 100,000 to 1 of someone's building such a physique. That is, given a cross section of 100,000 males, only one will have the necessary genetics, the intelligence to train properly and to judiciously regulate his intensity and recovery ability, and the motivation to engage in such training to realize his genetic potential. So, unless you are already quite large in terms of muscle mass, it is unlikely (though not impossible) that you will ever develop huge muscle size.

PHYSIOLOGICAL BARRIER #6: CONSERVATION OF ENERGY

As touched on previously, over a million or so years of evolution, during which time starvation was a real possibility, the human body has become incredibly efficient at conserving energy. New muscle tissue requires additional energy to sustain itself, so the body is in no hurry to grow larger

muscles comprising metabolically expensive tissue that it would have to service. The result is that most trainees will in fact get stronger and stronger—but it takes many such strength increases to produce a discernable increase in the cross-sectional thickness of a muscle. That's why you have to stay at it for the long term and why no one can become Mr. Olympia just overnight.

Another "energy" factor that militates against gaining inordinately large muscles is a law of physics: An organism radiates heat in proportion to its mass, and heat radiation is a form of energy dissipation—which, again, the body adamantly resists unless absolutely necessary. And while heat is produced in relation to mass (length × width × height), it is the surface area (length × width) that gives off the heat to keep the temperature of the body stable. For example, if your biceps grow to twice their present size, your biceps' heat capacity will have increased by 2 × 2 × 2 (or 8), while your cooling efficiency will have increased by only 2 × 2 (or 4), so your cooling efficiency will be reduced by 50 percent. This is a grossly inefficient use of precious energy resources by your body, and as a consequence, your body has no natural inclination to allow your muscles to get too big, and so it places a limit on how big your muscles can become (hence the myostatin protein). Add to this the increased caloric cost of keeping that new muscle alive, and you can see that from a conservation-of-energy perspective, your body would much rather you stay the way you are now—with the least amount of muscle mass gained, the better.

The human body is an organism that has survived owing to its proclivity to store energy. Inordinately intense physical effort is needed to cause the body to deviate from this course and produce bigger muscles—which require more energy to sustain than do smaller muscles.

The upshot is that most men will achieve only modest gains in their muscle mass, and most women (for reasons outlined in my book *Max Contraction Training*) will achieve even less.

PHYSIOLOGICAL BARRIER #7: POOR INNATE ADAPTABILITY TO EXERCISE

At Nautilus North Strength & Fitness Centre, some members have made excellent progress by training as little as once every four weeks. In fact, two women at the facility were out of the gym for three months, and both went up in reps and weight in every exercise upon their return! This can be explained by the fact that some people have a relatively low innate adaptability to exercise. So, while some people can recover and adapt (i.e., grow) reasonably quickly between workouts—say, within six to seven days—others require much more time.

Innate adaptability is a function of the chemical reactions that are necessary for the body to produce muscular growth. Although this process is complicated and still not completely understood, it includes the production and combining of such chemicals as hydrogen, oxygen, phosphate, adenosine triphosphate, lactic acid, potassium, glycine, arginine, methionine, creatine, and creatine phosphate. An efficient adaptive ability depends on adequate rest, balanced nutrition, and *time*. The degree of adaptive ability varies among individuals, but what does not vary is that one's adaptive capacity does not increase in proportion to one's strength. In other words, the stronger you become, the more resistance you can handle on each exercise; then, the greater the demands you make on your recovery ability, the easier it becomes to overtrain.

An overtaxed adaptive capacity will be unable to provide sufficient biochemical support for the buildup of muscle tissue and for the loss of body fat caused by the higher metabolic rate that increased muscle mass creates. In other words, any more training than the least amount required to stimulate the adaptive response of the body into motion is too much training. Remember, exercise is a stimulus that acts upon the body, causing it to produce a specific response, and this stimulus-response relationship operates the same whether the stimulus is a drug, ultraviolet light, or exercise. "More" is not "better." As Mike Mentzer pointed out, "precise is best."

Most bodybuilders can recover and adapt (i.e., grow) from an intense workout within six to seven days, but those with lesser innate adaptability require much more time off between workouts to recover and grow.

Performing any more than the precise (or least) amount of exercise required to produce a positive change in the body is unnecessary at best and is potentially toxic to the body.

Note also that as a trainee gets stronger, the body actually becomes less proficient at removing the waste products that accrue as a result of intense contractions. In fact, intense contractions can become so draining and the onset of fatigue so immediate, that it gets progressively more difficult for the trainee to give 100 percent to each succeeding exercise in a given workout and to derive full benefit from a given set.

It is for these and related reasons primarily that we at Nautilus North and medical doctors such as Doug McGuff, and more enlightened personal trainers, prescribe just one exercise session per week—particularly for trainees with more than two months of training under their belts. As McGuff explains:

> If you work out too soon, you will know that you have done so because you will actually be weaker in your workout rather than stronger. You will not be able to lift the same amount of resistance for as long as you did in the last workout. If you have waited long enough, you should be stronger on every set of every movement in your workout. We have found through experimentation that four days is the *minimum* that most average adults will require between workouts. Some people may require as many as nine or ten days. In general, the vast majority can recover sufficiently in seven days.[5]

Just don't allow your "off days" to run into months and months, unless your innate adaptability is so genetically bereft that you cannot progress in any other manner. (I'm inclined to believe that the two women cited at the beginning of this section are more the exception than the rule.) Any advocate of high-intensity training should clearly recognize the need for adequate recovery time and the fact that the more intensely you perform an exercise, the shorter the time you can perform it. With these facts in mind, the advanced bodybuilder must find a new, *more intense* method of training to which his muscles are unaccustomed, so that additional muscle-growth stimulation can be imparted.

We will get to this new training method shortly, but first let us examine the other major barrier to continued muscular progress.

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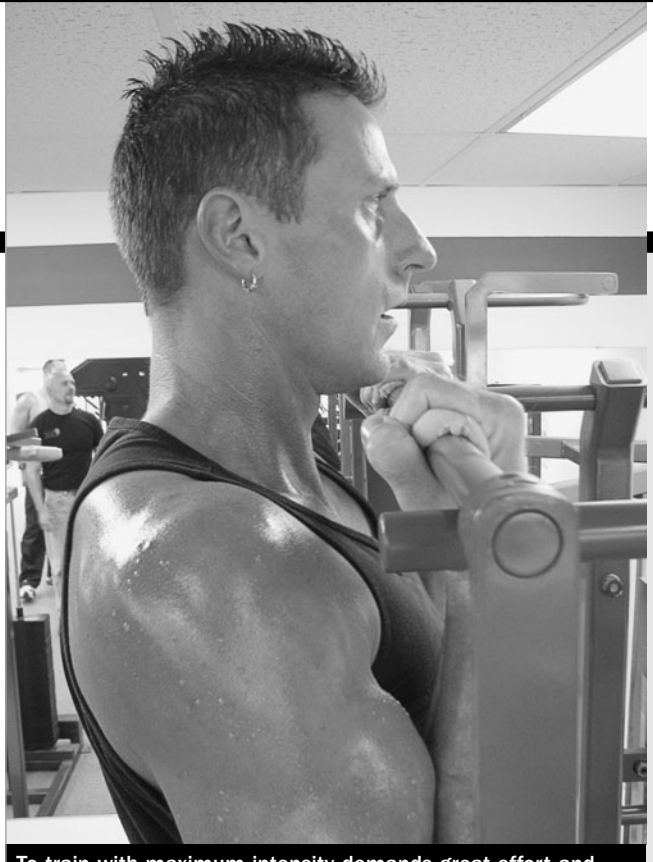
3

The Psychological Barrier



To train with maximum intensity demands great effort and genuine courage.

To exercise power costs effort and demands courage.

Friedrich Nietzsche,
The Wanderer and His Shadow

Because the energy resources of the human body are so precious, the body will not engage in the energy-draining growth-production process unless it has sufficient cause. Light weights, mild effort, and easy workouts are not considered sufficient cause in this respect. (If they were, the majority of people going to gyms would be massively muscled.) Muscular contractions must be of an inordinately high and demanding nature in order to give the body sufficient cause to order production of additional muscle mass. Via extension of this biological nature of things, and because the body has been conditioned over time to use such energy sparingly and only in response to conditions that are potentially exhausting and hence life threatening, the mind as well as the body do everything possible to prevent conditions from occurring that would warrant tapping into this potent but rare supply of energy. My late friend, bodybuilding champion Mike Mentzer, once astutely pointed out:

> Lassitude, anxiety and even a preference for low-intensity workouts are manifestations of the mind's disinclination to engage the body in such maximal efforts. Therefore, as your muscles get stronger and stronger, you must exercise your will to get stronger apace. Having been successful in my efforts to become both muscularly massive and very strong, I can assure you that the principle of intensity refers almost exclusively to the human will and the ability to command your muscles to contract against the only real resistance—your own mind.[1]

This type of mental resistance has been an impediment to human performance for eons and has been written about and commented on by many of the finest minds in human history—from psychologists and philosophers to poets and playwrights. Witness the following samples:

> **Thus conscience doth make cowards of us all.**
>
> —William Shakespeare, *Hamlet*

It has been established clinically that the strength of a muscle is directly proportional to its effective cross section, which is approximately 140 pounds per square inch in male trainees and 105 pounds per square inch in female trainees.

Compared with what we ought to be, we are only half awake. Our fires are damped, our drafts are checked. We are making use of only a small part of our possible mental and physical resources.

—William James, *Energies of Men*

I assess the power of a will by how much resistance, pain, torture it endures and knows how to turn to its advantage.

—Friedrich Nietzsche, *The Will to Power*

All-out physical effort such as Max Contraction Training requires not only ample motivation but also actual physical and mental courage.

PSYCHOLOGICAL BARRIER #1: THE INHIBITED TRANSMITTER

It has been clinically established that the strength of a muscle is directly proportional to its effective cross section, which is approximately 140 pounds per square inch in the male and 105 in the female. This equates to the pull exerted at the point of the muscle's attachment to the skeleton. However, it has been observed that under normal conditions we are not able to produce a pull to this physiological maximum. The reason for this, according to physiologist Dr. Arthur Steinhaus, is that we typically operate only to our *psychological* limit. You may have noted a degree of reluctance to engage in an all-out physical effort on an ongoing basis; it's something that is normally avoided whenever possible because, as we've seen, over the millennia, human beings have survived by being efficient at conserving energy—rather than dispelling it. Again, to quote Mentzer:

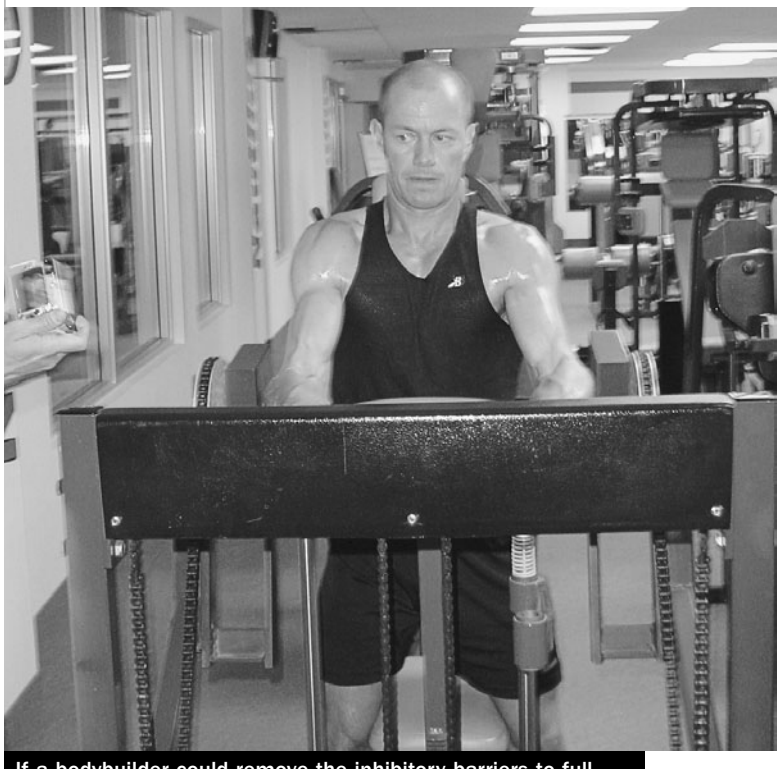
> Other than in athletic training and competition, such effort is required only in emergency situations. Only a person fired by a strong, almost overwhelming sense of purpose and meaning will be able to train with maximum intensity.[2]

Mentzer then went on to quote the psychologist-philosopher William James:

> Only the "unusual stimulus can fill you with the emotional excitement to make the extra effort" (according to James) that will carry you over the dam to optimal training progress.[3]

This point was scientifically established by Dr. Arthur Steinhaus more than fifty years ago during experiments he conducted to determine the psychological factors that affect the maximum expression of human strength. As Steinhaus recalled:

> In the closing years of his life, I met the late Professor Howe of Wellesley. He said to me, "You know, if we knew more of why people cannot get all the strength out of their bodies that is in them, we would understand people better." I accepted this as a challenge.
>
> About three years ago I came to try a very simple experiment in this area. We pulled against a scale to measure



If a bodybuilder could remove the inhibitory barriers to full muscular contraction, he would be able to stimulate closer to 100 percent of every muscle he trains.

strength of forearm flexors. Whenever the sweep second hand came to the one o'clock position the individual was to pull as hard as he could. So we registered a maximal contraction every minute. Then without warning to the individual we shot a gun at various times before the clock came to the pulling position. Invariably, we found the individual had more strength after the shot. We found that the shot about four seconds before the pull got the greatest increase. We found the increase was sometimes as much as 30 percent. Then we tried yelling. When we yelled their strength was also more than usual. Then we tried hypnosis. Under hypnosis it is possible to do away with inhibitions. We found up to 50 percent improvement in strength. Finally I had gotten on the trail of things Professor Howe and I talked about. We had found three ways of crashing the psychologic barrier that stops us in the execution of strength. The psychologic limit is always short of the physiologic one. Professor Hill of England once said that one of the big differences between the athlete and the non-athlete is that the athlete has learned to close the gap between the psychologic and physiologic limits. He drives himself closer to the physiologic limit.[4]

Considering that many are unable to summon the mental drive necessary to wring maximal contraction from their muscles during a typical workout, it might prove beneficial if these individuals could find a means of strengthening their will to better bypass these motivational shortcomings. This can be done, as we shall see, by applying an exogenous (initiated from outside the body) training method to the muscle, so that contractions can always be maximal. According to some estimates, only about 30 percent of the fibers of a single muscle can be made to contract at any given time through normal conscious direction. Assuming this is true, it follows that if this limiting factor could somehow be obviated, you would have effectively removed the impediment to your being able to stimulate

closer to 100 percent of that muscle at one time.

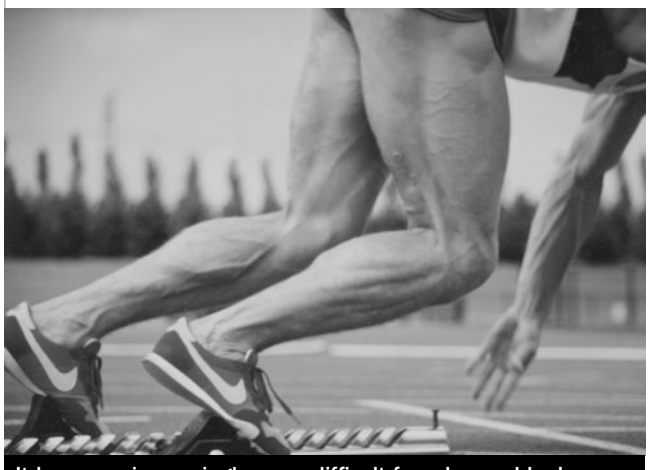
Many years ago Dr. John Zeigler, a physiologist in Olney, Maryland, created an electrical muscle-stimulation machine that was used by champion bodybuilders such as Mike and Ray Mentzer and professional athletes such as members of the Washington Redskins football team. According to Zeigler and the Mentzers, the device was helpful in that it allowed the individual to stimulate close to 100 percent of a given muscle by bypassing his motivational and neuromuscular shortcomings. The resistance was provided by electricity wired directly into the subject's muscles through small pads that were soaked in a saline solution. This is one example of the benefit of an exogenous stimulus. But who said being hooked up to an electronic muscle-stimulating machine is the only way to get to produce an exogenous muscle-stimulating effect? Again, more on this shortly.

Many cannot summon the mental drive necessary to wring maximal contraction from their muscles, so it might prove beneficial if they could strengthen their will to bypass motivational shortcomings.

PSYCHOLOGICAL BARRIER #2: A LACK OF MENTAL COURAGE

As we've seen from these investigations, as a trainee gets bigger and stronger, many significant barriers—both physiological and psychological—begin to impose themselves, because the body does not want to change. It literally must be "forced" to change. A Max Contraction rep—all things being equal—is the most productive rep one could perform, because the contraction, and thus the resistance one is contracting against, is "maximal." However, it becomes increasingly more difficult to psyche oneself up for a maximal effort. This situation is similar to the difficulties Olympic sprinters face in psyching themselves up for an "all-out" sprint every time they go to the track. Max Contraction Training, though, is even more difficult, since the inroad into the muscle's existing recovery ability is greater than that encountered in sprinting, as is the depletion of the body's energy reserves. After all, sprinting utilizes only the athlete's bodyweight—never more than that weight—in training.

Max Contraction Training is, in fact, the equivalent of doing an all-out sprint each and every workout with several additional hundred pounds of resistance strapped to your body. And given the slowness of the muscle growth process, it takes an individual



It becomes increasingly more difficult for advanced bodybuilders to psyche themselves up for a maximal effort each time they head to the gym—not unlike the difficulties Olympic sprinters face in psyching themselves up for an "all-out" sprint every time they go to the track.

of incredibly strong mental fortitude to derive motivational sustenance from witnessing changes in his appearance that are incremental at the best of times.

This last point is not something to be glossed over. The psychology of a trainee is important and must be based on the facts of the cause-and-effect relationship of muscle growth. No one can defy the laws of nature and expect to be successful. You must understand and apply these laws to make them work for—rather than against—you in your quest to realize your desires and aspirations.

PART 2

The Solutions

Bringing science to bear on the issue of muscle building is the solution to the advanced bodybuilder's problem of trying to build bigger and stronger muscles.

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4

The Scientific Foundations of Bodybuilding

Maximal muscular contraction performed for as short a duration as one second has been shown to build as much strength in the human body as is possible to build. A stopwatch and a progress chart are indispensable tools for the advanced bodybuilder in this regard.

Any muscle that is taxed to the maximum of its strength will respond by hypertrophy. Muscle volumes may be increased from 50 to 100 percent in this way. Whereas exercises of strength in which much work is done in a short period of time thus lead to hypertrophy, exercises of endurance do not."[1]

Since it was science that revealed the obstacles on our path to continued muscular development, it is logical to turn again to science for the means by which to surmount them. We should not be discouraged by the reality that such obstacles exist, knowing that few mortals have ascended to new heights without encountering some degree of turbulence.

Because human physiology is universal, a look at what science has to tell us about the "facts" of muscle growth will be eminently more meaningful and will help to guide us on a route that is more "steadfast and true" than would the logically suspect opinion of the muscle magazines, which are registered with the government not as science journals but as "catalogues" and whose existence depends on selling us such products as nutritional supplements.

Through exploring what science has to say on the subject of building strength and muscular size, we learn that in 1897, a physiologist named Morpurgo showed that exercise caused muscles to grow larger. It was a question of cause and effect: Morpurgo's research demonstrated that exercise causes hypertrophy of muscle cells and therefore proved experimentally that exercise is one cause of larger muscles. This had been known in a general way by many people, but now it was officially on record in the physiology books. Not long afterward, at the turn of the twentieth century, another physiologist, Roux, asserted that not all exercise resulted in hypertrophy. Roux observed that athletes may have big muscles in one part of the body and not in other parts and also that not all people who exercised developed large muscles. Gradually he formulated the hypothesis that it wasn't just exercise, per se, that resulted in the development of bigger muscles, but rather it was a specific *type* of exercise that made the difference.

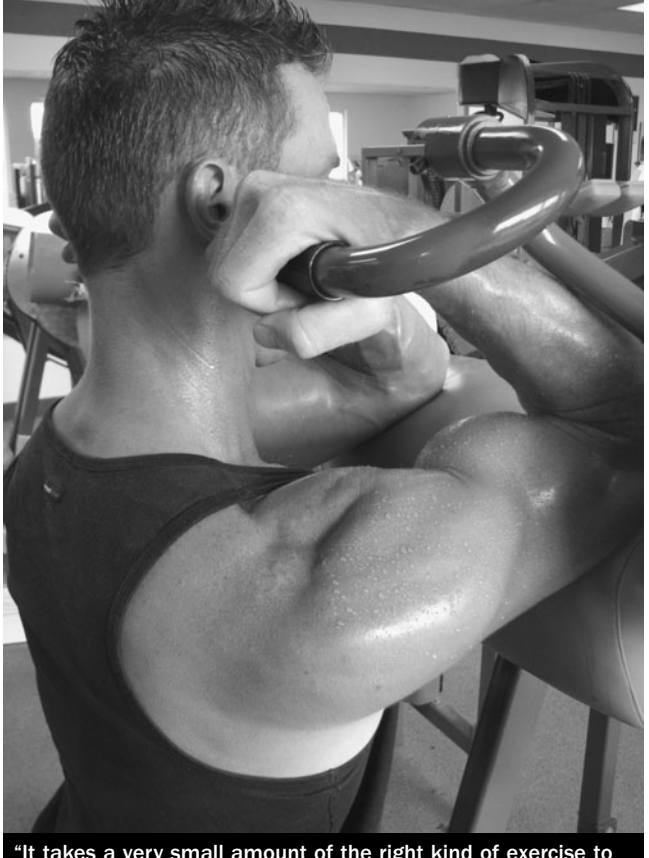
Unfortunately, Roux rendered his conclusions in long and complex German sentences, with the result that very few people understood his pronouncements. Fortunately, his young assistant, Lange, understood his professor quite well and distilled these ideas into language that was more comprehensible. Unfortunately, before he could publish them, Lange died as a pilot in World War I, so Roux published the work of Lange posthumously. Thus, it is thanks to Roux's dissemination of Lange's explanation of Roux's theory that we now have the simple statement that it is not the quantity or volume of work performed, but the *intensity* with which that work is performed, that is responsible for the development of larger muscles.

This theory was proved in 1925–26 by physiologists Petow and Siebert in Berlin. They proposed that exercise alone or the simple act of contracting a muscle is itself insufficient stimulus to cause the muscle to grow bigger and stronger. Rather, what is required is work that is performed more intensely than usual. The "intensity factor," the amount of work done in a unit of time, was now isolated as the deciding factor influencing the rate of human skeletal muscle growth.

One way to illustrate this is to compare the muscles of a sprinter and a distance runner. The sprinter has larger, heavier muscles. The distance runner generally has slender muscles. The distance runner who runs a mile or two miles does a great deal *more* work than the man who runs only a hundred yards. If size were related to the amount of work, then the distance man would have the larger muscles. But Roux noticed that this was not the case. Let us look at it another way: The man who runs a mile in four minutes covers twenty-two feet per second, whereas the man who runs a hundred yards in ten seconds covers thirty feet per second. Twenty-two and thirty are the intensity factors, and these figures correlate with the observed muscle sizes. The thirty-feet-per-second man has larger muscles than the man covering twenty-two feet per second.

This premise was then experimentally demonstrated on rats in Petow's laboratory, where the animals were caused to run at various speeds. It was also shown that muscles reach a certain size in response to a given intensity of work and remain at that size no matter how long that exercise is continued.

A study performed in 1923 lends some additional credence to this theory. At the close of a winter of heavy gymnastics and wrestling, the students of the Deutsche Hochschule fur Leibesubungen had larger muscles, as measured by girth, than they had in the following autumn after additional participation in a summer session of track-and-field activities. Other experiments on



"It takes a very small amount of the right kind of exercise to make a muscle grow in strength as fast as it can grow in strength. Repetitions become unnecessary. Maximal contractions give the same increases with just momentary holding."—Dr. Arthur Steinhaus

humans and animals pointed physiologists in the same direction: muscles grew in size and strength whenever they were taxed to their limit, that is, when called on to contract with greater intensity; adding more exercise does nothing to enhance the muscle growth process.

This conclusion was loudly echoed in the 1960s by Dr. Arthur Steinhaus, considered by many to be the father of American physiology, who stated: "Only when the intensity is increased, i.e., *overload*, will there be further hypertrophy."

Back in Germany, beginning about 1940, Professor E. A. Muller began to ask precisely how much intensity was necessary to make a muscle grow larger. Morpurgo in 1897 had shown that exercise makes muscles grow larger. Petow and Siebert in 1925 had established that in order for a muscle to grow larger, it must be exercised at an intensity greater than usual, which is what gave birth to the concept of "overload." There remained the quest, however, of establishing exactly how much exercise constitutes *overload*. How much does it take to make a muscle bigger? According to Steinhaus, Muller eventually was able to settle the question:

> In 1953 E. A. Muller of Germany surprised us with this discovery that as little as six seconds of static contraction once is enough to increase strength, provided that it is of appropriate intensity.[2]

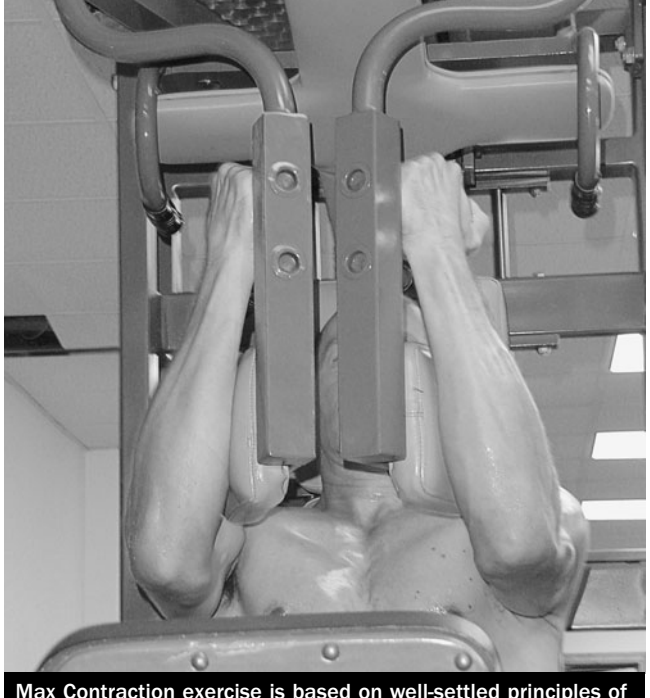
Having detailed Muller's experiments in *Max Contraction Training*, I now want to focus on why Muller used Max Contractions (more technically, "static contractions" or "isometric contractions") in his experiments. An isometric contraction is one in which the muscle does not change its length. *Iso* means "same," and *metric* means "measure." A muscle remains unchanged in its measure length when it produces tension against an immovable object, as in pushing against a wall or attempting to lift a resistance that is too heavy, or just pushing one muscle group against another as advocated by old-time bodybuilders and mail-order gurus such as Svoboda and Charles Atlas. Muller used isometric contraction principally because measuring the exact amount of tension developed in a muscle is easiest when the muscle does not shorten. He and his coworkers found that when a muscle is caused to contract to between 40 percent and 60 percent of its maximum contracting power, and the contraction is held for approximately six seconds (he later determined that a one-second maximum contraction was sufficient), the muscle will grow in strength as fast as that muscle can grow in strength.

Muller corresponded throughout the 1960s with Steinhaus about his research, which allowed Steinhaus to familiarize himself with this protocol better than any other physiologist and led him to conclude:

> You do not need endless repetition, just once [per session] is enough. This much

> exercise will produce in young men an average increase of 4 to 5 percent in one week. In women the average increase will be about 3 percent per week. It takes a very small amount of the right kind of exercise to make a muscle grow in strength as fast as it can grow in strength. Repetitions become unnecessary. Maximal contractions . . . give the same increases with just momentary holding.[3]

The fact that it is the intensity, rather than the volume or duration, of an exercise session that must be increased is slowly gaining acceptability in the bodybuilding world, not only among multiple Mr. Olympia winners such as champion Dorian Yates but also among members of the old (volume) school. Most notable is former Mr. Olympia winner Frank Zane, who, in the April 2004 edition of *Ironman* magazine, indicated that he was now training with more intensity and less volume and frequency—after years of championing the high-volume approach.



Max Contraction exercise is based on well-settled principles of exercise science, which is precisely why it is so productive.

More recently, the December 2004 edition of the *Journal of Exercise Physiology* online published an article indicating that the preponderance of bona fide, peer-reviewed scientific literature supports the position that one set per exercise is optimal for stimulating gains in mass and strength. In the article, physiologists D. Smith and S. Bruce-Low attested that "those interested in improving their muscular size, strength, power and/or endurance should perform one set of each exercise to muscular failure (volitional fatigue)."

The physiologists went on to list dozens of examples of misleading and inaccurate positions advanced over the years by certain physiologists who either did not perform the proper research or performed their research with a bias in favor of multiple sets. A previous edition of the same journal went so far as to publish an editorial criticizing the position taken by the American College of Sports Medicine (ACSM) that more sets and longer exercise sessions (up to twenty-one hours a week!) were necessary. The editorial contended that the references cited in the ACSM position paper were not cited accurately and/or did not support the ACSM's conclusions. This point was subsequently touched on in the paper by Smith and

Bruce-Low, who emphasized that high-intensity methods are "very different to the strength training guidelines offered by the National Strength and Conditioning Association, the American College of Sports Medicine and most exercise physiology textbooks." They continued, "However, in contrast to the lack of scientific support for most of the recommendations made by such bodies and in such books, [high intensity] training advice is strongly supported by the peer-reviewed scientific literature . . . as they are time-efficient and optimally efficacious."[4]

In short, the tenets of high-intensity Max Contraction Training have been strongly corroborated by reputable, peer-reviewed exercise studies. The same cannot be said of the "old-school" high-set/high-volume approach, which has only the echoes of ignorant incantations from long ago to "train more" as a basis for perpetuating its scientifically bereft methodology.

BUILDING MUSCLE WITHOUT WASTING TIME

Drawing from this rich scientific heritage, we know from Muller's work that a maximum contraction of a given muscle produces a dramatic effect in the strength of the muscle. Muscles contract by shortening, so a muscle would have to be in its fully contracted position for a maximum contraction to occur. The process is such that the more fully a muscle is contracted (i.e., flexed), the more fibers are recruited. But this is only half of the equation; the other half is the amount of weight or "load" against which these muscle fibers are made to contract. This determines the "intensity" of the contraction: if the load is maximal and the contraction is maximal, then the fiber recruitment will be maximal. Conversely, if the load is minimal and the contraction is minimal, the fiber recruitment will be minimal.

Muscle grows in direct proportion to the intensity of the training stimulus, with a greater intensity soliciting a greater adaptive response from the body.

Moving a given muscle group into a position of maximum contraction is crucial for two reasons. First, since muscles contract by shortening, a muscle has to be in a fully contracted position if all of its fibers are to be contracted at the same time. Further, to induce

maximum levels of growth stimulation, as many as possible of the available fibers must be made to contract. Second, the position of Max Contraction is the only position in which a maximum load (or overloading) of the muscle can occur.

It may be true that more weight can be *supported* in other points of a muscle's range of motion owing to certain leverage advantages, but it is also true that a supportive exercise is not the same type of exercise as one in which that muscle is made to contract maximally against the heaviest resistance of which it is capable. Any other position—or even a full range of motion—produces submaximal loading, owing to the fact that not all of the fibers are brought together. The muscle either is not contracting at all—as in the position of full extension—or is both technically and by definition out of a position of "maximum contraction" and hence unable to perform a maximum contraction. The muscle therefore is made to contract against a disadvantageous leverage factor that serves to diminish the amount of resistance against which it is capable of contracting.

When these two factors—point of contraction and optimum overload—are properly aligned, it is possible for the first time in the history of exercise to thoroughly stimulate the majority of a given muscle's fibers. Moreover, these two factors are the only ones that are relevant in the calculus of inducing maximum size and strength increases. This second factor, optimum overload, is worthy of more in-depth investigation, because understanding the role overload plays in the muscle-fiber recruitment process will effectively challenge a lot of mythology and dogma within the world of bodybuilding and strength training.

Muscle fibers are recruited by the intensity of the contraction, which is regulated by the amount of weight against which they are required to contract.

THE NATURE OF MUSCLE FIBER RECRUITMENT

Studies of human anatomy and physiology studies have isolated four distinct muscle fiber types within our species. Talk to most would-be experts or personal trainers, though, and you'll hear a simplified (and scientifically incorrect) synopsis contending that there are only "fast-twitch" and "slow-twitch" muscles. However, physiologists have identified not one, not two, but three types of fast-twitch muscle alone. Compounding the confusion, the classification schemes for muscle fibers have differed over the years, culminating in three systems for classifying the same thing. The classifications of the four fiber types under these three schemes are as follows:

Classification of the Four Fiber Types		
I	SO (Slow, Oxidative)	S (Slow)
IIA	FO (Fast, Oxidative)	FR (Fast, Fatigue Resistant)
IIAB	FOG (Fast, Oxidative Glycolytic)	FI (Fast, Intermediate Fatigability)
IIB	FG (Fast, Glycolytic)	FF (Fast, Fatigable)

An individual's distribution of fiber types appears to be genetically predetermined—a product of breeding, as opposed to environmental influences—which means that training in a certain fashion will not "create" a higher complement of a particular fiber type than one is born with. Still, most of us are brought into the world with a more or less even distribution of all types of fibers—both fast- and slow-twitch.

The first of the four fiber types—SO, or Slow—require the least amount of energy to engage. Slightly more energy is required to engage the FO fibers and more still for the FOGs. The ones that require the highest electrical output to engage are the FGs. And here is why it is of the utmost importance to have your muscles contract against the heaviest weights possible if you wish to activate the FGs. The brain is in no hurry to hit the switch for those FG fibers—the ones you want to stimulate for size and strength increases; it would rather engage the least amount of muscle fibers necessary to accomplish a given task. The body is an organism of survival and knows how to conserve energy, because doing so has proved over millions of years to be an asset for survival.

The brain will first attempt via the central nervous system to contract against a heavy resistance by recruiting only the SO fibers. When these prove inadequate for the task, it will recruit the FOs to assist and shortly thereafter the FOG fibers. If the weight is light or moderate, these are all the fibers that will be recruited. If, however, the weight is so heavy that you can contract against it for only one to six seconds, the brain will have realized that it needs more firepower than it's been providing, and only then will it send out the signal to engage the otherwise dormant FG fibers. This process is known in physiology circles as "orderly recruitment,"

A bodybuilder's complement of fast-twitch muscle fibers—the ones that produce the most pronounced size increases—is genetically predetermined, but the fact remains that he can involve those fibers only by employing the heaviest weights against which a given muscle can contract.

another way of saying that the brain does not engage in the firing of muscle fibers randomly. When recruiting muscle fibers for the purpose of contraction, the brain doesn't concern itself with issues of speed; what matters is force. It has no regard for how fast you want to lift a weight or run around a track—again, it cannot randomly recruit muscle fibers. Instead, the brain ascertains the exact amount of force your muscles require to move a precise resistance and, accordingly, recruits the precise amount of muscle fibers required to do the job.[5]

It follows, then, that when the brain sends sufficient current to activate FG fibers in a Max Contraction set, we automatically know that the FOs and FOG fibers—that is, *all* available muscle fibers—have been activated and engaged, thereby ensuring maximum muscle fiber recruitment. Training with submaximal weights will not activate the fast twitch or FOG fibers—no matter how many sets you perform. Consequently, you will never stimulate maximum size and strength gains by training with weights that are well within your existing capacities.

For more than ten years I've been promoting the fact that muscle fibers are recruited by the intensity of the contraction, which, in turn, is regulated by the amount of weight against which they are required to contract: the heavier the weight, the more fibers are recruited and thus stimulated to grow bigger and stronger. I didn't invent the condition—it's a fact of physiology—but I'm not aware of anyone else, at least in bodybuilding circles, who has called attention to it. The ramifications are truly "significant," as it immediately does away with much of the myth and nonsense that has pervaded bodybuilding training over the years.

Mike Mentzer used to make the point that it is that last rep of a ten-rep set that is the most productive for stimulating growth, because it is the hardest.

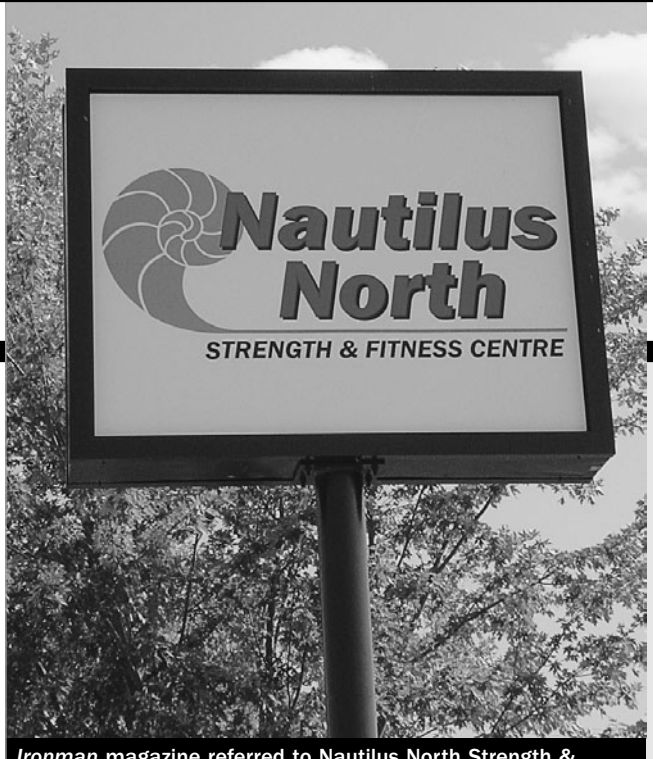
The key lesson to take from all of this is that muscle fibers have to be stimulated in order to grow larger and that they are stimulated by being recruited. You can't stimulate into growth fibers that are not involved in a contraction. Therefore, if you want to create bigger, stronger muscles as quickly and efficiently as possible, you need to use as many fibers as possible in your exercises. That is, you need to generate the highest "intensity" of contraction of which you are capable. A Maximum Contraction performed against the heaviest weight your muscles are capable of contracting against will recruit and stimulate all the available fibers to grow bigger and stronger, with any more sets necessarily requiring less weight (and thereby less fiber recruitment) and less-intense muscular contraction (and thereby less growth stimulation).

Mike Mentzer used to make the point that it is that last rep of a ten-rep set that is the most productive for stimulating growth, because it is the hardest. He used to say that if you were capable of ten reps but put the bar down after performing one, two, three, four—all the way up to rep nine—you wouldn't grow bigger and stronger, because it was the last rep—the hardest rep—that was the most intense and thus tripped the growth mechanism of the body into motion. If that's the case, why perform the other nine reps at all? Moreover, if a single maximum contraction is all that is required to stimulate the growth mechanism of the body into motion, then no other factor holds significance in stimulating muscle growth.

Even if Max Contraction yielded the *same* results in muscle mass and strength that conventional training protocols yield, the single Max Contraction protocol—being briefer—would clearly be the more efficient way to train, as nowhere does the scientific literature suggest that training three to four times more will net you three to four times better results.

5

The Nautilus North Study



Ironman magazine referred to Nautilus North Strength & Fitness Centre as "one of the leading fitness research centers in North America."

Once we understand the nature of the stimulus responsible for producing muscular growth, along with the fact that one set per exercise is all that is required for this purpose, we're faced with the next question: How often should the stimulus be applied for optimal results? The answer to this question has typically been vague, primarily because until very recently virtually no studies have been conducted to furnish any conclusive evidence.

That was the situation until June 2005, when my brother-in-law Cary Howe and I conducted a study at Nautilus North Strength & Fitness Centre, in Bracebridge, Ontario, to determine the optimal training frequency. The outcome, we surmised, would also help to settle other relevant questions such as the following:

Cary Howe (right), one of the trainers during the Nautilus North Study, supervises subject Clayton Bell during the performance of a Max Contraction set on the Nautilus hip and back machine.

- What—if any—benefit could be produced from a single high-intensity workout?
- How quickly can such a benefit be produced?
- How much muscle will be produced as a result of a single workout?
- How long is the new muscle growth held by the body?

In an endeavor to find the answers to these questions, we recruited eleven advanced trainees to take part in a two-week study. The subjects happened to be males between the ages of twenty and forty-four. Some had an extensive training history (more than twenty years) using many different protocols, while others had considerably less training experience, but all had been training intensely for well in excess of six months, qualifying them as advanced trainees in my estimation and for the purposes of the study.

Because it is relatively more difficult for trainees who have reached this level of experience to put new muscle on, it was decided that ultra-high-intensity protocols would serve as the exercise stimulus. We first performed a full-body composition test on each participant and then introduced the training stress, after which they did not train again during the two-week test period. We tested their body composition daily to see what, if any, changes took place in the amount of lean body mass.

Among all the training protocols we employed, ranging from negative-only to

heavy partial reps, the Max Contraction protocol produced the single most dramatic results. More important, *all* protocols produced increases in lean body mass for those who trained only once during the two weeks. The lone case of a trainee registering "zero" progress was an individual who performed additional workouts on his own and whose daily job involved heavy lifting. (So much for the "more is better" theory.) Moreover, after excluding the highs and the lows from our database to calculate a statistical average, we found the optimal training frequency for the average trainee to be 6.6 days (call it seven). In other words, once-a-week training was established as being not just viable, but the *optimal training frequency* overall, with some individuals requiring nine to eleven days, if not more, for their bodies to produce the growth they had stimulated.

We also noted that virtually all of the subjects registered a loss of lean body mass shortly after the workout. My guess is that the effect is attributable to the loss of water that attends the burning of glycogen stores within the various muscles, as opposed to an actual loss of contractile protein or tissue. Water represents 72 percent of a muscle's mass, and water bonds to glycogen molecules at a ratio of three grams of water for every one gram of glycogen, so it's reasonable to infer that as glycogen stored within a muscle is burned for energy, the water that bonds to these molecules leaves the body, thus diminishing the actual "mass," or lean content, of the body to a marked degree.

The average recovery period following an intense workout was shown to be three days, at which point the body was back to the lean composition it had registered prior to introduction of the workout stimulus. From this point until day seven, the body is in a stage of over- or supercompensation during which additional lean body mass is created (perhaps an overcompensation for the depletion of glycogen stores and the water that bonds to the glycogen). After day seven, the lean mass of the body begins to decompensate slightly, so that by day fourteen, while there is still a registrable "gain" in lean (on

The Nautilus North Study showed that the production of an increase in muscle mass takes an average of seven days after the performance of a high-intensity workout. Here, I check the data on the progress chart of trainee Jeremy Hymers to determine his optimal training frequency.

average, three-quarters of a pound), it is down somewhat from the peak experienced on day seven.

The data analysis from this study has several important implications for advanced bodybuilders:

1. **The immediate consequence of training is a negative one.** While many people envision a linear increase in mass as a result of a workout, the actual route to a mass increase is far more volatile. In some instances the lean mass may increase marginally almost immediately after a workout, owing I believe to the fluid retention associated with inflammation and/or swelling that attends the body's repair of membrane, fibers, and connective tissues that may have suffered trauma or microtears from intense muscular contraction. But then follows an almost immediate drop-off of lean to a level that is in some instances two or more pounds below what it was prior to the workout. This "dip" in lean is a pattern that can be observed in almost all trainees. The recovery process lasts on average three days (some trainees will require seven or more), and it will then take on average 3.6 days for the **over- or supercompensation** process to be completed, at which point the trainee reaches a peak of lean body mass composition.

> Intense training performed too frequently is akin to repeated exposure to too much ultraviolet radiation.

2. **Resuming training before lean body mass composition has peaked will prevent or preempt the optimum production of lean body mass.** Interfering with the process causes the body to go into another "dip" pattern as more biochemicals and energy resources are consumed to offset the energy that was expressed during this subsequent workout. Moreover, and this has particular bearing for athletes, every time an individual's lean composition diminishes, there is a corresponding decrease in resistance to injury. For example, if the human calf muscle tears at seventy-five pounds of force, then a diminishment of the lean composition of that calf will also lower its breaking point—to, say, sixty-eight pounds of force—thereby increasing the odds of injury. This is why daily training is always a mistake for athletes (all the more serious when coupled with twice- and thrice-weekly practice sessions and/or competitions).
3. **Uninterrupted progress occurs when the body is allowed the time it requires to produce the gains that have been stimulated.** The growth-and-repair mechanism of the human body is the

same whether it's called into action to produce bigger muscle tissue or to replace damaged tissue as a result of a severe burn. According to the medical literature, for a first-degree burn (which is the mildest) the body requires an average of three to six days to repair the damage and produce new tissue to replace the old; a second-degree burn can require upwards of two to three weeks; while a third-degree burn (the most severe) will typically require several months (and usually skin grafts to assist in the repair process). Similarly, with high-intensity exercise, one workout consisting of several sets taken to positive failure will require up to 6.6 days for the body to completely recover its energy resources and to produce an increase in lean tissue. The more intense forms of exercise, such as negative-only, Max Contraction, or Omega Set training, can require upwards of two weeks off between workouts for full growth production to be completed. (After studying the effects of **high-intensity** training on more than two thousand clients at Nautilus North, we have found that, as a rule of thumb, for each **ultra-high-intensity** set performed, you will require two days to recover and grow. So, if you perform five intense sets, you will be looking at roughly ten days to recover and grow; if you perform six intense sets, then you will be looking at twelve days; and so on.) Intense training performed too frequently is akin to repeated exposure to too much ultraviolet radiation: the skin will continue to burn while the body is being denied adequate recovery time to perform repairs and grow new skin. Such overtraining is the equivalent of a third-degree burn in terms of the body's growth-and-repair mechanism, which can quickly be so overwhelmed that many months of almost no activity at all will be needed merely to recover from the repeated exposures to the training stress.

This revolutionary study has received coverage in *Ironman* magazine, and a full report of the study is available online at maxcontraction.com. The website also lists the Max Contraction workout that produced the best gains, which has implications for bodybuilders and athletes that can be of inestimable value in mapping out their training and (in the case of athletes) practice programs. However, for the purposes of this book, the accompanying graphs provide sufficient data to bring these implications into sharper focus.

Remember that the body doesn't produce change according to the individual's whim; it does so solely out of biological necessity. If the stimulus is intense enough and if the recovery period is long enough, you will produce additional lean tissue, but these two factors must be perfectly balanced; a slight disproportion of one will have a dramatic impact on the ability of the other, yielding—at best—dramatically reduced progress.

Again, based on the peak gains and dips of all participants in the study, the average optimal training frequency is once every 6.6 days (see Figure 5.1). Training prior to the end of this period will actually interrupt the growth process. The immediate effect of a workout is a negative: the lean content of the body dips, making the trainee weaker, thus increasing the risk of injury. Optimal gains are produced during the rest period following the workout. Even working out once every fourteen days produces substantially better results than training every day or every other day.

FIGURE 5.1 *Average Optimum Training Frequency*

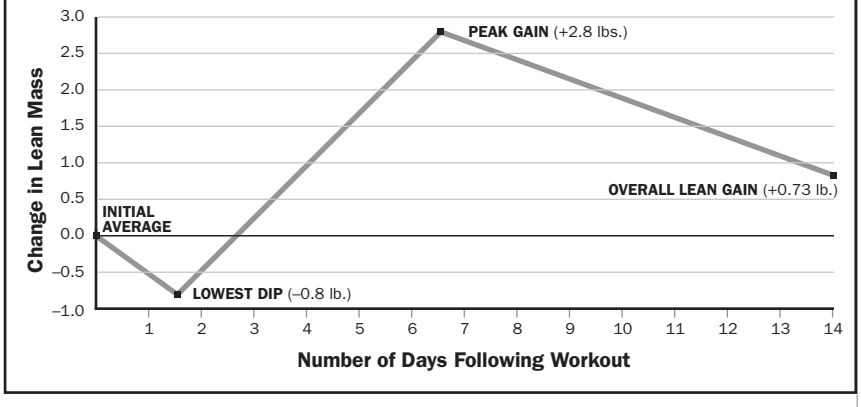
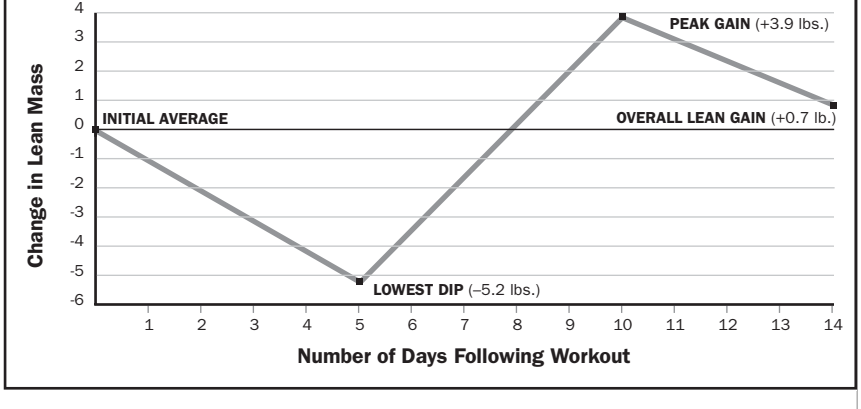


FIGURE 5.2 *Sample Optimum Training Frequency*



As shown in Figure 5.2, subject Chris Greenfield's optimal training frequency is longer than the study's average, with ten days required between workouts for peak adaptation to take place. Although he is tracking upward by day six (after five days of muscular suppression), his lean is well below his preworkout level. It is only on day eight that his lean is back to his starting level, and day ten that it hits its peak. If he waits until day fourteen to work out, he will still be stronger and leaner (by three-quarters of a pound) than he was prior to his previous workout but will be well below what his peak level was on day ten.

Body Comp Weight Analysis Centre, a business that employs an expensive air-displacement device to determine the body composition of clients, has tested hundreds of clients using all sorts of training programs over several years, and invariably those who trained the most gained the least. The clients who are making the best progress are training very intensely and very infrequently. After all, the growth you have stimulated in the gym is produced only when you are at "rest" (i.e., out of the gym), which, as we learned, should be from seven to fourteen days in most instances and even longer in some cases.

In 1993, Arthur Jones, the founder and retired chairman of both Nautilus Sports/Medical Industries and MedX Corporation, published a book entitled *The Lumbar Spine, the Cervical Spine, and the Knee: Testing and Rehabilitation*, which was based on his many decades of study and research regarding strengthening and rehabilitating muscle tissue. Among other findings, he reported that the muscles of the lumbar spine were markedly improved in test subjects who trained just once every two weeks. Another group, training once every seven days, displayed similar results. He went on to state that one subject discovered that if he trained once a week, he lost strength; if he trained once every two weeks, he maintained (didn't gain or lose) strength; and if he trained once every three weeks, he gained strength.

If you don't rest, you don't recover the energy that was expended during your workout. If that deep reserve of adaptation energy is not replenished, then growth cannot be produced.

At Nautilus North we have tracked this same trend with all muscle groups and have observed that individuals who've taken off at least three to four weeks (and in some cases as many as twelve) invariably are stronger. In contrast, the vast majority of bodybuilders today are working out four to five days per week. What Jones and the rest of us who have closely examined trainees' results, and who continue to research and experiment, are discovering is that trainees don't need as much exercise as has popularly been supposed. In fact, exercising too often is actually an impediment to progress and can lead to a host of maladaptive symptoms—from tendonitis to suppressed immune system function.

Nevertheless, many otherwise intelligent people, including trainers and coaches even at the university level, go off on ill-informed tangents when it comes to how best to increase existing levels of strength. In their opinion, there are just not enough days in the week for you to train. Their logic is, simply, "If training makes you strong, then more training makes you even stronger." Training, however, does not make you stronger. Indeed, as the Nautilus North Study clearly revealed, the immediate consequence of a workout is to depress the body's lean composition, thus making you weaker. If this were not so, then you would never get tired from training; theoretically, you could be bench-pressing all day long. Anyone with any training experience will readily acknowledge that this is not the case. If you continue to perform any exercise, you doubtless will become less and less efficient at it. In sum, the more you train, the weaker you become.

The workout serves as a stimulus for the body to produce more muscle growth—which it does providing that a sufficient number of days off have been allowed for optimal recovery.

Precise record keeping of dates of workouts, exercises performed, weights employed, and time of contractions is integral to determining both the volume and frequency that will result in optimal progress for advanced bodybuilders.

Therefore, training, per se, does not produce strength so much as it produces weakness.

What, then, produces strength and size increases? The answer may surprise you: rest. If you don't rest, you don't recover the energy that was expended during your workout. If that deep reserve of adaptation energy, as explained in Chapter 2, is not replenished, then growth cannot be produced. Rest more, grow more. It's as basic as that.

The issue is not how much training you can manage to tolerate, for the human body can adapt to almost any stress. The real issue is precisely how little exercise is required to produce the desired result. As illustration, if you had been studying an average of eight hours a day in order to pass an exam, when you needed to put in only thirty minutes a day, you would consider your surplus hours of study to be time ill-spent. Or, if you spent two weeks traveling to a destination and then found that you could have made that journey in five days, you probably would be kicking yourself for wasting all of that excessive time traveling. The same is true with training.

If you are an advanced bodybuilder and are training more than once a week, you are in the same boat as the overearnest student and the exasperated traveler. You have been wasting precious time engaged in a grueling activity that doesn't require that much input.

It has now been established beyond any reasonable doubt that you can stimulate maximum increases in muscle mass and strength with one set per bodypart and once-a-week workouts. Why, then, do bodybuilders continue to spin their wheels and waste time by gross overtraining? Anyone who claims that any muscle group needs

more than one set to be fully stimulated is ignorant of the cause-and-effect relationship that applies to muscle growth. The body grows muscle in response and in direct proportion to the amount of stress applied to the muscle group during training. The greater the stress (or tension, or intensity) applied to the muscle group in question, the greater the growth stimulation. The caveat here is that the greater the stress, the less time you can tolerate it. As your ability to willfully generate stress increases, your training time (sets per workout and workouts per week) must diminish if you hope to keep on progressing up the ladder of size and strength gains. In other words, the stronger you get, the less time you can spend training.

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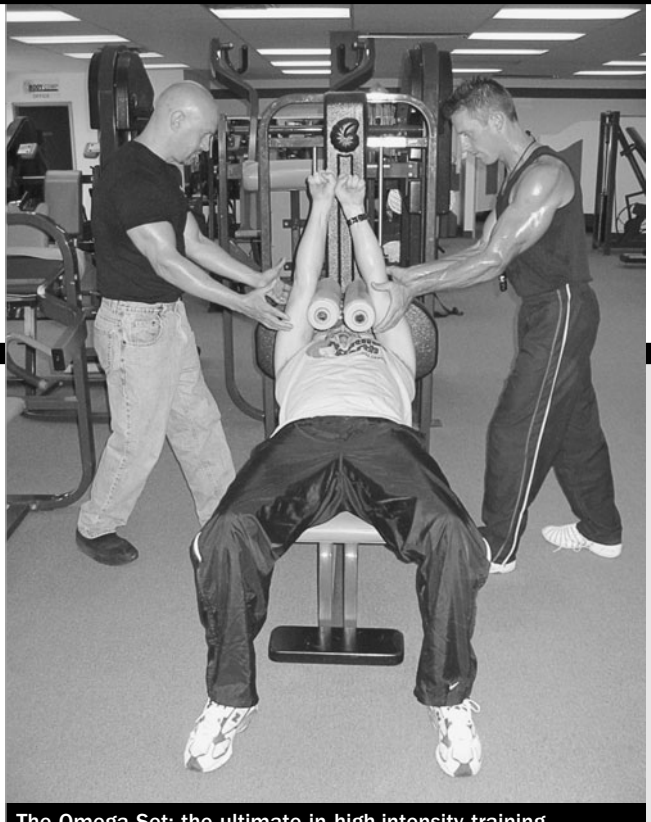
6

Introducing the Omega Set



The Omega Set: the ultimate in high-intensity training.

If you've reduced your training frequency to once a week, or less, and your progress has either slowed or arrested entirely, then you need to find a way to increase the intensity of your muscular contractions. You need the Omega Set.

Omega is a term of truly "biblical proportion." Jesus was said to have referred to himself as the "Alpha and Omega" of metaphysical issues. Omega is the last letter of the Greek alphabet, and I use it to represent the last word in high-intensity-training protocols. If positive sets can be considered the alpha, or first step, in one's high-intensity-training career, then the Omega Set can certainly be considered the final step. It serves as the final technique for the advanced bodybuilder en route to the full development of his genetic potential.

An Omega Set is all about maximum muscle contraction: not "how long" you can hold a resistance in the position, but how intensely you can contract your muscles once in this position.

The Omega Set derives this status from the fact that it represents the perfect solution to all of the barriers and problems outlined in the previous chapters. It is not for the faint of heart: it will require more effort than any other type of high-intensity exercise. The upside is that it comprises only between one and six seconds of actual stimulation. So, even those who are dreading their next workout and the effort they must expend—a common reaction given the body's aversion to change—will be able to rise to the occasion. If the set is initiated appropriately, they will find it well within their capabilities.

A potential drawback to this new protocol is that you need a training partner (and in the case of particularly strong trainees, two or more partners) to raise the resistance repeatedly for you. Usually, though, advanced bodybuilders don't have a problem finding others of like mind and goal orientation to assist them in training.

The Omega Set is a variant of the Max Contraction set but actually allows you to contract against a resistance that is heavier than what you can hold for one second. Why couldn't you perform four quarter-second reps (thereby equaling one second) or six one-second reps (thereby equaling six seconds)? An Omega Set is all about maximum muscle contraction: not "how long" you can hold a resistance in the position of Max Contraction, but how intensely you can contract your muscles once in this position. A contraction so intense that you can sustain it for only one-quarter of a

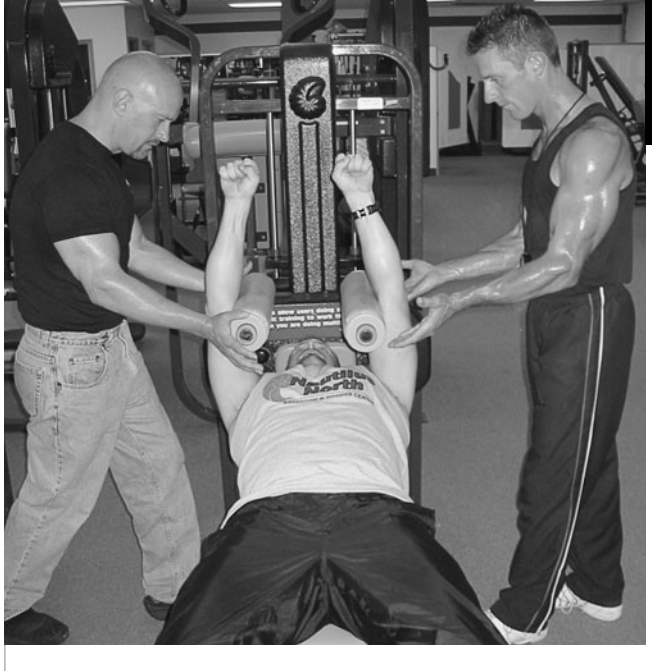
second is four times as intense as a contraction that you can hold for one second.

Of course, one-quarter of a second can be a tricky measurement to count, or even to register (though not impossible, as many sporting events are determined by hundredths of a second), so if you prefer to hold the resistance for a slightly longer period that's easier for you or your training partner to record, that will work just as well. For purposes of illustration, however, this chapter uses the quarter-second scenario.

OMEGA SET PERFORMANCE

Here, in short, is how the Omega Set is performed: Once you are sufficiently prepared mentally and physically for the work that is to follow, your training partner steps in and lifts the resistance for you into the position of full contraction. You then try with all your might to sustain this Max Contraction for one-quarter of a second. When you can no longer sustain the contraction, your training partner(s) will return the resistance to the Max Contraction position, and you then perform a second Max Contraction for another one-quarter of a second. When you can no longer sustain this contraction, the resistance is again raised for you, and the process is repeated. Obviously, this becomes progressively more difficult to do, and no more than four of these Max Contractions can or should be performed.

This new protocol is similar to negative-only repetitions, with the key exception that you do *not* need to lower the resistance through a full range of motion. Indeed, for safety purposes, you *should not* lower the resistance all the way. Heavy resistance either raised or lowered through a full range of motion plays havoc with the joints and connective tissues.



It is imperative that training partners be vigilant during Omega Set training, so that as soon as the trainee can no longer sustain a full contraction (left), they block the descent of the movement arms of the machine and (right) push the arms together, to enable him to perform additional Max Contractions.

Your training partner must always be ready to catch the weight once you can no longer sustain the contraction. In exercises such as the leg curl, your training partner should keep his hands very close to your ankles during your initial Max Contraction (far left); as the contraction gives way (left), he should catch your ankles or shins and push them back into the position of Max Contraction (right), at which point he should once again stand ready to catch them (far right).

The problem is that your joints were not designed for moving heavy weights through an exaggerated plane of motion, and your muscles of course hypertrophy *only* by contracting against the heaviest weights they can manage in the position of full contraction. In the past this dichotomy had bodybuilders attempting to lift heavy weights through a full range of motion—and most have suffered irreparable joint damage as a result. Others were forced to employ weights that they could move only through their weakest range of motion, which produced submaximal stimulation of the muscles and little or no growth stimulation.

Max Contraction removed this limitation and provided a means by which the muscles could be maximally stimulated while leaving the joints and connective tissues free of injury-producing sheer forces. However, to inroad the muscle further, *more intense* contractions are required. This necessitates the use of a heavier maximal resistance, not more sets that require more time or prolonging the duration of a set. Performing more sets requires a reduction in weight, and a lighter weight recruits less than maximal muscle fibers for the task.

The Omega Set employs a truly *maximal* weight (greater even than in a regular Max Contraction set, in that the resistance is too heavy to hold for a full second). As with a Max Contraction set, the muscle is in a position of maximum contraction. If you lower the weight out of that position, lower it only three to four inches. This will give you both a temporary (very temporary) physical break to allow your muscles to "reload," or seek alternate fibers to assist with the next contraction, and a psychological break—which is vital whenever the body is being subjected to a discomfort that is almost impossible to bear. The payoff is that when the Omega Set is completed, you will feel a stimulation that you have never experienced before. Your muscles will respond so quickly to this stress that it will almost shock you. The Omega Set is so productive because it is the ultimate in high-intensity training and also recruits the last ounce of muscle fiber you have in a given bodypart, thus ensuring maximal growth stimulation.

A MORE THOROUGH MEANS OF TAXING MUSCULAR STRENGTH

From a physiological standpoint, skeletal muscle has been established to have three levels of strength. The weakest is the positive level, which is the raising of a weight. In the middle is the static level, which allows us to hold a weight at some given point in the muscle's range of motion. The third and strongest is the negative level, which allows us to lower more weight than we can raise or hold in a static position.

To induce maximum growth stimulation in a muscle, you must train it as hard as possible. This can happen only when the muscles are trained in a fashion that sufficiently taxes all three strength levels in a given set. Carrying a set to a point at which you can no longer complete another positive rep is not thoroughly stimulating a muscle. Positive repetitions, in fact, are the least productive for size and strength. We bypass the useless or inefficient with Max Contraction, and focus on a contraction that is truly maximum—a static hold performed in the muscle's position of full contraction.

Once the muscle has been exhausted in this position, however, you may still have some strength that has been in some measure left untapped. This would be in your negative, or lowering, level. Unless you continue after having exhausted your static level, by performing negative reps till failure, you will not have achieved maximum growth stimulation. The hitch is that conventionally performed negative repetitions actually require you to "unload" a muscle. That's because with each inch of descent, the muscle group you are training is moving that much farther out of a position of full contraction. I have theorized previously that the most important part of a negative-only set is the beginning of it, when the muscle is in its fully contracted position and made to contact very hard against a resistance that is typically at least 40 percent more than the muscle is accustomed to handling in a positive fashion. The Omega Set provides more than ample stimulation for the negative component, focusing all of its impetus on the fully contracted position. Once the muscle starts to disengage from a position of full contraction, it is lifted right back into this position again, thereby ensuring that all of the fibers that can be involved in contraction are involved in the contraction.

The Omega Set is so productive because it is the ultimate in high-intensity training and also recruits the last ounce of muscle fiber you have in a given bodypart.

The way this works in practice is to select a weight for your exercises that allows you to sustain a Max Contraction for only one-

An even more precise way to perform Omega Set training is to have one partner guard the contraction while the other keeps track of your time of contraction (top left); the partner keeping time should be aware of when the Omega portion of the set is beginning and when the trainee is losing control of the contraction (bottom left and right), so that he can assist the other training partner if necessary in bringing the movement arm of the machine back to the Max Contraction position.

quarter of a second. Once you reach the point where you couldn't possibly sustain the contraction, have your partner lift the weight back into the top contracted position for you to again contract against. The first few contractions will be relatively easy, but as soon as you find yourself losing control of the downward movement of the weight—unable to contract against it for even one-quarter of a second—it is time to terminate the set, rather than risking serious injury.

Those who train alone will find it extremely difficult to perform the Omega Set. The best course in such cases is to train as hard as possible by going to a point of Max Contraction failure unilaterally and then to use the free arm (or leg) to assist in raising the resistance back to the position of Max Contraction for four more Max Contractions lasting one-quarter of a second each.

It is not necessary to include Omega Sets in every workout. Since they raise the intensity of effort and impose a much more demanding stress on your body, your chances of overtraining are greater. You might train a given muscle group every *alternate* cycle with the inclusion of the Omega Sets. To see how great an inroad the Omega

Set makes into a given muscle group, try this experiment: Perform your Omega Set to a point of failure, making sure that as you hold the resistance (and even as it begins to lower), you sustain the contraction for as long as you can. Immediately upon failure, perform a set of positive repetitions in perfect high-intensity form: four seconds raising, two seconds holding in the position of full contraction, and then four seconds lowering. You will be incredulous to discover how few repetitions and how little weight your muscles are now capable of contracting against. If, for instance, you typically perform barbell curls with 120 pounds for six to ten positive reps, you will be fortunate to perform six reps with 50 pounds. Doing this experiment will prove to you that you have made a considerable inroad into your muscular strength and, thus, have done all that you can to ensure maximal growth stimulation.

For maximum growth stimulation, train as hard as possible. This can happen only when the muscles are trained in a fashion sufficiently taxing all three strength levels in a given set.

THE PROCESS OF ADAPTATION

There is no getting around the fact that making a set last upwards of ninety seconds moves it squarely into the domain of aerobic exercise—which promotes little or no gain in muscle size and strength. Then there's the problem that adding more sets to your workout would demand a reduction in weight and therefore intensity. After one intense set of Max Contraction, most of the fibers will have been fired and therefore depleted sufficiently to prevent another truly maximum contraction. The good news is that with Omega Sets you do *not* have to reduce the weight against which you are making your muscles contract, and, depending on your neuromuscular efficiency, you may be able to recruit more fibers. Omega Sets may not recruit a *lot* more fibers, since most of them will already have been recruited via the heavy resistance (the principle of orderly recruitment) and the position of Max Contraction that you have already been employing in your Max Contraction workouts, but they will definitely recruit more fibers than would have been recruited had you opted to leave this final strength level untapped.

The Omega Set is ultra-intense, so intense that your muscles can withstand only one to six seconds of exposure to it, but it is also the best growth-stimulating set you can perform to make your muscles bigger and stronger. Also, because an Omega Set lasts just one to six seconds, the set is terminated well before the aerobic pathways kick in, thus ensuring that all of the training stress is

When spotting a trainee on a machine such as the Nautilus pullover, the spotters should stand on opposite sides of the machine (left). As the trainee begins to lose the contraction (center), both spotters should take hold of the movement arms and push them back into the Max Contraction position, at which point the trainee should attempt another Max Contraction, with the spotters ready to take the resistance when he once again can no longer sustain the contraction (right).

directed toward making your muscles bigger and stronger—not toward affecting a change in your muscular endurance.

Given that the Omega Set is so brief, it is, in effect, a series of mini Max Contractions. Your first Max Contraction set lasts one-quarter of a second and is followed immediately by three more such contractions, with the same resistance and lasting one-quarter of a second each. The stimulation and the results it produces are truly "advanced," and it is recommended that *only* advanced trainees employ this revolutionary protocol.

7

The Split Routine

When training with an ultra-intense protocol such as the Omega Set, an advanced bodybuilder will be unable to do justice to more than four sets in a workout. Anything more than this would require that the bodybuilder pace himself, which would result in a submaximal effort and reduced progress.

Training the whole body at each workout is rightly considered a superior approach for beginners, intermediates, and even those in the early advanced stages of training, owing to the "indirect effect" of exercise (see pages 85 and 147 of *Max Contraction Training* for further detail). A whole-body routine creates an accumulative demand of a very high order on the central nervous system, which, over time, responds by enlarging on the body's existing store of muscle mass. However, a problem assails the advanced bodybuilder on such a program as the intensity mounts in severity: the heavier weights and greater energy required to produce the force needed to sustain muscular contraction against these weights cause the advanced bodybuilder to run out of gas long before he is able to perform all of the exercises in the whole-body routine. The result is submaximal loading and stimulation of the remaining bodyparts.

Given the demands of ultra-intense training techniques such as Max Contraction and the Omega Set, the advanced trainee should not—indeed, cannot—continue with a whole-body workout routine. It's not that the body recognizes differences in workout structuring; rather, the body responds to energy demands. As the trainee grows stronger, eleven sets is simply too much work to perform at a high level of intensity. Whereas training the legs during a whole-body workout might have initially drained the body of only thirty units of energy, by the time the weights mount up, these same leg exercises can now require on the order of seventy units of energy to perform in high-intensity fashion. The remaining muscle groups of the body likewise make greater energy demands as the weights mount up, with the result that the trainee is spent after five exercises, too fatigued to train the remaining bodyparts with the requisite intensity to stimulate any additional growth in these bodyparts.

The simple solution is to train the body in thirds, with one third trained at each workout. One workout is performed, followed by seven days of rest, at which point the next third of the body is trained, followed by another seven days of rest, and finally, the last third of the body is trained, followed by another seven days of rest. The cycle is then repeated. The total amount of sets performed at each workout, along with the attendant energy drain, is diminished by two-thirds. In this way, the trainee is able to invest the highest possible intensity of effort in each and every set.

Once a trainee can be considered "advanced" and nearing the end of his genetic potential, having reached a point where he experiences exhaustion almost immediately (owing to the intensity of his muscular contractions and energy output), the split routine is recommended. Here, then, is a three-way split routine for Omega Set training that has produced excellent results for advanced trainees:

WORKOUT 1

Chest, Shoulders, and Triceps

1. **Pec deck—Max Contraction™ set**
   (1 to 6 seconds)
2. **Lateral raises—Max Contraction set**
   (1 to 6 seconds)
3. **Rear lateral raises—Max Contraction set**
   (1 to 6 seconds)
4. **Max Straps kickbacks—Max Contraction set**
   (1 to 6 seconds)

Take 7–10 days off.

WORKOUT 2

Upper Back, Traps, Lower Back, and Biceps

1. **Max Straps™ pulldowns—Max Contraction set**
   (1 to 6 seconds)
2. **Nautilus shrugs—Max Contraction set**
   (1 to 6 seconds)
3. **Lower back machine—Max Contraction set**
   (1 to 6 seconds)
4. **Close-grip chins—Max Contraction set**
   (1 to 6 seconds)

Take 7–10 days off.

WORKOUT 3

Legs and Abs

1. **Nautilus hip and back machine—Max Contraction™ set**
   (1 to 6 seconds)
2. **Leg extensions—Max Contraction set**
   (1 to 6 seconds)
3. **Leg curls—Max Contraction set**
   (1 to 6 seconds)
4. **Standing calf raises—Max Contraction set**
   (1 to 6 seconds)
5. **Max Straps crunches (optional)**

Take 7–10 days off.

Repeat the three-workout cycle with conventional Max Contraction™ training (use Omega Sets™ every other cycle).

Exercise Performance

WORKOUT 1

Chest, Shoulders, and Triceps

1. Pec deck—Max Contraction set
(1 to 6 seconds).
Emphasis: pectorals (1 set).

Adjust the height of the seat so that when you sit down and place your upper arms on the pads, they are parallel to the floor. Have your training partners pull the movement arms into the fully contracted position and slowly release the arms into your control. Sustain your initial contraction for 1 to 6 seconds. When you can no longer sustain the contraction and the movement arms come apart, your training partners should immediately push the movement arms back together and release the arms into your control again. When you can no longer sustain this contraction and the movement arms have again separated, have your training partners return the movement arms to the fully contracted position once again. Repeat this for two more such contractions. When the final contraction is completed, have your training partners take hold of the movement arms and let them return them while you exit the machine.

2. Lateral raises—Max Contraction set
(1 to 6 seconds).
Emphasis: lateral head of the deltoid.

This exercise can likewise be performed on either a shoulder-raise machine such as Nautilus or with a pair of dumbbells. If performing the exercise on a Nautilus machine, adjust the seat so that the shoulder joints are in line with axis of the cam. Fasten seat belt and pull hands back until knuckles touch pads. Lead with elbows and raise both arms (again, with the assistance of two training partners) until parallel with floor. Sustain this full contraction for 1 to 6 seconds. When you can no longer sustain the contraction and


Pec deck

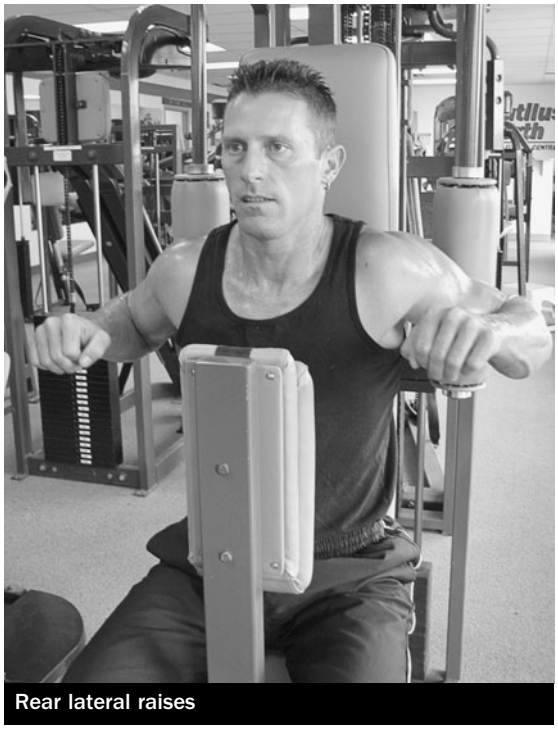

Lateral raises

the movement arms begin to descend, your training partners should immediately push the movement arms up to the top fully contracted position and release the arms into your control again. When you can no longer sustain this contraction and the movement arms have again begun to descend, have your training partners return the movement arms to the fully contracted position once again. Repeat this for two more such contractions. When the final contraction is completed, have your training partners take hold of the movement arms and let them return them while you exit the machine.

3. Rear lateral raises—Max Contraction set

(1 to 6 seconds).

Emphasis: rear head of the deltoid.



Rear lateral raises

My preference in terms of equipment for performing this exercise is older generation Nautilus machines. If you have access to such a machine, the best results can be obtained by performing the exercise as follows. Sit down in the Nautilus Rowing Torso machine (rear delt machine) with your back toward the weight stack. Place your arms between the pads and have your two training partners pull the movement arms back until your elbows are at least parallel with your shoulders. Sustain this fully contracted position for 1 to 6 seconds. When you can no longer sustain the contraction, have your training partners pull the movement arms back into the fully contracted position again and attempt to sustain the contraction for at least another one or two seconds. When you can no longer sustain this contraction, again have your training partners return the movement arms back to the fully contracted position and attempt to sustain the contraction for at least another second. Have your training partners repeat this procedure twice more before letting them take the movement arms from you, allowing you to exit the machine.

4. Max Straps kickbacks—Max Contraction set

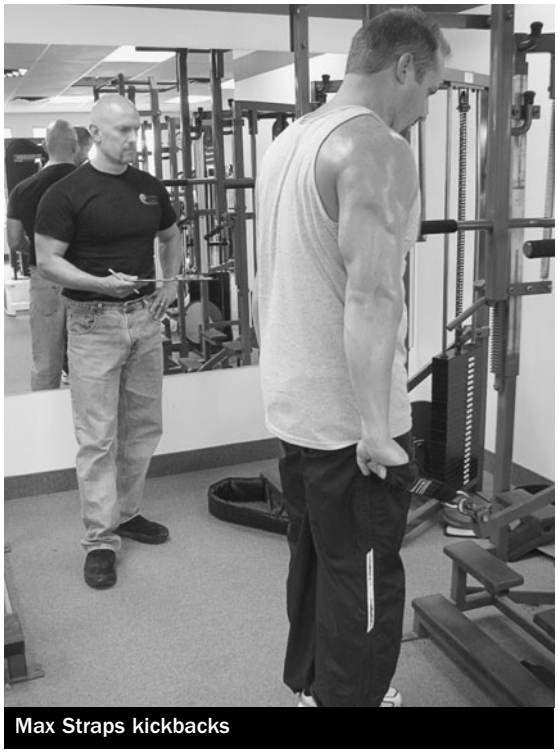
(1 to 6 seconds).

Emphasis: triceps.

With the ring of the Max Straps attached to the hook at the end of a floor pulley,

place your hands through the Max Straps so that the pads are across your wrists. Maintaining an erect position, have your training partners help you to draw your arms behind you until they are as far behind your torso as you can move and your arms are fully locked out. Sustain this maximum contraction for 1 to 6 seconds. When you can no longer sustain this contraction, have your training partners help you to return the straps back to the fully contracted position and attempt to sustain the contraction for at least another second. Have your training partners repeat this procedure three more times before letting them take the straps from you.

Take 7 to 10 days off.



Max Straps kickbacks

WORKOUT 2

Upper Back, Traps, Lower Back, and Biceps

1. Max Straps pulldowns—Max Contraction set
(1 to 6 seconds).
Emphasis: lower lats, upper back, chest, abdominals (1 set).

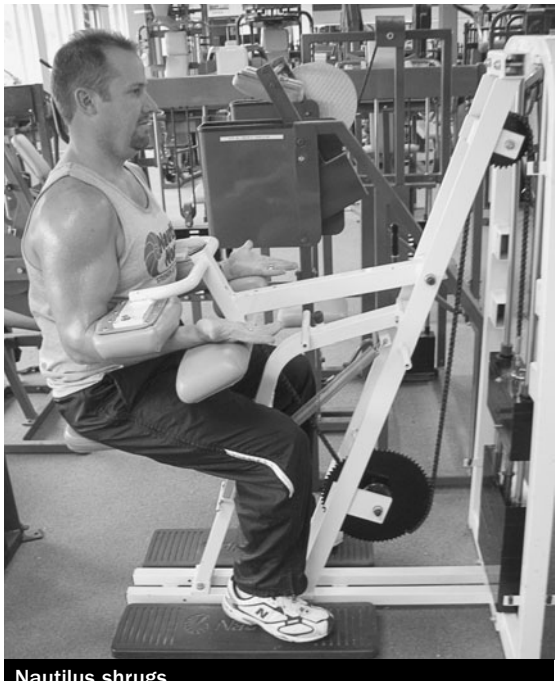
Position yourself in a lat pulldown machine and insert your arms through the Max Straps so that the bottom (the padded) portions of the straps are over the ends of your upper arms (nearest the elbow joint) and your hands are resting against the side straps. Don't close your hands on the straps, as this will unnecessarily involve and fatigue the forearm muscles and (to a lesser extent) the biceps. Have your training partners pull the straps down until your elbows are just to the sides of your ribs. Sustain this full contraction for 1 to 6 seconds. When you can no longer sustain this contraction,

Max Straps pulldowns

have your training partners pull the straps back down to the fully contracted position and attempt to sustain the contraction for another second or two. Repeat for two more sequences and then exit the pull-down machine.

2. Nautilus shrugs—Max Contraction set
(1 to 6 seconds).
Emphasis: trapezius.

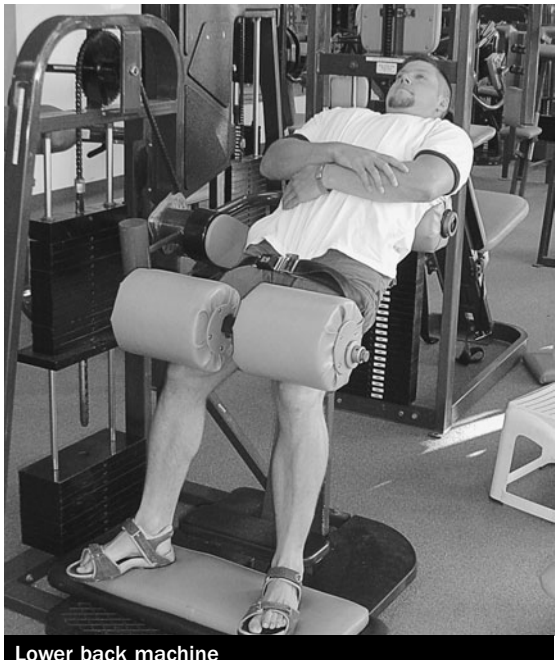
Sit down on the seat of the Nautilus shrug machine and place your forearms between the pads. Keep your palms open with the fingers pointed toward the floor. Have your training partner (or partners, as the weights will mount up quickly on this exercise) lift the movement arms until your shoulders have been raised as high as possible. Sustain this full contraction making sure that you are not leaning back or pushing with your feet. When you can no longer sustain this contraction and the movement arm begins to descend, your training partners should take hold of the movement arm and raise it back to the fully contracted position for you. Attempt to sustain another contraction for at least 1 to 2 seconds. When the movement arm again begins to descend, your training partners should lift it back again to the fully contracted position and ease it into your control, where you will attempt to sustain another contraction for 1 to 2 seconds. As you fatigue and the movement arm again descends, your training partners will lift it back to the fully contracted position again, whereupon you will attempt another second or two of contraction. As the movement arm again begins to descend, have your training partners raise it back up one more time to the fully contracted position and attempt to contract against the resistance for a final second or two, then let your training partners take the movement arm from you and exit the machine.


Nautilus shrugs

3. Lower back machine—Max Contraction set
(1 to 6 seconds).
Emphasis: upper back.

Enter the lower back machine by straddling the seat bottom. Place your feet firmly on the platform or (if your legs are shorter) step and sit forward in the seat, making sure that your upper back is

underneath the back pad. Stabilize your lower body by moving your thighs under the roller pads and adjust the thigh pads until your thighs are stabilized. Fasten the seat belt across your thighs and interlace your fingers across your waist. With the help of your training partners move your torso backward smoothly and slowly until it is in line with your thighs (do not try to arch back excessively) and sustain this fully contracted position for 1 to 6 seconds. When you can no longer sustain this contraction and the movement arm begins to descend, your training partners should take hold of the movement arm and raise it back to the fully contracted position for you. Attempt to sustain another contraction for at least 1 to 2 seconds. When the movement arm again begins to descend, your training partners should lift it back again to the fully contracted position and ease it into your control, where you will attempt to sustain another contraction for 1 to 2 seconds. As you fatigue and the movement arm again descends, your training partners will lift it back to the fully contracted position again, whereupon you will attempt another second or two of contraction. As the movement arm again begins to descend, have your training partners raise it back up one more time to the fully contracted position and attempt to contract against the resistance for a final second or two, then let your training partners take the movement arm from you and exit the machine.



Lower back machine

4. **Close-grip chins—Max Contraction set** (1 to 6 seconds).
Emphasis: biceps.

Close-grip chins

Begin by standing on a chair (or climbing the stairs on a Nautilus Multi Exercise unit) and placing your hands on the chinning bar with an underhand palms-up grip. Assume a position where your chin is parallel with the top of the bar and your biceps are fully contracted. Now, slowly step off the chair until your biceps contract fully. Sustain this fully contracted position for 1 to 6 seconds. When you can no longer sustain this contraction and begin to descend, step back up the stairs (or the chair) until you are back in the position of full contraction, and attempt to sustain this contraction for another second or two. Repeat for three more series of such contractions.

Take 7 to 10 days off.

WORKOUT 3

Legs and Abs

1. Nautilus hip and back machine—Max Contraction set
(1 to 6 seconds).
Emphasis: gluteus maximus.

Lie faceup with both legs over the roller pads. Grasp the handles lightly and straighten your arms. The hip joint should now be aligned with the rotational axis of the cams. Fasten the seat belt so that the back may be arched at the completion of the movement. The belt should be snug, but not too tight. Have your training partners press the right and left roller pads towards the floor while you fully extend both legs. Once in the fully contracted position, make it a point to keep your legs straight and your knees together. Your toes should be pointed throughout the movement. Your partners should then slowly release the pads so that you have full control of the resistance. Sustain this fully contracted position for 1 to 6 seconds. When you can no longer sustain this contraction and the movement arms begin to descend, your training partners should take hold of the movement arms and push them back to the fully contracted position for you. Attempt to sustain another contraction for at least 1 to 2 seconds. When the movement arms again begin to descend, your training partners should push them back again to the fully contracted position and


Nautilus hip and back machine

ease them into your control, where you will attempt to sustain another contraction for 1 to 2 seconds. As you fatigue and the movement arms again descend, your training partners will push them back to the fully contracted position again, whereupon you will attempt another second or two of contraction. As the movement arms again begin to descend, your training partners should push them down one more time to the fully contracted position whereupon you will attempt to contract against the resistance for a final second or two, then let your training partners take the movement arms from you and exit the machine.

2. Leg extensions—Max Contraction set (1 to 6 seconds).
Emphasis: quadriceps.

Sit on a leg-extension machine and place your feet behind the roller pads so that your knees are snug against the seat. Keeping your head and shoulders straight, slowly straighten both legs with the help of your training partners until you reach the fully contracted position. Sustain this contraction for 1 to 6 seconds. When you can no longer sustain this contraction and the movement arm begins to descend, your training partners should take hold of the movement arm and raise it back to the fully contracted position for you. Attempt to sustain another contraction for at least 1 to 2 seconds. When the movement arm again begins to descend, your training partners should lift it back again to the fully contracted position and ease it into your control, where you will attempt to sustain another contraction for 1 to 2 seconds. As you fatigue and the movement arm descends once again, your training partners will lift it back to the fully contracted position again, whereupon you will attempt another second or two of contraction. As the movement arm begins its final descent, have your training partners raise it back up one more time to the fully contracted position and attempt to contract against the resistance for a final second or two, then let your training partners take the movement arm from you as you exit the machine.

Leg extensions

3. Leg curls—Max Contraction set
(1 to 6 seconds).
Emphasis: hamstrings.

Lie facedown on the leg-curl machine and place your feet under the roller pads with your knees just over the edge of the bench. With the help of your training partners slowly curl your lower legs up until they are almost touching your buttocks. Hold this maximum contraction for 1 to 6 seconds. When you can no longer sustain this contraction and the movement arm begins to descend, your training partners should take hold of the movement arm and raise it back to the fully contracted position for you. Attempt to sustain another contraction for at least 1 to 2 seconds. When the movement arm again begins to descend, your training partners should lift it back again to the fully contracted position and ease it into your control, where you will attempt to sustain another contraction for 1 to 2 seconds. As you fatigue and the movement arm again descends, your training partners will lift it back to the fully contracted position again, whereupon you will attempt another second or two of contraction. As the movement arm again begins to descend, have your training partners raise it back up one more time to the fully contracted position and attempt to contract against the resistance for a final second or two, then let your training partners take the movement arm from you and exit the machine.


Leg curls

4. Standing calf raises—Max Contraction set
(1 to 6 seconds).
Emphasis: gastrocnemius (calves).

Place your shoulders under the pads on a standing calf-raise machine. With the balls of your feet firmly on the platform, your training partners should help you to rise up on your toes until your calves are in a fully contracted position. Sustain this contraction for 1 to 6 seconds. As you


Standing calf raises

begin to descend, your training partners should take hold of the shoulder pads and push them back up, bringing you back into a position of full contraction. Attempt to sustain this fully contracted position for a second or two. Once you begin to lose control of the contraction and your heels start to descend, your training partners should once again push the shoulder pads upwards until you are back into a position of full contraction. Sustain this position for another second or two. Repeat this series two more times, then exit the machine.

5. Max Straps crunches (optional)
Emphasis: abdominals.

Attach the Max Straps to an overhead pulley (ideally on a lat pulldown machine that has a seat and knee pad). Sit down on the seat and place your arms through the Max Straps so that the pads are over the bends in your elbows. Lower your elbows down to a point and out to the sides so that the Max Strap is touching the back of your neck. With the help of your training partners slowly bend your torso over while drawing your elbows downwards until your elbows are almost touching your knees. Once you've hit the fully contracted position, sustain it for 1 to 6 seconds. As with the previous exercises, once you can no longer sustain the fully contracted position, have your partners take hold of the Max Straps and pull them back down so that you are once again in a position of full muscular contraction. Attempt to sustain this position for another 1 or 2 seconds. As you lose strength and the weights begin to pull you back, your training partners should step in once again and pull the straps down, allowing you to assume the fully contracted position once more, where you will attempt another second or two of contraction. Repeat this procedure for two more series, then exit the machine.


Max Straps crunches

Take 7 to 10 days off.

It is my opinion that the best equipment presently known to train in Omega Set style is old (preferably First Generation) Nautilus machines. However, this does not mean that other machines and certain free weight exer-

cises cannot be substituted with good results. The key is to train but once every seven days and to take each set to the point where you can no longer sustain the maximum contraction.

Omega Set Alternate Exercises

Quads: leg extensions
Hams: leg curls
Calves: donkey calf raise
Lats: pulldowns (using Max Straps)
Traps: shrugs
Delts: lateral raises
Pecs: pec deck
Triceps: dumbbell kickbacks
Biceps: flexed arm hang
Forearms: wrist curls
Abs: crunches

The correct performance of all of these exercises using non-Nautilus-equipment substitutes are fully described in *Max Contraction Training*. These exercises place a constant stress/tension on the target muscle groups from beginning to end and are, therefore, the most productive exercises possible owing to their extremely high intensity threshold.

Remember there are no repetitions involved in this program—you are to think only in terms of seconds. In a normal set of ten repetitions, the time frame is typically between forty-five and sixty seconds in length but the intensity level varies throughout the range of motion. In Omega Set training, the time frame is much briefer but the intensity is the highest possible throughout the entire duration of the set, thus allowing for greater growth stimulation to actually take place.

When commencing any exercise Omega Set style, make sure the resistance is moved with great care (so as not to damage any ligaments or muscle tissue) into the position of full muscular contraction, but instead of then lowering the weight, sustain this fully contracted position for a minimum of one to six seconds (or briefer) or until the contraction can no longer be held (whichever comes first).

If you can hold the resistance for more than six seconds, then it's too light and you should heavy it up by 5 percent for the next workout. If you can't hold the contraction for even one second, then it's too heavy and you should reduce the resistance by 5 percent until you can contract the muscle for a full one to six seconds.

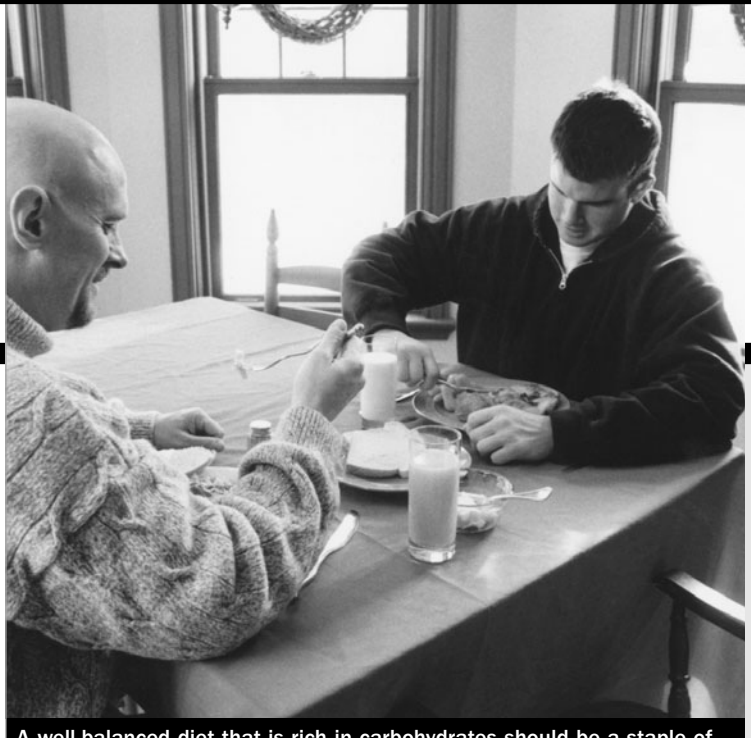
Some of you may require two training partners to lift the weight up into the fully contracted position for you. In this case, make sure they don't just "drop" the weight into your control, as the sudden shock to the joint of articulation could prove traumatic. Every movement must be done slowly, particularly the settling into the fully contracted position. You may notice that your target muscle group might begin to shake violently near the end of your first Omega Set, but that's fine. It's an indicator that your muscles are firing more and more

fibers to maintain the contraction, and the more they use, the greater the growth stimulation!

After an Omega Set workout, you will feel like your limbs are made of Jell-O owing to the high volume of activated muscle fibers. Based on the results of the Nautilus North Study, if you wish to reap maximum growth gains from this system, you must now rest completely (i.e., no other forms of strenuous exercise) until your next workout some seven (or more) days later. Eat a proper diet, get adequate rest, and train as hard as you possibly can on this program and you should realize the best gains of your body-building career!

8

Nutrition for Omega Set Training



A well-balanced diet that is rich in carbohydrates should be a staple of all Max Contraction trainees.

In *Max Contraction Training* I explained that Max Contraction is fueled predominantly by adenosine triphosphate, or ATP:

> The first one to six seconds of muscular contraction are fueled by ATP (adenosine triphosphate), which is a compound responsible for all bodily functions, from muscular contraction to thought. There is generally enough ATP within each muscle to sustain a contraction for up to three seconds. To reach six seconds of contraction, additional ATP must be created, which the body does by breaking creatine phosphate (or CP) down into its constituents of creatine and phosphate; the energy released from this breaking down of CP can take an ADP molecule (adenosine diphosphate) and attach another phosphate, thus creating a new ATP molecule. There is sufficient CP stored in the body to keep one's muscles in ATP for up to ten seconds of contraction—which is more than enough for Max Contraction exercise.[1]

Intense muscular contractions are fueled by sugar stored in the muscles as glycogen. "Muscle-stimulating" or "power" supplements that emphasize protein are misleading or even fraudulent.

All energy expenditure in the body involves ATP. One ATP phosphate radical splits off and leaves ADP. The original bond between the phosphate and the adenylitic acid is a potent, high-energy bond. When that bond is broken, the energy that is released causes the muscle to contract—the released energy is used to draw the actin filaments along the myosin filaments in muscle tissue by shortening the actomyosin bridge, which contracts the muscle.

When ADP and phosphate are separated, they must quickly be reunited to form ATP. Without some ATP present, muscles go into contracture, or cramps. Fortunately, phosphocreatine (creatine phosphate) also has high-energy phosphate bonds, and when it splits into creatine and phosphate, the energy released can reunite the phosphate with the ADP. To avert the danger of using up all of the phosphcreatine, the body calls on another substance in muscle, glycogen, which is a polymerized form of glucose and a great reservoir of quick energy. To tap into this reservoir, one of the phosphates attaches to the glucose in glycogen and causes it to separate. Now you have phosphoglucose.

Through further intermediate steps, phosphate and the sugar molecules interact. For every molecule of glucose that undergoes these breakdown steps, four batches of

energy are released, enough to change four ADPs back into ATP. One of these, though, is used to break down the sugar, which means for every molecule of sugar that you get at this stage, there is a net gain of only three such batches. This all happens in the absence of oxygen—hence the term "anaerobic."

From this bit of biology we can see that intense training, such as Max Contraction and the Omega Set, that results in the stimulation of muscle growth requires a special—though common—type of fuel. Intense muscular contractions are always fueled exclusively by sugar stored in the muscles as glycogen, a polymer of glucose. This is why "muscle-stimulating" or "power" supplements that emphasize protein are misleading or even downright fraudulent. Sugar is the key to building larger muscles. Without an adequate supply of it in the bloodstream, you cannot contract your muscles intensely enough to stimulate muscle growth. If sugar is not obtained through dietary carbohydrate, the body can obtain it from only two alternative sources:

1. Ingested protein
2. The protein in muscles

Through a complex process that takes place in the liver, protein derived from either of these two sources can be converted into glucose. Since the body cannot convert fats or liquids into the required sugar, it's wise for the advanced bodybuilder to spare his muscle (and muscle protein) by including generous quantities of carbohydrates in his daily diet. This is, in fact, why carbohydrates are referred to as "protein sparing": they literally spare protein from being used as fuel, thus allowing it to engage in its primary role of the repair and growth of tissues.

Carbohydrates, such as baked potatoes, may be the most important nutrient to the bodybuilder seeking to build bigger and stronger muscles.

In addition to providing the fuel for maximal muscular contractions, sugar is required by the brain and central nervous system to operate efficiently and effectively. As we've seen, training that is intense enough to induce muscle growth requires a lot of enthusiasm and motivation. These heightened levels are impossible to reach for someone on a diet low in sugar and carbohydrates.

The human brain derives almost all of its nutrition from sugar. If there is a shortage of it in the diet for any extended period, your

focus and motivation will suffer, and the drive and energy you usually invest in your workouts will be greatly diminished.

Considering their role in motivation and in fueling intense muscular contractions, carbohydrates may be the most important nutrient to the bodybuilder (despite what some faddists such as the late Dr. Atkins have opined). Notwithstanding this importance, it does not follow that you require a special "sugar" supplement for peak performance. The vast majority of reputable nutritional scientists, along with the Senate Subcommittee on Nutrition, agree that carbohydrates should account for 60 percent of our daily calorie intake. The remaining 40 percent should consist of 25 percent protein and 15 percent fats.

To build muscle, the first requisite is growth stimulation. The second is adequate recovery time. Only after these two requisites have been fulfilled does nutrition become a factor.

Protein is essentially a growth, repair, and maintenance substance and does not provide energy under ordinary circumstances. While protein is important in the advanced bodybuilder's diet, bear in mind that muscles are composed of more than 70 percent water. Muscular growth beyond normal levels is such a difficult and slow process that even a ten-pound gain a year is considerable—which means that our daily intake of protein need not exceed maintenance levels. Ten pounds of muscle gained a year translates to a gain of only twelve grams per day, or less than half an ounce—and remember, 70 percent of that "gain" is water!

Force-feeding yourself supplements that emphasize a macro- or micronutrient does not result in increased utilization of these substances for building muscle, as pointed out in *Max Contraction Training*. In order to build muscle, the first requisite is growth stimulation. The second requisite is adequate recovery time. Only after these two requisites have been fulfilled does nutrition become a factor. So, train hard, eat a well-balanced diet, and get adequate rest, and you will grow.

Fats, the last of the macronutrients, should comprise the remaining 15 percent of our daily calorie intake. Fats are important for energy, for maintaining a healthy nervous system, and for providing a medium for the metabolism of certain vitamins. Ingesting too many fats, however, makes it hard to control calorie intake. One gram of fat contains nine calories; one gram of carbohydrate or protein contains only four calories. Also, excess consumption of fats, both saturated and polyunsaturated, has been implicated in cardiovascular disease as well as in certain

cancers, including cancer of the colon and the breast. Include fats in your daily diet, but make sure the amount doesn't exceed the recommended percentage.

The micronutrients—vitamins and minerals—are essential in a well-balanced diet because they make the utilization of the macronutrients possible. If you're eating a well-balanced diet every day, you should be getting all the vitamins and minerals you need to maintain health and provide for growth. If you're not eating a well-balanced diet, for whatever reason, an all-round multivitamin/mineral supplement will help ensure that you are not deficient in any area.

Remember that consuming excessive quantities of these nutrients is not helpful to the advanced bodybuilder. Your body has specific daily needs for all the various nutrients, and consuming an amount in excess of need is not only wasted but also can actually disrupt bodily function.

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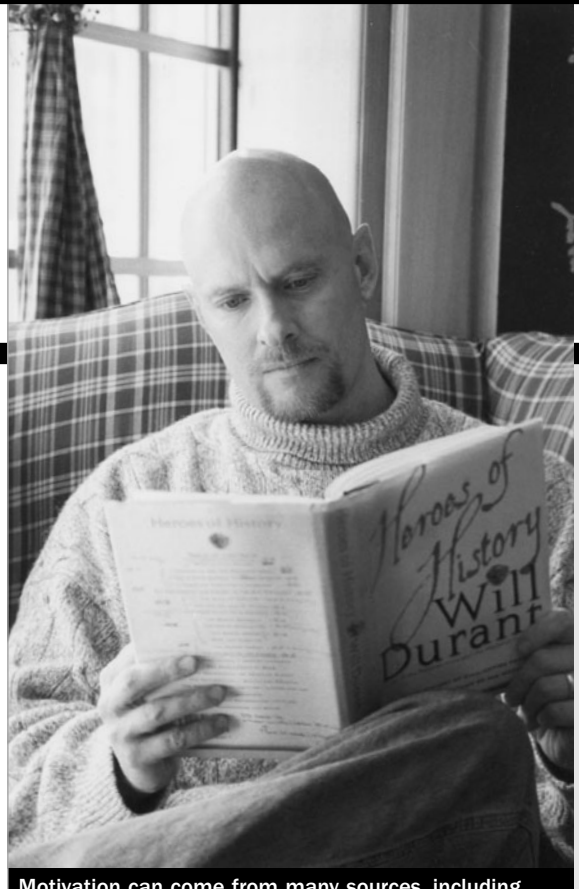
Motivational Tips for Omega Set Training

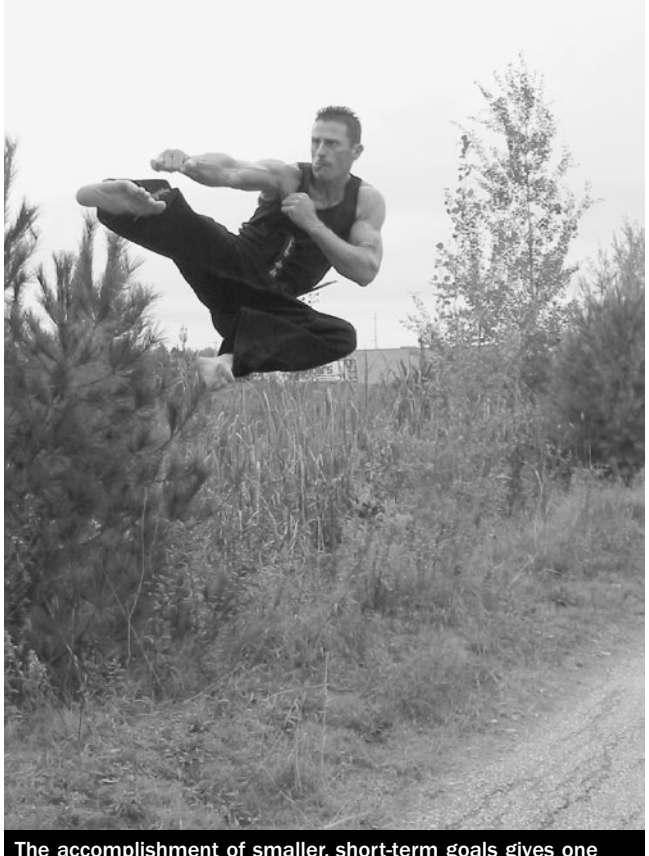


Motivation can come from many sources, including music and sporting events, photos of well-muscled individuals in magazines, and written accounts of the lives and accomplishments of outstanding men and women throughout history.

The high-intensity muscular contractions of Omega Set training place extraordinary demands on the body's resources and reserves. While Max Contraction Training is very productive, it's also very difficult. Ordinarily, the kind of maximum effort that leads to inordinate levels of size and strength is avoided whenever possible and is witnessed only in situations of dire emergency or, sometimes, in athletic competition. As Mike Mentzer has emphasized, under normal circumstances the mind will balk at the prospect of exerting such effort, because the action could be life threatening if prolonged and because it creates extreme discomfort, including general irritability and light-headedness as well as deep, searing pain in the working muscle. Only a highly motivated individual with the requisite degree of physical and mental courage will engage in Omega Set training.

Dr. Arthur Steinhaus, as cited earlier, conducted long-term research into the factors that modify the expression of human strength. While he found that certain catalysts—from drugs to gunshots—could enhance and suppress the full expression of human strength, he also reported that one test subject was able to voluntarily contract his muscles at such a high level that none of the other factors could have any positive or negative effect on his performance. It's probably not surprising that the individual in question was a weight lifter. After years of subjecting himself to intense training, this subject had so conditioned himself that all that was required for a peak performance was for him to be presented with the opportunity. This incidence speaks volumes about the power of motivation that exists within each of us—and about the effort of will necessary to realize it.

People have used countless ways over the years to develop sufficient motivational skills. Because everyone's psyche is unique, each of us must remove our own barriers of inhibition that impede us from progressing from where we are now to where we wish to



The accomplishment of smaller, short-term goals gives one confidence to attempt bigger, long-range goals. In martial arts, the confidence gained from learning how to perform the basic techniques motivates the martial artist to attempt the more spectacular and complicated techniques as he progresses.

be. One method that many have employed with success is short-term goal setting. Formulating strong mental goals can give your training some direction or purpose, while short-term goal setting can give you the confidence needed to proceed. Arnold Schwarzenegger is an example of someone who fully understands this approach, as the following excerpt from a dialogue I had with him in 1995 reveals:

Our muscles provide the vehicle through which our will expresses itself.

JOHN: As you know, martial artists have always stressed the need for having strong mental goals, and these are things, as I understand, that you came to your own conclusions about years ago.

ARNOLD: That's right.

JOHN: How did you come to believe in this method of goal achievement?

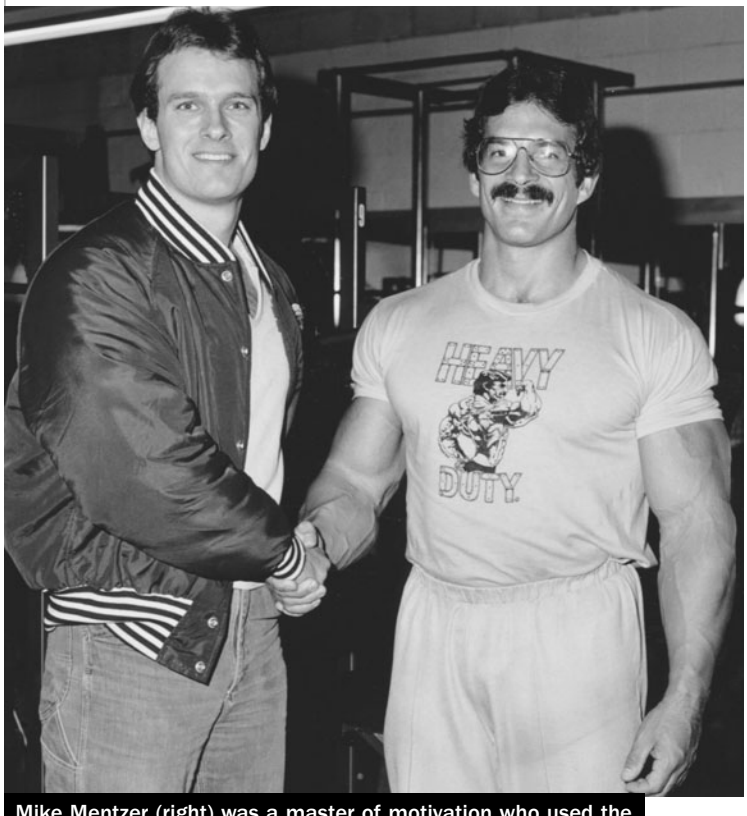
ARNOLD: Well, I just knew that the whole idea of achieving your goals starts in your mind. You first have to dream it; you first have to see it or visualize it. Then, when you can visualize it, you can go after it, and you can accomplish it and turn it into reality. But if you have no vision, then what do you go after? There's nothing to go after! I mean, I always use the analogy that you can have the best ship in the world, but if the captain doesn't know where to go, it's just going to drift around.

JOHN: Right.

ARNOLD: This is why in sports, the coaches and the trainers all tell you, "This is your goal—you have to break through this piece of wood." Or, "You have to get this kind of a style to accomplish your goals in fighting," and all this. "This is the belt that you go after—the brown belt, the black belt." There's always these little goals, and when you accomplish them, then you know it was through hard work. And then that message that you learn, and that thing that you learn [from accomplishing these tasks], of course, you can then apply to anything you do in life.

Our muscles provide the vehicle through which our will expresses itself. Even if you tend to develop easily and already have large muscles, you will never develop fully unless your will is strengthened as well. Stimulating a strong sense of will is needed if your workouts are to be productive and if you are to overcome certain mental barriers elucidated earlier that can prevent you from developing your muscles to their fullest potential. One way to stimulate the will is to draw inspiration from stories of people who had to rise above formidable opposition to achieve success.

I personally am inspired in this way by accounts of such direct role models as Mike Mentzer, Arthur Jones, and Bruce Lee, as well as other outstanding figures who have



Mike Mentzer (right) was a master of motivation who used the music of Wagner and Led Zeppelin as well as the novels of Ayn Rand to fuel his will to become one of the greatest bodybuilders in the world. Here, Mike and I share a moment after a seminar he gave in 1981.

applied their will to intellectual issues, such as Aristotle, Leonard Peikoff, Will Durant, Ayn Rand, Bertrand Russell, Socrates, Krishnamurti, and Friedrich Nietzsche. For some, the life of a compelling character in a work of fiction fans the flames of their will to achieve. Mike Mentzer, one of the most massively muscled bodybuilders of all time, is an example. When he was in serious training, he would read authors such as Jack London and Ayn Rand, who wrote of men's struggle with nature and the great efforts of will they exerted in their battles. Mike particularly enjoyed Rand's character of Howard Roark from the novel *The Fountainhead*, which depicts the struggles—and ultimate triumph—of an intransigent architect against the forces of mediocrity that conspired to keep him down.

Inspiring music can likewise help to fuel one's will to achieve. The type of music is not as important as its effect on your psyche. Does it fill you with passion and energy, or does it calm you and sap your motivation? Mike Mentzer used to listen to different types of music before and after his workouts. Before all of his serious Heavy Duty workouts, he would listen to some form of "high-intensity" music. In *High-Intensity Training the Mike Mentzer Way* he explained: "This generally rouses me and readies me for the effort I must exert in the gym. Certain rock music, such as that of Led Zeppelin, or classical music, usually Wagner or Tchaikovsky, really psyches me up as I play it in my car on the way to gym."

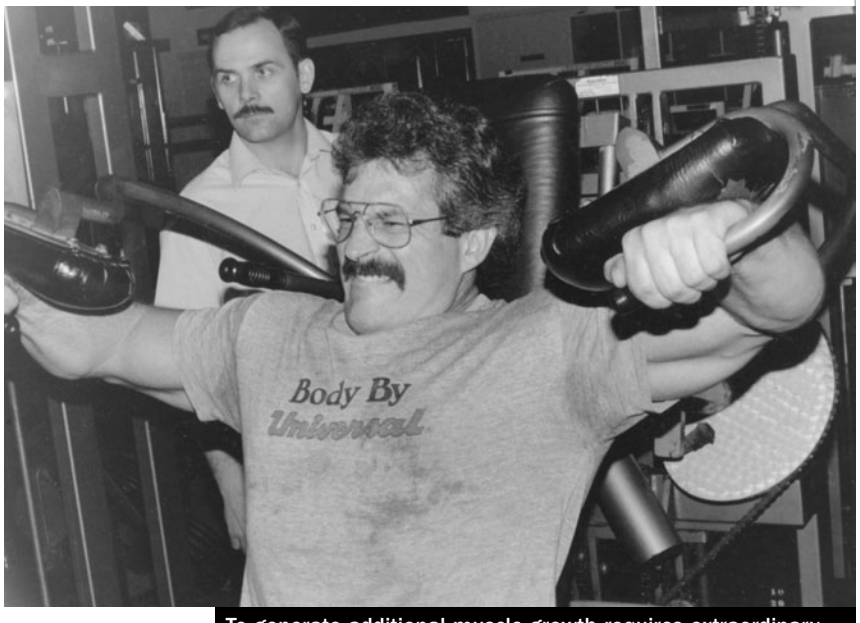
After his workout, during the start of his "recovery" period, when his muscles were repairing themselves and growing stronger, he would play softer music such as the brilliant piano pieces of George Winston, which evoke moods of tranquility and relaxation.

All the same, as exemplified by the weight lifter in the Steinhaus experiments, the best way to stimulate the will to achieve and to increase personal motivation is to actually make the effort. Once you have successfully pushed yourself closer to 100 percent intensity of effort and experienced

the exhilaration that follows such effort, it will be easier for you to do it again the next time around.

I'll conclude this subject with the encouraging words of Mike Mentzer, who was (and remains) the most shining example of an individual who forged his body in the fire of his will:

> All of us possess the potential for such exertion; all that is needed is something to carry us over the dam of our mental barriers. The best way is to merely make the extra effort of will and carry out the act.



To generate additional muscle growth requires extraordinary effort during one's training. Bodybuilding champions such as Mike Mentzer not only understood this fact but also applied it.

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Results

Joe Ross, shown in midstride in national competition, was a Canadian 400-meter hurdles champion.

In my personal consultation business, as well as at my fitness center, we have incorporated the Omega Set™ into the workouts of dozens of clients and produced tremendous results in size and strength. Perhaps the most dramatic increase involved two factory workers in Bracebridge, Ontario, each of whom gained 30 pounds of muscle in one year while on the program—one gained 18 pounds of muscle in the first month. And while I recognize that testimonials do not constitute evidence, sometimes they nevertheless serve as motivational fuel as to what an individual can attain with the correct methodology.

GETTING STRONGER AND LEANER TRAINING ONCE A WEEK: JOE ROSS

At 5′11″ and 175 pounds with a bodyfat level of 6 percent, Joe Ross is the embodiment of what proper scientific training can produce in terms of getting stronger and leaner. At age forty-one, Joe is the envy of most members of his gym. I've known Joe for more than thirty years: his older brother, Jon, and I have been best friends since kindergarten, and I've had the opportunity to watch this exceptional individual blossom into one of Canada's premier athletes. Joe's background includes being a dominant figure in the Canadian national track-and-field team, in addition to winning both the provincial and national championships in the 400-meter hurdles. He also was All-Canadian hurdles champion in college and then went on to join the national team in the Olympic sport of bobsledding. He is currently a personal fitness trainer and a professional golf coach in Richmond Hill, Ontario.

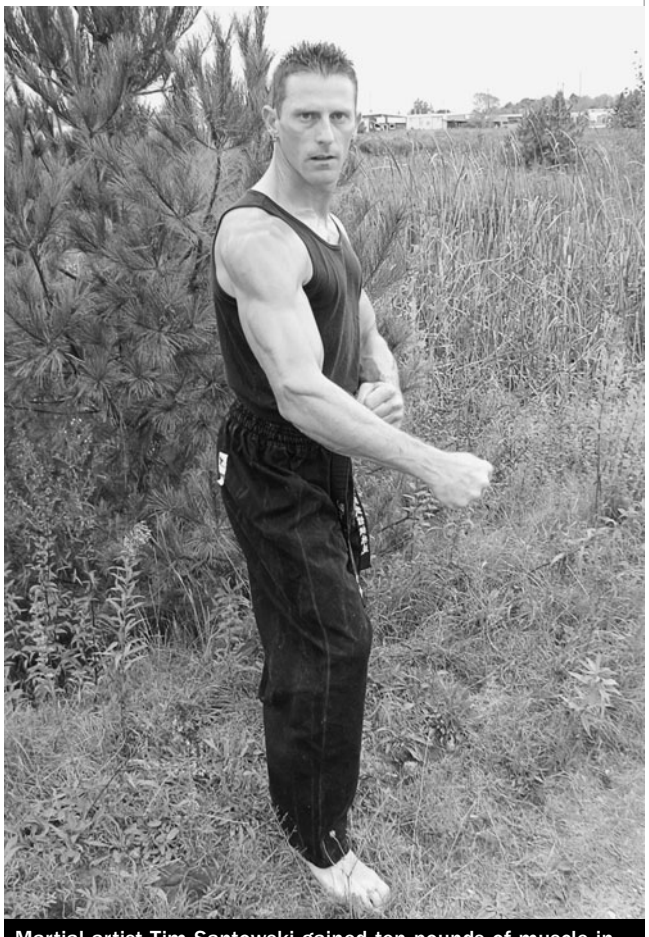
No stranger to demanding exercise, Joe has worked out with all kinds of training programs, and so I knew it could be a challenge for Max Contraction to have a significant impact on his already well-settled physical condition. According to Joe, it did:

> After using Max Contraction Training along with the Max Straps, I found not only did it increase my overall strength level, but also it has a pronounced effect on my cardiovascular system. It would normally take me an hour and a half of training—running, weights, stretching, and so on—to reach the same level of fatigue that I got in what was roughly a fifteen-minute Max Contraction workout. You can see John training me in the *Max Contraction Training* DVD, and as you can tell from that footage, it was a demanding workout—so much so that after I first used the method in 2003, I've continued to use it. Being a personal trainer, a professional golf coach, and full-time father, I don't have the luxury of multiple hours to spend in a gym each week. Max Contraction helps to keep me strong, muscular, and fit with an absolute minimum amount of time. Given my genetics and my track background, I find that I

recover fairly quickly from exercise, but after a Max Contraction workout, I'm looking at the better part of a week before I'm ready to train again. I also use the method with many of my personal training clients who are likewise pressed for time or who want to build maximum strength and size in minimum time—which, in this day and age, is more common than not. It even has benefits outside of simply being bigger and stronger. One thing I've noticed is that my increased strength from Max Contraction Training has translated into longer drives off the tee—and that sure puts a smile on my face!

TEN POUNDS IN ONE MONTH: TIM SANTOWSKI

Tim Santowski has the kind of muscular physique that Bruce Lee would have envied. At 5'10", 170 pounds, and less than 11 percent bodyfat, Tim turns heads whenever he walks into Nautilus North Strength & Fitness Centre. In his mid-thirties, Tim is a First Dan black belt in shorin-ryu karate/kung fu. As a martial artist, Tim is always on the lookout for training methods that will enhance his techniques, speed, stamina, and power. "Muscle is the delivery system of martial art techniques, so being stronger, having more muscle, is very helpful in what I do," says Tim. Shortly after Tim started training at Nautilus North, he wanted to try the Max Contraction Training system. Here is his testimony:



Martial artist Tim Santowski gained ten pounds of muscle in one month using the Max Contraction system.

In one month of Max Contraction Training I gained a lot more strength and improved in my martial arts skills—punches and kicks. I even found that I could hold stances longer. The training method is so intense that even after a five-minute workout, I was beat. But the results happened so quickly, I was stunned! When I started training with Max Contraction, I weighed 160 pounds. One month later I went to my doctor for my annual physical, and when I stepped on the physician's scale, I weighed 170 pounds! I was 10 pounds heavier—all muscle—after only one

month of Max Contraction Training! John had me training on a three-way split routine, performing one workout every seven days, and explained to me the importance of recovery ability in the muscle-building process. Max Contraction has not only made my muscles bigger and stronger—my arms and shoulders just ballooned on this system—but also improved my endurance for martial arts training. I'm able to grapple longer and with more power, in addition to having increased speed and stamina in my sparring. This is without a doubt *the* best strength- and size-building system I've ever used. I used to train a lot—and a lot more frequently—on things like Bowflex and free weights, but I've never made gains like I have on Max Contraction.

GROWING LEANER AND BUILDING MUSCLE—AT AGE FIFTY: BOB REINER

I receive many e-mails and letters from people who want to put on muscle but worry that they are "too old." My reply is always that age is a "nonissue." I have known and have trained many older people who have gained muscle—even past the age of seventy-six. As a matter of fact, the senior population is probably the one that stands to gain the most from Max Contraction Training. Research has validated the superior benefits of strength training for seniors—including, in some cases, no longer having to use a wheelchair. Among other benefits are enhanced posture, better respiration, lower blood pressure, and stronger bones.

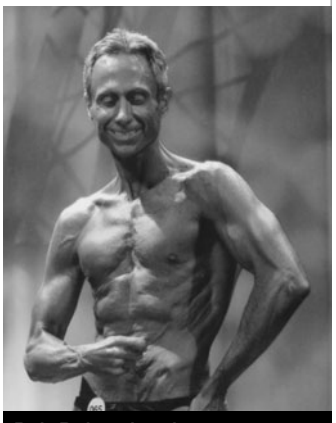
It's ironic that the seniors tend to grasp this point readily, while the younger generation, the group fifty years and up, seem to believe that building more muscle isn't possible at their "advanced" age. I'm pleased to point to the example of Max Contraction trainee Bob Reiner, who recently placed fourth in the NPA Pro Classic Bodybuilding Championship, as to just what is possible for those fifty-plus-year-olds who haven't given up on their quest for additional muscle size and strength. At fifty-two, Bob is rewriting many of the rules of bodybuilding competition and credits the Max Contraction system with his success. Bob has gained more than twelve pounds of pure muscle and substantially increased his overall strength in two years of Max Contraction Training with once-a-week workouts. He accomplished all this after having gained "zero" strength and muscle with conventional training protocols during the three previous years. Here, in his words, is his story:

I had trained with high-intensity training for many years with good progress, but I could tell I was reaching my peak and/or the limits of my genetic potential due to my age and my inability to progressively increase the intensity level of my workouts. When I began working with John Little in 2003, I became intrigued by his Max Contraction articles in *Ironman* magazine and wondered if this particular

protocol might be just the leap in intensity I needed to further my gains and continue my progress.

John started me on whole-body workouts with thirty-second holds, and I began to gain muscle once again as the intensity of the workouts with Max Contraction really put that added stress on my body to make it adapt to become bigger and stronger. I gained approximately 6 pounds of muscle (all natural, I might add) the first year on the protocol and almost another 6 pounds the second year. In the process, John increased my weight and reduced my hold time in the Max Contracted position from thirty seconds down to fifteen seconds—and then down to one to six seconds of hold per exercise. I was handling so much weight at this point that I was unable to complete a whole-body workout, and I began to divide my workouts, so that I trained only upper body one week and lower body the next (still at one training session per week).

Unfortunately, I soon began to adapt to this protocol as well, and my gains again slowed. What next? During our next phone consultation, John mentioned the new Omega Set style of Max Contraction he was experimenting with. Oh Lord! I thought, this will really be cruel. John is either one of the most brilliant exercise physiologists in the world or the sickest guy on the planet, as he has come up with *the* most intense exercises known to mankind. This time he wanted me to put each exercise in the contracted position and use just enough weight so that I could sustain the hold for only a quarter of a second, and then do four consecutive holds of a quarter second in a row, to equal one second. Wow! Talk about another leap in intensity!



Bob Reiner has been averaging a six-pound gain of muscle per year for the past two years—at age fifty-two!—using Max Contraction Training.

After using this protocol with leg extensions of close to 450 pounds (I weigh only 165), I was shot for the rest of the week. I'm not exaggerating! The intensity level was again another level higher, and it forced my body to once again adapt by growing bigger and stronger. This time the workouts were so intense that I could not work my entire upper body in one workout with sufficient intensity, because I was so drained after only three or four sets. As a result, I broke up my training sessions into three separate workouts, each one focusing on one or two muscle groups. I now trained legs by themselves, then back and chest, and finally, shoulders and arms. As before, I trained no more than once a week, so that each muscle group was trained no more than once every three weeks. Sometimes I would have to extend the "off" time between workouts

to once every eight to ten days, depending on how I felt physically. I performed no aerobics, which would be too much of a drain on my recovery ability, although my heart and lungs were receiving plenty of work from the intense muscular contractions I was performing. Besides, I wanted to focus all of my energy toward stimulating new muscle gains.

On John's advice I used the protocol right up to my next contest, the natural FAME World Championships in Toronto. While I placed out of the money (sixth), I was still ecstatic about the overall size and shape that this protocol enabled me to achieve and display, and I'm certain that it will bode well for me in my next contest and that I will place even higher. Keep in mind that this is a fifty-two-year-old natural bodybuilder speaking (and gaining still, on average, 4 pounds a year).

Omega Set training is the most brutal training I've ever experienced in my life—but it works! It is actually sick! And I sometimes wonder if there is not something wrong with me mentally for using the protocol. I'm now using the Omega protocol but working out only once every twelve to fourteen days—and gaining! I know it's hard to believe, but I just need that amount of time to recover and grow from such a brutal workout.

I guarantee you the hardest workout of your life if you have the fortitude to take on this protocol, but I also promise you the most significant gains of your bodybuilding career.

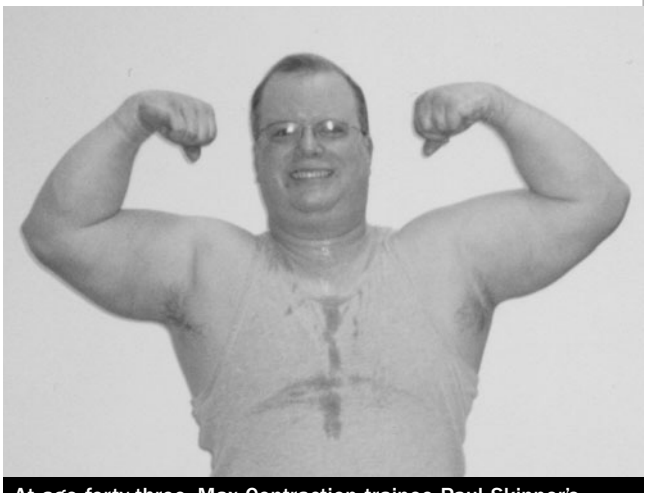
Shortly before we went to press, I received the following e-mail update from Bob Reiner:

> John, thanks to your advanced Omega Max Contraction protocol I was able to add four additional pounds to my frame over the last several months, which I'm convinced helped me to place second in my class at the recent MuscleMania World Championships held in Hollywood, California, on November the 19, 2005. Four pounds does not sound like very much, but when you consider the twenty plus years I have been training, and the fact that I have never taken any kind of illegal chemical to assist in my development, four pounds of lean muscle is fairly substantial. Also wanted to let you know that I got in very muscular, ripped condition without the aid of any aerobics whatsoever—I just gradually cut my calories until I reached peak condition. I also trained only once every seven to ten days (either legs, back/chest, or arms per work out). The photos taken at the prejudging and night show attest to the condition possible with the use of your methodology. Best regards, Bob Reiner

That's sixteen pounds of new muscle—and still growing bigger and stronger—at age fifty-three!

TRAINING EVERY FOURTEEN DAYS TO GAIN THIRTY-THREE POUNDS OF MUSCLE IN TWELVE MONTHS: PAUL SKINNER

Paul Skinner is a longtime advocate of Mike Mentzer's Heavy Duty Training System. He came to me as a client of Mike's who wanted to continue to employ certain exercises from Mike's routine, such as leg presses and dips, but also felt he needed a new technique to further boost muscle growth. I therefore created a program for Paul that would incorporate elements from Mike's protocol in addition to certain Max Contraction exercises and extended his recovery period—so that he was training just once every fourteen days. The following is his story:



At age forty-three, Max Contraction trainee Paul Skinner's bodyfat levels have "a tendency to creep upward," once going up to 28 percent. Using Omega Set™ in his high-intensity training program he was able to build eight pounds of muscle and lose bodyfat simultaneously over a period of just four months.

> I have been engaged in bodybuilding, on and off, for the last twenty-five years. I was familiar with and had employed high-intensity-training protocols during this time. Although I had fairly good genetics for bodybuilding, my bodyfat level had a tendency to creep upward if not carefully monitored. At one point my bodyfat got up to 28 percent—I weighed 226, at a height of 5′5″. This was in February of 2002. I remember it very well because my father had just died of a cardiac arrest. At the funeral, a doctor who was a friend of our family commented to my brother about how fat I had become. It was not very tactful, but unfortunately, it was true.
>
> In August of 2002 I began dieting to get in shape for three bodybuilding contests that were nine months away. I slowly dropped down to 165 pounds with a 28″ waistline. My bodyfat was 9.5 percent on May 3 and 8 of 2003, and I garnered fifth-, fourth-, and third-place trophies, respectively. Even though I had lost 61 pounds, unfortunately 13 pounds of it was muscle. Along with my dieting, I had made the mistake of incorporating daily aerobic exercise into my workout schedule, because my metabolism had slowed from the protracted dieting. In retrospect, I would have been in better shape by just reducing my calories, and eliminating the excessive aerobics and working out intensely, to maintain or increase my muscle mass. The larger one's muscles are, the more calories they require.
>
> In any event, after the last contest, I took a three-week layoff, and my weight

steadily rose back up to 174 pounds with a lean mass of 147 pounds (15 percent bodyfat). It was here that I switched to Mike Mentzer's Heavy Duty "consolidation routine" and quickly regained the 13 pounds of lost lean mass. So, by October 30, 2003, I weighed 196 pounds with a bodyfat of 16.8 percent and a lean body mass of 163 pounds. I continued on with the consolidation program and was pleased to add 4 pounds of lean muscle. On January 21, 2004, I weighed 205 pounds with 18.5 percent bodyfat and a lean body mass of 167 pounds. Given my ratio of lean muscle mass to height, along with the fact that I had tried virtually every high-intensity-training protocol in existence at this point, I accepted the fact that I had most likely reached the limits of my genetic potential for building muscle.

It was also during that month that I was referred to John Little for a phone consultation. I knew John as the coauthor of *High-Intensity Training the Mike Mentzer Way* and the author of a new book entitled *Max Contraction Training*. Up to that point I was performing three exercises once every seven days, one set per exercise, as Mike advised for his consolidation routine. Being an advanced trainee, I would arbitrarily apply static holds and negatives to increase the intensity of my workouts.

In that first consultation with John, I was impressed with his analytical mind and his ability to explain bodybuilding concepts in a clear and well-ordered fashion. I would ask tangential questions, and, instead of becoming ruffled, John would answer with increased enthusiasm. It was more like an animated discussion between peers than a consultation.

When John first proposed that I try Max Contraction, he asked me, "Are you up for something new?" "Yeah sure," I said, with an air of confidence. John introduced the concept of the Omega Set, performing isolation exercises such as the Nautilus pec deck and, with the help

Using Max Straps on exercises such as pulldowns enables trainees to thoroughly target the latissimus dorsi muscles and build more thickness in their upper back.

of a training partner, moving a maximum weight into the contracted position and then holding it there to barely allow for a one- to six-second contraction (or to failure). Every time I would disengage from the contracted position, my partner would push it back, and I would once again fight to keep in that position. This was repeated four times. Typically, on the third or fourth rep I could hold the weight in the contracted position for only two to three seconds. Next, I would perform a compound exercise such as Nautilus bench presses in "Omni style"—exhausting the positive, static, and negative aspects of the set. My workouts usually consisted of a total of two to four sets.

John suggested that I work out only once every two weeks, because it would take that long for my body to recover and for overcompensation to take place. In retrospect, three weeks might have allowed for even more growth; however, I was making good progress from workout to workout on the biweekly frequency. I must say that I was very sore. It was not the typical lactic acid buildup one usually experiences from a conventional workout, but soreness as though my muscles had been internally ripped by a saw blade. After working my legs, I could barely walk and thought I was going to have to buy one of those motor-operated vehicles or a wheelchair to get from place to place. Every muscle that I trained felt this way.

During that year, I used this protocol of Max Contraction (along with other select high-intensity-training techniques such as Omega Sets and Rest/Pause) as John instructed, and it resulted in the following size increases:

June 1, 2003	**June 2, 2004**
Weight: 174 lbs.	207 lbs.
Chest: 43″	46″
Neck: 16½″	17½″
Biceps: 16″	17½″
Waist: 33″	35½″
Thighs: 25″	27½″
Calves: 16″	17½″

At age forty-three, I made incredibly fast gains with Max Contraction. I had believed, at the time, that I was getting close to my genetic potential.

Moreover, and despite what I had been led to believe by others, the gains from "motionless" Max Contraction Training were not restricted to the range in which I was training (the position of full muscular contraction); I strengthened my muscles throughout a full range of motion. I noticed that there was a carryover effect from Max Contraction to exercises performed in a conventional manner. For example, when I started Max Contraction, I performed my first thigh extension with 160 pounds and worked up to 450 pounds. In turn, my leg press increased from 850 pounds for ten reps to 1,600 for ten reps. This also held true for

triceps: for my first Max Contraction with the Nautilus triceps machine, I used the entire stack with both arms for forty-five seconds, followed by five reps on the dip machine with 250 pounds. I finally worked up to the whole stack plus 50 pounds using *one arm* at a time for twenty seconds on the Nautilus triceps machine, followed by 420 pounds for six reps on the dip machine.

I started this new workout regime on January 21, 2004, and made some dramatic gains in size and strength. As I stated earlier, I worked out once every fourteen days. After four months I went from 205 pounds with 18.5 percent bodyfat to 207 pounds with 15 percent bodyfat. My lean body mass was 175 pounds. In a little over a four-month period, I gained 8 pounds of muscle and lost 3.5 percent bodyfat, versus the 4-pound gain on the consolidation routine alone.

I plan on continuing to consult with John Little to improve my physique and to prepare for future bodybuilding contests. The 33 pounds of gained/regained muscle in one year is a testimony that Max Contraction yields the best results in a shorter period. Holding a maximum weight in the contracted position allows one to stimulate the maximum amount of muscle fibers and therefore train at a true 100 percent effort.

PART 3

Advanced Considerations

The advanced bodybuilder, more than most, requires a thorough knowledge of how the body reacts to the stress of high-intensity exercise.

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Glycogen Theory

Muscle tissue comprises mostly water—not protein, as the supplement hucksters would have you believe.

Bodybuilders looking to increase their muscle size may wish to pay more attention to the role of glycogen in energy production and the creation of muscle.

Max Contraction Training places a phenomenal demand on the body's ability to supply energy to muscles. The body stores energy within a muscle's cells in the form of glycogen, and the amount of that glycogen more or less determines the ability of a given muscle group to continue contracting. When a muscle's glycogen supply is fully exhausted, contraction ceases. On the plus side, exhausting these stores of glycogen causes the body to adapt by increasing its capacity to store extra glycogen in the muscles that have been trained.[1] In fact, the muscles of bodybuilders and strength athletes have been shown to have increased levels of glycogen as compared with the muscles of nontraining individuals.[2]

It follows from this that if more glycogen is available, you'll be able to train harder and to stimulate greater gains in muscular mass from your workouts. Given that muscle tissue comprises mostly water—not protein, as the supplement hucksters would have you believe—which is stored in the muscle by glycogen molecules, it is easy to understand how increasing glycogen storage in muscles would cause the muscles to become bigger. This fact has already been proved in reverse; it explains why bodybuilding competitors often lose muscle size, or "get flat," prior to a contest when they restrict the amount of carbohydrates they ingest. Carbohydrates are the macronutrient most readily converted to glucose, which is what forms the polymer of glycogen in the muscles.

Glycogen is what fuels high-intensity muscular contraction, so the more glycogen that is stored in the muscle, the greater the muscle's potential performance.

There is more and more evidence to suggest that the amount of glycogen stored in the muscles is a trainable condition. That is, through training, one can deplete local glycogen reserves in a muscle or muscles. The body, looking to protect its reserve of glycogen, will then overcompensate (put back more than was there before) by storing more glycogen (and the water that bonds with it), resulting in an increase in muscle size.[3] Glycogen is what fuels high-intensity muscular contraction, so the more glycogen that is stored in the muscle, the greater the muscle's potential performance, including increased hold times in static work, increased repetitions in dynamic work, and increased ability to handle more resistance or weight in both instances.

This phenomenon has been observed in athletes. A dietary regimen known as "carbohydrate loading" has proved popular with aerobic athletes because it induces the muscles to exceed their normal limits of glycogen storage. In practice, the athlete first empties the muscles of all stored glycogen and then consumes a high percentage of complex carbohydrates in the two or three days prior to competition. For many athletes, as a result of draining the glycogen reserves, the muscles supercompensate for this period of depletion by storing an unusually high amount of glycogen. For bodybuilding purposes it is worth repeating that for each gram of glycogen you can cause your muscles to store, you will have added three grams of water, thus increasing the mass of your muscles proportionately.

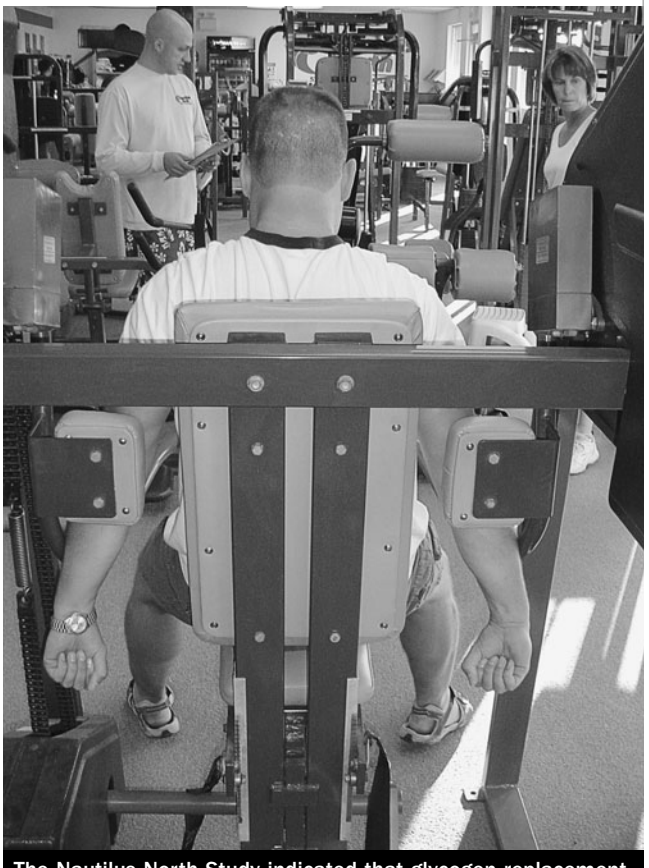
Moreover, the bigger the muscle group that is trained, the bigger the glycogen "pool" that gets drained and, consequently, the longer it takes the body to refill it. Glycogen is so important for survival—from thinking to muscular contraction and mobility—that when it is drained from a muscle by a workout, the muscle may enlarge on its prior capacity of glycogen storage in order to have additional energy in reserve should a similarly draining stress beset it again in the near future.

I know from having conducted and supervised thousands of personal training sessions at Nautilus North Strength & Fitness Centre that engaging in as little as sixty seconds of intense muscular contraction, and performing even as few as three exercises to a point of muscular failure, can cause light-headedness or nausea. These same symptoms of hypoglycemia, or low glucose levels, are exhibited by most aerobic or endurance athletes only after an hour or more of related activity. This comparison illustrates the much greater impact that high-intensity training has on the body.

The bigger the muscle group, the bigger the glycogen "pool" that is drained by intense muscular contraction and the longer it takes the body to refill it.

Max Contraction Training is a different species of exercise. The traditional, lower-intensity, higher-set protocols more closely resemble aerobics in their effect on the body's energy systems. While it is common—and wise—for people to carry water

Max Contraction is a different "species" of exercise.



The Nautilus North Study indicated that glycogen replacement, as part of the recovery and overcompensation process, can take up to seven days after an intense workout.

bottles with them to a gym to aid in replacing fluids lost through perspiration, we are beginning to suspect that water, while necessary, takes a backseat to sugar when it comes to high-intensity training.

The first time we noted this phenomenon was in 2004, when a woman briefly passed out after an intense workout. We noted immediately that her symptoms were identical to those of a person with diabetes experiencing low blood sugar. As she began to regain consciousness and was able to answer our questions, she confirmed that she had problems controlling her blood sugar and also informed us that her thyroid had been surgically removed. In fact, she was on medication to adjust for her fluctuations in blood sugar. Armed with this knowledge, we immediately administered sugar to her. Within minutes she was fine.

After this incident, both the staff and I have noted similar symptoms occur even among well-trained athletes who were performing high-intensity workouts. While such episodes of light-headedness are not uncommon in gyms, the usual solution has been to provide water and have the trainee "walk it off." Typically, such incidents require the trainee to lie down for a while (sometimes for ten to fifteen minutes) until they feel capable of standing. Now we understand that what had evidently happened was that

these people had burned so much glycogen from their muscles that there was a lag time during which there was too little sugar in their system or in their muscles to allow them to even stand. In such cases, it simply takes time for the liver to produce more glucose and restore their blood sugar levels to normal levels.

It has been our experience that administering sugar, typically in the form of a sugar cube or pouring the contents of a packet of sugar under the tongue, serves to quickly counteract the symptoms just cited. Prior to realizing the dramatic impact that intense training has on the body's glycogen reserves, we would have considered the symptoms to be the result of "not being in condition." Indeed, at Nautilus Sports/Medical Industries during the mid to late 1970s, feeling light-headed was common for trainees and believed to be almost entirely the result of the person's not being used to "outright hard work." Now I would submit that such symptoms are rather the result of the muscles having been drained of glycogen and the onset of exercise-induced hypoglycemia.

It must be remembered that the entire neuromuscular system utilizes sugar for fuel, and in light of this supreme importance, the body must make significant metabolic adjustments to allow for adequate production. Although recovery to the point of being able to carry on normal tasks must occur rapidly for survival, the full replenishment of glycogen reserves within the muscles after an intense workout can take much, much longer. The study conducted at Nautilus North, discussed in earlier chapters, as well as other studies indicate that the recovery process following an intense workout can often take anywhere from three to ten days.[4] The period is longer in some instances, usually depending on the severity of the workout and how many muscle groups are subject to high-intensity training, with the greater the number of muscle groups, the greater the drain of the body's glycogen reserves.

For each gram of glycogen you can cause your muscles to store, you will have added three grams of water, increasing the mass of your muscles proportionately.

It stands to reason that the more intense the training approach, the greater the glycogen depletion and, hence, the greater the potential for glycogen supercompensation within the muscle. As such, a training approach that stimulates more muscle fibers, such as the Omega Set or conventional Max Contraction sets, lasting between ten and

sixty seconds, will drain the glycogen reserves of each muscle more thoroughly, thus causing them—if sufficient time is then allowed between workouts—to refill to a greater capacity than before. It is for this reason that having a diet rich in carbohydrates is crucial for both growth stimulation and growth production.

This theory, if valid (and I believe it is), could have a profound impact on determining the most effective approach to building muscle size and strength. It might well be the key to increased muscle growth. However, I stress at this juncture that all I'm offering here is a theory, but, I believe, a plausible one.

12

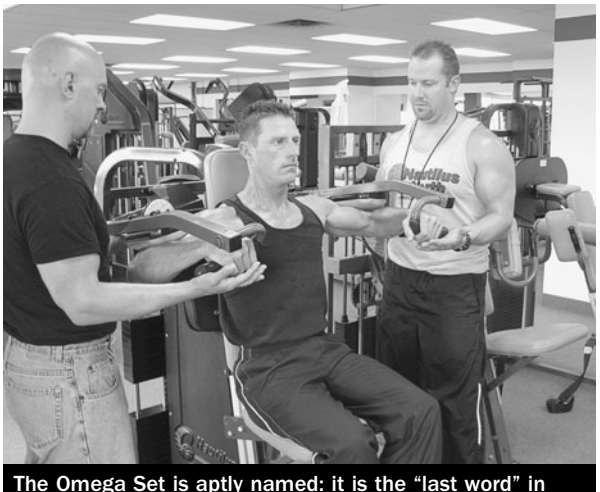
Questions and Answers

Max Contraction Training and Omega Set™ training build muscular mass and strength quickly—for all body types and all genetic dispositions.

Whenever new training concepts, such as the Omega Set, are introduced, questions are bound to arise. What follows are answers to the more common questions I receive on this exciting new protocol (and ancillary topics pertaining to building maximum levels of size and strength naturally) that were taken from a recent seminar I conducted at my training facility Nautilus North, in Bracebridge, Ontario.

HOW MAX CONTRACTION TRAINING BUILDS MUSCLE MASS

QUESTION: I get the role of glycogen in the muscle-mass-building scenario, but aren't there other factors that add to the overall "mass" of a muscle? And what does Max Contraction Training do to involve these factors?



The Omega Set is aptly named: it is the "last word" in high-intensity training.

ANSWER: *Apart from enhanced glycogen storage, and the water bonding that accompanies this process, another way that Max Contraction Training contributes to the mass-building process is by increasing blood volume to the muscle group being trained. Increasing the volume of blood directed to a given muscle group helps to create more capillaries in the area, which can receive more oxygen and thereby increase that muscle group's size. It's been further established that Max Contraction Training can increase the natural production of growth hormone. The greater the overload or intensity of muscular contraction, the greater the degree of stimulation of this naturally occurring anabolic. Max Contraction Training also allows you to use the heaviest weights possible to*

stimulate mass increases, and a muscle's force is directly proportionate to its cross-sectional area. Simply stated, this means that the stronger a muscle becomes, the bigger it becomes.

MORE ON THE OMEGA SET

QUESTION: I like the effects of Omega Set training very much, having gained seventeen pounds in seven weeks using this protocol. I'm curious, however, about the name for this new protocol. How did you come up with it?

ANSWER: *The Omega Set had several names during its evolution. I had initially labeled it "Staccato Reps," from the musical term for a tempo or cadence with a short and sharply detached series of notes played apart from the main melody. The new bodybuilding protocol similarly requires a "short and sharply detached" series of contractions performed apart from, but in relation to, the original Max Contraction set.*

Then, upon further consideration, I thought a more descriptive title would be "X REP," because it is performed exoge-nously, *by having the training partner raise the resistance for the trainee—thereby bypassing the potential problems with the individual's neuromuscular efficiency in raising the weight and with motivation, which is so often a limiting factor for someone about to engage in such training. When the resistance is suddenly "on you," you have no choice but to contract against it for all you're worth; otherwise, it falls through, and no effective stimulation is imparted. I couldn't use that name, though, because I learned that an article on an extended form of Static Conraction was published in* Ironman *under the heading "X-Rep."*

That led me to the "final" choice. Because the protocol represents the final frontier of high-intensity-training techniques, and because in particle physics, "omega" represents the heaviest hyperon elementary particle, the "Omega Set"—being the heaviest possible set your muscles can perform—was deemed to be the most fitting nomenclature.

THE PROBLEM WITH (CONVENTIONAL) NEGATIVES

QUESTION: How is the Omega Set more effective in taxing the "negative" strength of a muscle than a conventional (full-range) negative rep would be?

ANSWER: *The Omega Set generates the highest intensity possible by taking the muscle into the one place in its range of motion where all the fibers are activated and leaves it there for the duration of the set, thereby stimulating as many of a muscle's fibers as physiologically possible. Conventionally performed full-range negatives do not allow for this: trainees release the full contraction almost instantly and lower themselves down to a position where*

The Omega Set keeps the muscle in its strongest position throughout the duration of the set. Even when the trainee can no longer sustain the contraction, the muscle is made to contract maximally several more times through the assistance of a training partner who returns the movement arm of the machine to the Max Contraction position. Such ultra-high-intensity training stimulates muscle in a way that must be experienced to be believed!

fewer and fewer fibers are involved as the muscle extends.

The Omega Set derives from posing a series of questions related to this condition: What if you did not "release the full contraction almost instantly"? What if you attempted to sustain the Max Contraction for at least a quarter of a second? And what if you did not allow the negative rep to descend to a position where fewer and fewer fibers are involved as the muscle extends? What if you allowed the muscle to lower only an inch (or two inches, or three inches) and then had a training partner raise the resistance back into the position of Max Contraction? Conventional negative reps actually diminish fiber involvement; the Omega Set enhances it. With the Omega Set, you are returned to the Max Contraction position quickly, so that your muscle can never fully disengage, and because the weight is heavy enough to allow for only one-quarter of a second of contraction, as opposed to one to six seconds with a regular Max Contraction set, the principle of "orderly recruitment" ensures that the fiber involvement is also maximal. It is the equivalent of a series of maximal contractions performed in staccato-like sequence.

The Omega Set allows advanced bodybuilders to actually reach "total" muscular failure, perhaps for the first time in their training careers.

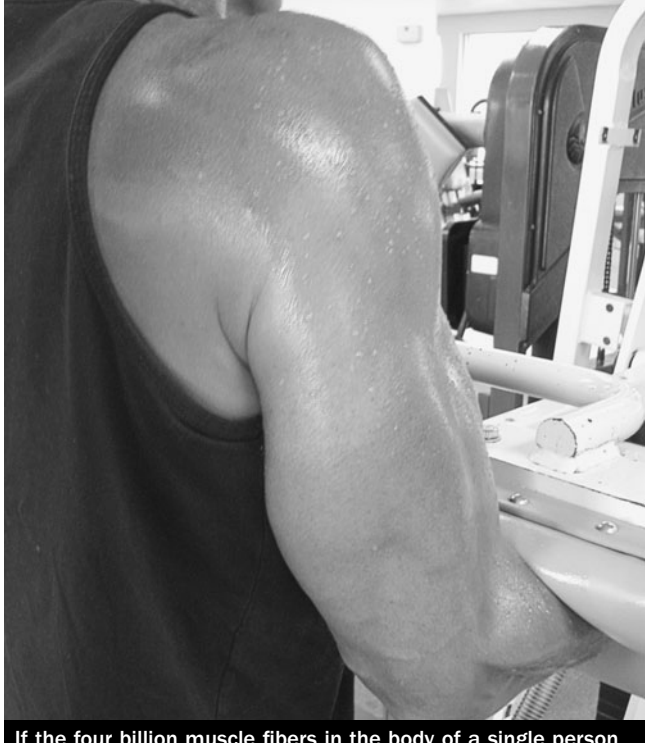
Mike Mentzer had told me years ago of a similar electrical stimulation he received from an electro-muscle stimulator created by Dr. John Zeigler, the physiologist and strength researcher. It had a rapid series of maximal contractions, which Mike believed helped significantly improve his physique development (already at an advanced level). Full-range negatives were almost as

unproductive as full-range positives, perhaps even less productive. With full-range positives your muscles contract into a position of Max Contraction, thereby increasing fiber involvement as the muscle moves into a fully flexed position, whereas with full-range negatives the muscle fiber involvement is diminishing with each passing second of the set as the weight is lowered out of and away from a position of full or maximum contraction.

The Omega Set allows advanced bodybuilders to actually reach "total" muscular failure, perhaps for the first time in their training careers. All of the limitations inherent in full-range repetitions are removed, leaving only the central issue of full muscular contraction to deal with. It is even a more productive technique than "partials," which restrict you to employing a resistance that you can move concentrically into a position of full contraction and then move slightly out of it. The result is that you have to perform upwards of twenty repetitions in most instances to fatigue the muscle. With the Omega Set, you are using a weight that is heavier than you could lift for positives (which is why your training partner must lift it) and that requires full muscular contraction to sustain in the Max Contraction position. The heavier weight recruits more muscle fibers, and you must focus on contracting against it—maximally—and then lowering it only slightly, thus digging deeply into your negative strength and taxing it thoroughly. At this point, your partner raises the resistance again, and you again flex your muscles maximally against it, trying to prevent it from lowering. Naturally, it will lower as the fibers continue to fatigue, but there again, you will reap the benefit of having taxed your negative strength reserves until you reach a point at which you can no longer control the lowering of the resistance—even for one to four inches. It is at this point that the set is terminated.

SIZE AND STRENGTH

QUESTION: I'm interested in the relationship between muscle size and strength and whether the increased size is a result of hyperplasia (fiber splitting) or hypertrophy



If the four billion muscle fibers in the body of a single person were laid end to end, the tiny strand would encircle the globe more than four times.

(enlargement of existing muscle fibers). What does the science of physiology have to tell us about this?

ANSWER: *The strength of a muscle, or its ability to contract, is directly proportional to the area of its cross section. Muscle size is a result of hypertrophy, not hyperplasia. Perhaps the best simple presentation of these facts of physiology was made by Dr. Arthur Steinhaus in a speech he gave in the 1930s:*

> According to Harvey of Chicago this [contractile] power is about 140 pounds to the square inch (9.7 kgm per cm^2). Thus if the effective cross section of a muscle were doubled its strength would also be doubled. This pulling power is due to the united effort of many thousands of discrete, cylindrical muscle cells or fibers averaging in length about ¼ inches (32 mm) and in diameter, 1/600 inch (0.04 mm) (in m biceps brachialis of man there are about 260,000 such fibers). If the four billion (4 milliarden) muscle fibers in the body of a single person were laid end to end, the tiny strand (80,000 miles, or 128,000 km) would encircle the globe more than four times in the latitude of Berlin. Exercise makes an individual's muscles become larger and therefore stronger; but it does not cause the number of cells to increase. The increase in size is due to thickening of some of the cells which previously had been undersize. This was first demonstrated by the brilliant histologic studies of Morpurgo of Sienna in 1897. Leg muscles which had almost doubled their size due to exercise were shown by actual count to have no more muscle cells than their smaller mates from the unexercised leg of the opposite side.[1]

WARM-UPS

QUESTION: I recently bought your audio lectures and read your book—terrific information. However, I did not see anywhere what you recommend for preparation, such as

Warm-ups, while important for some, are not mandatory in Max Contraction Training, because there is no "motion" to warm up for.

warm-ups and stretching out. Wouldn't it be unreasonable to come into the gym and start lifting a max weight without some sort of warm-up?

ANSWER: *Warm-ups are important, but they also are individually oriented and depend on such variables as the individual's age, physical condition, training history, and injury history. For this reason, it's difficult for anyone to prescribe a warm-up program without dealing with each trainee individually. Typically, warm-ups are required for full-range or conventional training: you are moving a weight throughout a full range of motion, and as the weights get heavier for your working set, the potential shear forces on joints and connective tissue increase. Max Contraction is motionless exercise, and the exercise that is performed is executed in your strongest range of motion—where your leverage is optimal and your muscles, joints, and connective tissues are strongest and, thus, best able to accommodate it. Therefore, a warm-up is not always required.*

Still, if you are employing a technique that is ultra-intense, such as the Omega Set, you should warm up the muscle that you are about to train with a set or two of Max Contraction exercise, lasing approximately ten to fifteen seconds, with a weight that is approximately 50 percent of what you will be using for your working set. If you are training with conventional Max Contraction, you may wish to perform three or four progressive "holds" wherein you simply increase the resistance and hold it for one or two seconds. This should be required only for the first two or three exercises in a given workout; thereafter, your body temperature should be elevated sufficiently to have provided an adequate "warm-up" for the remaining bodyparts.

If you are employing a technique that is ultra-intense, you should warm up the muscle that you are about to train with a set or two of Max Contraction exercise.

CAN ONE REPETITION BE ENOUGH?

QUESTION: I can understand that one set of an exercise is sufficient to stimulate muscle growth—all of the scientific studies you presented in *Max Contraction Training* make this obvious—but I'm still having trouble wrapping my mind around the concept that one repetition is enough to stimulate muscle growth! Is there any scientific basis for this?

ANSWER: *Yes. Apart from my own research, I also cited the ten-year study performed by Dr. E. A. Muller, in Germany. He established not only that just one set was required to*

One set taken to momentary muscular failure is all that is required to induce maximal increases in size and strength in human muscle tissue.

stimulate size and strength increases, but also that a single contraction, or "rep," was sufficient for this same purpose.

More recently, the physiological research of R. A. Berger was brought to my attention. More than fifty years ago, Berger tested various training protocols to determine if any were inherently superior in stimulating size and strength increases.[2] He experimented with untrained male students whom he taught at college. After a three-week break-in period in which the subjects were taught the mechanics of the squat exercise and then allowed time for neuromuscular or motor learning, several classes (rather than individual students) were randomly assigned to seven experimental groups, each training with a variant of the One-Rep-Max (1-RM) protocol. Each group performed one repetition *of the squat across the six weeks of this phase of the study. The first group did 66 percent of their 1-RM twice per week; group two did 80 percent of their 1-RM twice per week; group three used 90 percent of their 1-RM twice per week; group four used 100 percent of their 1-RM twice per week; group five used 66 percent of their 1-RM three times per week; group six trained only once per week and did a 1-RM; while group seven was a control group and did not train at all. According to Berger, "training once weekly with a 1-RM was considered as effective for increasing strength as either training twice weekly with various proportions of the 1-RM, and once weekly with the 1-RM, or three times weekly with the 1-RM.[3] If one maximum repetition stimulates the same size and strength increase as can be derived from protocols employing more than one repetition, then engaging in these other protocols is absolutely a nonnecessity.*

WHY MORE SETS FOR SPECIALIZATION IN MAX CONTRACTION TRAINING?

QUESTION: If one set is all that's required to stimulate muscle growth, why in your book *Max Contraction Training* did you advocate performing *more* sets for specializing on a particular bodypart? The more you do, the less intense the workout, no?

ANSWER: *While it is true that one set is all that is required to stimulate growth in a*

muscle, it has been my experience that when a certain bodypart lags in development, it is typically the case that it does so owing to two factors:

1. *The trainee has poor or largely untapped motor units/neuromuscular efficiency in that bodypart.*
2. *The trainee has still not acclimated to the protocol.*

The two factors are strongly interrelated, and in both instances, the trainee will benefit from a specialization course for a brief period—say, one month. The first factor is addressed by simply having the trainee do something that will better develop his capacity to utilize these motor units, and this comes down to practice. The more (slightly more, but more nonetheless) exercises a trainee does for that one bodypart, or the more he practices the skill or protocol, the better he is able to recruit muscle fibers and make efficient use of the motor pathways/neuromuscular efficiency (within certain genetic limits) that he is currently not able to employ to maximum result.

The second factor is addressed simply by practicing the new skill or protocol until learning has taken place, at which point the sets are reduced, as per the instructions in the book. Additional "advanced" or "specialization" techniques can be employed. One option is to perform several negative reps, with the same weight as was used for the Max Contraction exercise, immediately upon completion of the exercise. This amounts to a series of additional brief Max Contraction "reps," in that the resistance starts high, or maximum, and tapers off as the resistance is lowered. A full lowering is neither desirable nor necessary; the emphasis should always be the top—or Max Contracted—position. Another option, as indicated in the book, is to perform a second set. Either approach accomplishes the same thing: extending the work of the muscles involved. Extending the work of a set is not necessary for

Only beginning trainees benefit from performing more than one set for a given muscle group, as multiple sets serve to build stronger neuromuscular pathways in the initiate.

stimulating growth, but, providing the trainee still operates within the anaerobic pathways of sixty seconds, it is necessary to cultivate greater neuromuscular efficiency and to ensure that the Golgi tendon organs aren't triggered prematurely, thereby diminishing the intensity of muscular contraction. Again, this is particularly useful for those suffering from the two factors—but by no means all trainees. This is the reason for performing slightly more sets and longer contraction times.

Remember, the book covers training from the beginner to the low advanced levels of development and recovery ability, so there is of necessity some variation to account for the variation in training experience among individuals—a physiological one. The reason for performing specialization, however, is largely a psychological one. Changing the emphasis of one's routine keeps the workouts fresh and interesting instead of predictable and monotonous, and that makes the trainee more likely to stay with it. Specialization keeps training stimulating and, particularly at the high-intensity level, easier to stay with for the long term, which is how one must approach training when strength of psyche and of soma play vital roles in achieving ultimate success.

MAX STRAPS

QUESTION: In your *Max Contraction Training* book and DVD, you illustrate a training tool called Max Straps. I like to do Max Contraction Training, but I also like full-range training. Can Max Straps be utilized in conventional bodybuilding workouts?

ANSWER: *Certainly. While Max Straps were created specifically for Max Contraction trainees, they can be used for all types of bodybuilding training and have been employed to great effect by hundreds of clients. And while I illustrate how to use*

Max Straps are a power tool for isolating many muscle groups—from the lats of the upper back to the triceps of the upper arm.

Max Straps in my book and DVD, you will also find that I have listed alternative exercises to the ones where Max Straps are indicated, for those who do not have access to these straps. Nautilus machines (the older ones more so) such as the pullover, super pullover, and behind-neck machines are effective in isolating the lats, but these pieces of "isolation" equipment are far more expensive than the economical version I am promoting (several thousand dollars versus $69). Remember, the more direct you can make an exercise—that is, the more ancillary muscle groups you can take out of the exercise—the better and more thoroughly you stimulate the particular muscle group you are attempting to train. Max Straps do this efficiently and are featured in the book and DVD for that reason. (To learn more about Max Straps, please visit maxcontraction .com.)

ALTERNATIVE EXERCISES

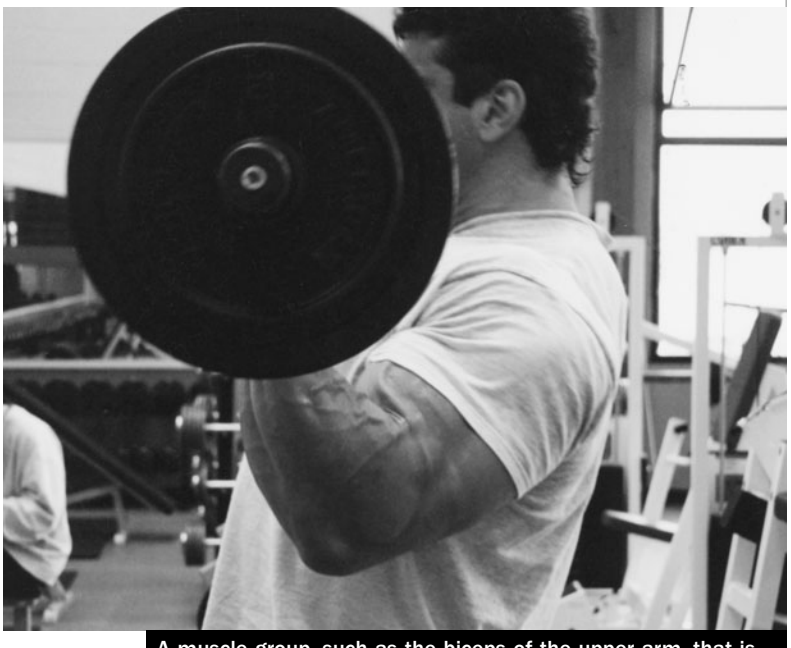
QUESTION: Are there alternate exercises to the ones recommended in your book? I'm thinking, for instance, of seated calf raises instead of standing calf raises, or Nautilus pullovers instead of the Max Straps pulldowns, since the Nautilus pullovers are more of an isolation exercise.

ANSWER: *You can indeed use alternate exercises to the ones I advocate in the book—providing that there is resistance in the position of maximum contraction. You could do Nautilus curls rather than steep-angled preacher curls, or Nautilus flyes instead of cable crossovers, and so on. The Nautilus pullover machine is a tremendous alternative to Max Straps pulldowns, although not necessarily "more of an isolation exercise," as the Max Straps make the pulldown a pure isolation exercise. When doing the Nautilus machine pullover, however, do not perform the Max Contraction rep in the bottom position of the pullover (where your hands are closest to your thighs), as this involves more of the rear deltoid and triceps than the lats. To really target the lats thoroughly, the*

Nautilus machine pullovers are an effective means of isolating the latissimus dorsi muscle of the upper back—if they are performed in the proper point in the range of motion.

position of Max Contraction is where your elbows are in line with your lower pecs (no lower).

The problem with seated calf raises as an alternative to standing calf raises is that the gastrocnemius can be fully contracted only when the knee is locked—not bent. It would be better to substitute toe presses on a leg-press machine, which would fulfill this function of the gastrocnemius better than seated calf raises. Seated calf raises target the soleus muscle on the front of the calf, which is much smaller and therefore has less mass potential than the gastrocnemius. As a rule, isolation exercises are better for Max Contraction Training than are compound exercises, which dilute the training stress through the involvement of ancillary muscle groups.



A muscle group, such as the biceps of the upper arm, that is properly trained in the position of full muscular contraction will also be stronger through its full range of motion.

FALLACY OF FULL RANGE

QUESTION: It is widely known that increases in strength as the result of isometrics are joint-angle specific, in that the increases occur only at the angle at which the contraction was held. In your book you suggest taking a joint to the end of its range of motion so that the muscle is in a fully contracted position, and then applying isometric tension at this point. My question is: Will this method allow uniform strength to be gained throughout the full range of motion, or will it still be restricted to the joint angle— in your case, at the end of the range of motion?

ANSWER: *I, too, have heard about the alleged "nontransference" of strength increases in one's strongest range to one's full range. I believe that Arthur Jones even conducted some testing on this in the 1980s but found that only* some *subjects (whom he dubbed type S, for "specific") did not record a transference of strength from one position of flexion to full range. Others, whom he classified as type G, for "general," did record a positive transfer to full-range strength after training exclusively, and statically, in one position. However, my full answer to your question is two-pronged:*

First, the primary factor in muscle fiber recruitment and, thus, muscle fiber stimula-

tion, is the intensity of the contraction of a given muscle—that is, how heavy the load is that your muscles are made to contract against. A heavier load requires more fibers to accomplish the task of contraction. It used to be believed that if you trained a muscle through a full range of motion, you would be training the full muscle, whereas if you trained a muscle in one position, you would be developing only one part of the muscle. Actually, the reverse is true: if you train through a full range of motion, then you will develop only part of the muscle, predominantly slow-twitch and intermediate-twitch fibers. Those are the only fibers that can be recruited, owing to the fact that a full range of motion restricts you to using a lighter weight than what you are actually capable of maximally contracting against. Muscle fibers are recruited solely by the amount of force they must produce (i.e., the amount of weight they are made to contract against), and you are capable of contracting against more weight in the fully contracted position than you are in your weakest range of motion, so you will recruit and therefore stimulate all fibers—the full muscle—with a Max Contraction set. Muscles contract by shortening; therefore, the one position in which all of the fibers are contracted is, by definition, the "fully contracted position" (what I term the position of "Max Contraction"). In other words, the two factors responsible for maximal stimulation of a given muscle both involve "maximums": the muscle must be in a maximally contracted position, and the load imposed on the muscle while in this position must be the maximum that the muscle is capable of contracting against.

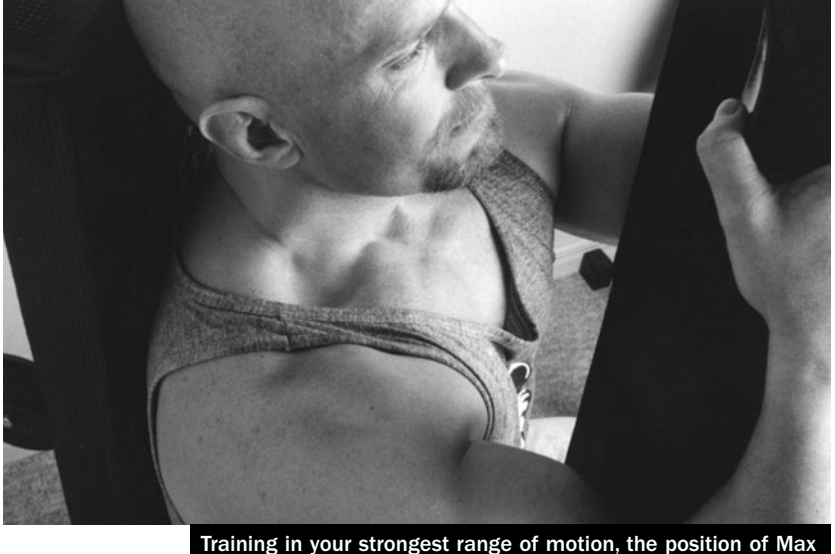
A maximal contraction involves all of the available fibers from a particular muscle group—the same fibers that are responsible for moving a muscle throughout every degree of its range of motion.

This being the case, what fibers would not be recruited from this protocol? If "all" the fibers are recruited as a result of the two requisites indicated, then that would include the fibers involved during the first sixteenth of contraction, the first quarter of contraction, the first third of contraction, the first half of contraction, the third quarter of contraction, and so on, because all of these same fibers are involved in the contracting pro-

cess. Ergo, all fibers that can be stimulated to grow stronger will have been stimulated to grow stronger from a "zero" range of motion—providing this zero range of motion takes place in the muscle's fully contracted position. Jones, to my knowledge, tested his subjects at different points in the range of motion. The fully contracted position is the only position in which all of the fibers are brought together and in which, indeed, the contraction can be said to be truly "maximal," so it is not surprising that a weak-range contraction would produce results only proportionate to the amount of fibers recruited and stimulated in that range. Any other point but that of maximum contraction is by definition a submaximum contraction and hence less productive.

Also relevant here is a study conducted by Peter Sisco with motionless (static) exercise. He determined that there was a 35 percent transference of strength to full range or dynamic strength. It might be argued that 35 percent proves that a full transference of strength did not take place. However, when you consider that none of the trainees in the study had gained "any" strength using exercises with a "full range" of motion for several months prior to performing the static holds, a 35 percent increase in their full-range positive strength was and is meaningful.

That brings me to the second part of my answer. I don't believe that an increase in full-range-of-motion strength is or should be the benchmark that many others believe it to be. If you increase your strength (statically) in a given position by, say, 80 percent, and you gain seventeen pounds of muscle in the process, you would obviously be accomplishing your objective of building a bigger, stronger body. The fact that this can be accomplished in so little time (seconds per week, versus the hours per week in the conventional approach) makes it a more efficient means of achieving your objective. Unless you absolutely require the ability to bench-press throughout a full range of motion many hundreds of pounds on a progressive basis, what would be the point of devoting hours and years to the cultivation of this talent? You don't need to



Training in your strongest range of motion, the position of Max Contraction, is the safest way to exercise.

do this to become bigger and stronger. In fact, it is an impediment to becoming bigger and stronger: a full range of motion actually reduces the amount of resistance against which your muscles are capable of contracting maximally, thus providing sub-maximal overload and results.

Again, contrary to the popular view, training throughout a full range of motion does not enhance flexibility more thoroughly than performing a Max Contraction. Flexibility, to begin with, has a strong genetically mediated limit, and a muscle cannot "increase" its flexibility without either tearing something or losing its tonus. The stronger the whole muscle, the more secure the joint and mechanoreceptor sites responsible for tonus/tension and relaxation or stretch. There even is ample evidence that training with moderately heavy weights throughout a full range of motion will increase your chance of injury, owing to the sheer forces that impinge on joints and connective tissue when bones and ligaments are required to move through arcs and positions of disadvantaged leverage.

If your objective in training is to have a stronger full range of motion—that is, to be able to lift heavier weights through a full range of motion—the best approach would be to train specifically for this skill, by performing only full-range movements. This will, however, severely compromise your ability to build maximum size and strength in your muscles. To repeat, your muscles are capable of contracting against much heavier weights than a full range of motion allows you to employ. The heavier the weights, the more intense the contraction; the more intense the contraction, when combined with proper rest periods, the greater the muscle growth.

MAX CONTRACTION AND MUSCLE "INNERVATION"

QUESTION: Muscle fibers don't usually run the length of a muscle. So, if you build the fibers only in an isolated part of the

Muscle fibers operate according to the "all-or-none" law of muscle fiber contraction: only the fibers required are recruited to contract, and they do so at 100 percent of their momentary ability.

muscle, you don't build all the fibers above and below it. And that just has to limit your muscle growth. Isn't this one law of exercise physiology that you can't sidestep?

ANSWER: *I won't sidestep it: I'll meet it head-on. The nerves that enter a given muscle divide out into threads that resemble branches on a tree. Each branch ends at the muscle cell and carries the electrochemical current that causes the cell to contract. When this current is released, all of the cells serviced by the branch (a single neuron) contract simultaneously, not some to the exclusion of others. This is in accordance with the all-or-none law of muscle fiber contraction. It's simply not possible to isolate one portion, border, or ridge of a muscle.*

You don't have to take my word for it. Here's how Dr. Fred Hatfield explained it in his book Bodybuilding: A Scientific Approach*:*

> The cells associated with each motor unit are spread all through the gross muscle; all portions of the gross muscle are affected similarly by a given exercise and therefore develop similarly. This is called the principle of noncontiguous enervation. Using many variations of an exercise for one muscle in no way ensures more growth or different growth patterning than does performing the basic exercise. . . . The shape of that muscle will not be affected by variations in the angle or position of stress application. Does this mean that all a bodybuilder has to do is perform the basic movement and rid himself or herself of the array of supplemental exercises for a given muscle? I suspect it does.[4]

"MAX-ING" OUT EQUIPMENT

QUESTION: I had a question about training with the Max Contraction system after reading your book. The question is: What happens when I max out on the equipment—if I can't load up, say, a Bowflex more than 410 pounds? Or, even at a gym, if I use a leg-curl or leg-extension machine and I am doing holds with all the weight, how do I accomplish my Max Contraction at a one- to six-second hold if I have no other way to add weight?

ANSWER: *Your concern is a common one—and a well-founded one. You will find that you get so strong so fast with Max Contraction that your strength will, indeed, surpass the capacity of virtually all gym equipment—Bowflex above all. I'm sorry to report that nothing can be done to remedy this—yet. I'm working on a line of machines that will have a new cam that permits training muscles to their full strength potential, but it will be a while before the machines are perfected. Meanwhile, your best bet when you max out a machine is to do one of two things:*

Individuals grow so strong so quickly from Max Contraction Training that their strength soon exceeds the weight stacks on most exercise machines. It is not unusual for a Max Contraction trainee to require a training partner to stand on the weight stack for him, to provide sufficient weight to stimulate his muscles into further growth.

1. *Pin additional resistance onto the weight stack—but be careful with this, and also first ask permission of the gym owner, who may not be keen on the idea.*
2. *Train unilaterally—one limb at a time; this will effectively "double" the resistance on the machine and will at least buy you a few more months of training progress.*

As I say, your problem with weight selection is a common one. The weights typically used for full-range or conventional repetitions are always far below what the trainee's muscles are truly capable of contracting against. So, a full range of motion is an artificial barrier to maximum muscle contraction. A good rule of thumb to start out is to take your One-Rep-Max and then sustain the fully contracted position with this resistance for sixty seconds. As long as your set completes itself at sixty seconds or less, you are training exclusively within the anaerobic, or muscle-building, pathways. As you get stronger, you will need to have a training partner help you into the fully contracted position, because you will get so strong so fast that your muscles will require far more weight than you are able to move through a full range of motion—even for a One-Rep-Max.

Certain exercises lend themselves better to Max Contraction than do others. Always look for isolation exercises that require you to fight to hold the fully contracted position: for arms, concentration curls or steep-angled preacher curls; for triceps, dumbbell kickbacks; shrugs for traps; and so forth. Barbell curls and standing or even incline dumbbell curls typically see the resistance fall off in the top (or fully contracted) position, which is the most important position in the range of motion—and the one position in which you need maximum resistance.

STRENGTH CURVES

QUESTION: Shouldn't the weights always be heaviest in the position of full contraction? I was training recently and discovered that I was actually weaker in this position than I was just an inch or two beneath this position.

ANSWER: *The fact that a muscle is contracted "maximally," or in a position of full contraction, simply means that all of the available fibers have been "brought together in one room," so to speak. The leverage, or angle of pull on a muscle, changes throughout the range of motion, and often the position of full contraction is not the muscle's demonstrably "strongest" position, owing to leverage factors. However, there is a distinction between how much weight one can lever and how much weight a given muscle can be made to contract against.*

I was unaware of this phenomenon when I formulated the theory of Max Contraction back in 1984. It stood to reason that maximum *meant simply that: maximum fibers involved, maximum strength generated, ergo, maximum weight lifted. The flaw with this reasoning is that as muscles revolve around individual joints, the moment or lever arm (essentially the effective resistance) changes dramatically. In the barbell curl, for example, performed in the conventional or full-range manner, the effective resistance at the beginning of the curl is literally "zero." There is no movement, and the biceps are not activated to any significant degree. As the muscle begins to contract, it begins to move the resistance horizontally, so that the effective resistance is still low. As the forearm begins to rotate upward around the elbow joint, the movement becomes linear (rather than horizontal) for several degrees, and the effective resistance increases dramatically. Then, as it passes through the 90-degree position, the resistance begins to travel horizontally again, thereby reducing the effective resistance until the lever arm eventually reaches an angle of 180 degrees. Here the resistance is supported in a vertical position by the forearms and there is no effective resistance in the position of full contraction. For any exercise to be maximally efficient in stimulating muscle fibers, the resistance must be applied perpendicularly to the muscle being trained, thus ensuring that it is under the highest order of intensity and, hence, contraction. I believe it was Arthur Jones who first brought this to the bodybuilding world's attention (though few, it seems, took much notice of it), in his* Nautilus Training Principles Bulletin *Number 2, when he wrote:*

> For all practical purposes—in the field of exercise—we can (and should) ignore anything except VERTICAL movement of resistance; it makes no slightest difference in which direction we are pulling or pushing, and the

"total amount" of movement is of no importance—what matters, and all that matters, is the vertical movement of the resistance.

Please note his statement "the 'total amount' of movement is of no importance," which sharply underscores the reason for the methodology of Max Contraction. This now understood, let us return to our example of the biceps curl. The potential strength curve of the biceps muscle is weak in the bottom, stronger in the mid range, and maximally strong at the top. If an individual has trained with conventional exercise or free weights predominantly, then the mid range—the point in the range of motion that receives the most effective resistance—will get stronger, but the beginning and end positions will not change at all. They don't have to, as they are not receiving any effective resistance in these positions.

The result is that most newcomers to Max Contraction Training find themselves very strong the closer the lever arm is to the 90-degree point and weaker (sometimes very weak) in the position of full or maximum contraction. The only way to rectify this imbalance is to train solely in the position of full contraction until one's strength increases to the point where a truly maximum resistance can be employed to thoroughly stimulate the muscle. Fortunately, this doesn't take very long to accomplish—if you're training correctly.

If you have been training conventionally, using predominantly compound movements, the problem is exacerbated by the fact that the lever arm will again return to "zero." (Some muscular involvement is obviously present, or else you would not be able to keep your bones in the position of

Effective resistance is provided in a barbell curl only when the bar is in the midpoint position—directly opposed to gravity. At the top of the movement, with the biceps fully contracted, the resistance falls off, providing no effective stimulation of the biceps muscle.

lockout, but the involvement isn't maximal.) For such individuals, a slightly longer "break-in" period to the protocol may be required. The idea is not to see how much weight you can support, but rather how much weight your muscles can actually contract against when, again, all of the available fibers have been brought together in a contraction that is truly maximal. Bringing them all together means that—in that one position—they are all available to be fully stimulated. But they will not be fully stimulated, even in this position, if sufficient overload or resistance is not applied. If too much resistance is applied, you are in danger of activating the Golgi tendon organs, and no contraction will be possible. If too little resistance is applied, then only a portion of the fibers brought together in the contraction will be stimulated.

When I created the Static Contraction protocol, I had assumed that because the weights were heaviest in the position of near lockout, a maximum contraction was occurring. I have subsequently learned through additional research and experimentation that this is not the case. Each muscle has its unique strength curve that must be accounted for, and the effective resistance is compromised when the lever arm is at "zero" and the weight is simply supported—rather than maximally contracted against.

For any exercise to be maximally efficient in stimulating muscle fibers, the resistance must be applied perpendicularly to the muscle being trained.

The only constant in this is that if a muscle is brought into a position of Max Contraction, all *of its fibers are present to be stimulated, including those fibers responsible for raising it into and out of this position, and if a load is then imposed that is heavy enough to recruit the FG fibers, then* all *of the fibers will have been stimulated to grow bigger and stronger. Now, this load may be slightly less than you are currently capable of "holding" in a different point in the range of motion, but again, given that you have been training conventionally and thus have developed greater strength in a position of submaximal contraction, along with the fact that the limb you are training—depending upon the exercise—may be moving horizontally in the position of maximum contraction, the actual effective resistance might be diminished. That is to say, the lever arm has reduced the effective resistance considerably, despite the increase in the weight on the bar or machine. This is why I prefer to have trainees exercise on machines such as the early Nautilus machines, which had bigger*

cams, thus allowing for greater resistance in the position of Max Contraction as one's strength increases and which also provide rotary, balanced, and direct resistance, while free weights do not.

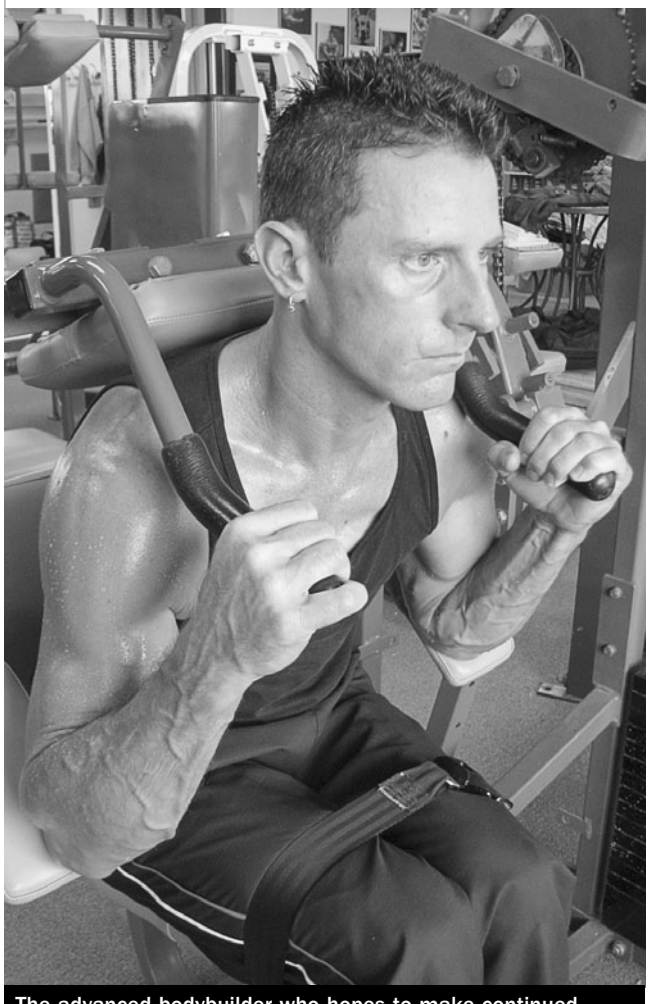
Muscles move rotationally, but effective resistance is applied vertically—except with certain machines such as Nautilus—and once the point of travel moves from the vertical plane to the horizontal plane, the effective resistance falls off. Therefore, you appear to be stronger in certain areas, but the effective resistance has actually diminished, so that you are contracting against less weight. This was true with Static Contraction Training and Power Factor Training—which are performed typically with barbells or compound exercises, by the way, particularly in exercises such as bench presses, overhead presses, leg presses, and even preacher curls to some extent.

Max Contraction takes these factors into account and ensures that only *the muscle fibers are involved in the exercise and that the effective resistance is truly* maximal *for the given bodypart. It also ensures that there is resistance solely in the position of maximum muscular contraction and that there is no chance of locking out, as in Static Contraction Training, or having the resistance "fall off," as in conventional full-range training. The resistance should be maximal, but maximal only when the proper physiology of the muscle and the proper physics of the exercise are taken into account. You might have found that you appeared to be "stronger" in a position in which the weight was moving or being held horizontally, and naturally you would not be as strong (demonstrably) in a position in which the resistance was fighting directly against gravity and the movement arm was larger, thus making the effective resistance greater. Because muscles contract by shortening, the muscle always has to be in its shortest, or fully contracted, position to have a maximal contraction, and the resistance will be precisely what it needs to be—neither too much nor too little—when the factors cited here are properly taken into account.*

TRAINING ONLY ONCE A WEEK

QUESTION: Can you really get bigger and stronger from only one workout per week?

ANSWER: *Yes. My research as well as that of others who have done extensive personal training in which clients' progress is monitored closely and patterns are observed, in addition to more and more scientific studies, strongly indicate that if the quality of an exercise program is high, one session a week of exercise is more than adequate to cause optimal positive adaptation. For nonbeginners (i.e., those with one to six months of consistent training under their belts) doing more than one session can actually work to prevent the benefits you have stimulated from being produced.*



The advanced bodybuilder who hopes to make continued gains in muscular mass and strength should train no more than once a week. The stronger he gets, the greater the energy he puts out in a given workout, and the longer it takes his body to restore that energy.

Remember that exercise is merely a stimulus to positive change; by itself it produces nothing. It is the body that produces the results you seek, but only if you provide it with sufficient time to do so. My brother-in-law, Cary Howe (who is also our manager at Nautilus North), made the astute observation that performing a workout is akin to pressing the button for an elevator: once you've pressed the button, the mechanism is engaged, and you must then wait for the elevator to arrive. Pushing the button three more times won't make the elevator arrive three times faster. The same is true with exercise: train once, set the growth mechanism into motion, and then wait for the gains to arrive. Training two, three, or four more times won't produce gains two, three, or four times faster.

BODY-COMPOSITION ANALYSIS METHODS

QUESTION: What method did you use to determine body composition in the Nautilus North Study—and why?

ANSWER: *It is difficult for bodybuilders and nonbodybuilders alike to accurately test body composition. While there is no shortage of body-composition testing methods available, not all of them are accurate, and some can be off by more than 30 percent. Without an accurate and repeatable means of assessing body composition, you are a rudderless ship. How do you know if your training and/or diet is producing any muscle gains at all? A bodybuilder can easily gain ten pounds over the course of a month—but ten pounds of what? Water? Fat? Muscle? Fat and muscle? A bodyweight scale can't tell the difference; its sole function is to record bodyweight, not determine composition. The same applies to using a tape measure, another typical means of assessing a bodybuilder's progress. Putting two inches on*

your arm means nothing if those two inches are adipose tissue—and a tape measure merely measures volume, not the composition of that volume.

To make any sort of meaningful measurement for determining the productivity of a given training approach, the composition of the weight and volume gained has to be accurately assessed. You need to know, in other words, that the weight you gained from training this month was as a result of an increase in the lean composition of your body, rather than fat. Conversely, if you are seeking to lose fat, you need to have a reliable means of determining if the weight you lost was fat, water, lean tissue, or a combination of all three.

A Dual Energy X-Ray Absorptiometry (DEXA) machine could be good for this purpose, being sophisticated enough to measure individual limbs for compositional components down to the gram. The disadvantage is that DEXA uses radiation, and even though it is present in small amounts, who wants to be exposed to radiation in any form or magnitude for repeated sessions? In all cases, to consistently and accurately measure body composition, repeated testing is required over a short span of time—daily, in our study—in order to determine when the gains actually are produced and what the immediate effects of a proper muscle-building workout are on one's muscle physiology. DEXA, while valuable for bone densitometry, which does not have to be performed so frequently, simply posed more risk than value for our purposes.

Joe Ostertag (left), of Body Comp Weight Analysis Centre, discusses the results of his body-composition tracking machine with a client. The Body Comp machine was used to great effect during the Nautilus North Study.

Another potential choice, underwater (hydrostatic) weighing, is excellent and highly accurate. Both Mike and Ray Mentzer used this method in 1980, when Mike was preparing for the Mr. Olympia contest. It revealed that Mike had gained twelve pounds of muscle over a period of only twelve days. Yet, while hydrostatic weighing was the gold standard of body composition twenty years ago, composition-assessment methods have advanced since

that time, most notably in the areas of practicality and convenience. After all, who wants to be dunked up to ten times in an underwater tank for thirty seconds? Accessibility is also a problem. My subjects would have had to drive the hour and a half to Toronto and wait for appointments in university physiology labs. Moreover, most universities don't welcome members of the general public to use their facilities—and certainly not as frequently as our testing required.

Bioelectric impedance analysis seemed promising, but definite problems surfaced in both accuracy and repeatability with this technology. One client of ours, a medical doctor, is a fitness freak. He not only does strength training but also competes in cross-country ski events and is so defined that you can readily see virtually every muscle in his body. In contrast, he has a niece who is morbidly obese. So, imagine the surprise when both he and his niece tested themselves on a bioelectrical impedance machine and both tested at 36 percent! Evidently, many of these machines measure only the composition of the limb or limbs in contact with the apparatus; the current lacks the strength to measure all aspects of the body. Increasing the accuracy would require increasing the power, and who wants to be supercharged from head to toe with electrical current?

Calipers were a fourth possibility, but fat is stored all over the body, not just in the three or four areas tested with this method, and there is no way that overall bodyfat can be accurately measured under such circumstances. Likewise, when bodyfat is lost, it comes off in a random order from all over the body, not just from the test sites. Another negative is that calipers measure only subcutaneous fat deposits and would tell us nothing about visceral fat (or internal fat), which is the fat that typically builds up to cause serious health problems. Then too, of all the methods listed, calipers have been shown to have the highest error percentage, a reflection of the fact that people often store fat in different areas from those being measured at the sites that the calipers target.

To make any sort of measurement for determining the productivity of a given training approach, the composition of the weight and volume you gained has to be accurately assessed.

In the end, the only valid scientific method found to be ideal for the type of consistent, frequent, repeatable, and reliable whole-body testing needed for the study was that offered by Body Comp Weight Analysis Centre (body-comp.com). Body Comp utilizes the same principle of

displacement that hydrostatic weighing employs, but rather than displacing water, its "Bod Pod" capsule measures air displacement. The testing procedure takes less than five minutes and is accurate within plus or minus 2 percent, which puts it on a par in terms of accuracy with hydrostatic weighing. Shy of an autopsy, that's as accurate a measurement as science currently permits. We also based our choice on the fact that, although this technology is used in universities, hospitals, and other professional institutions, Body Comp is the only provider we could find in Canada that is open to the general public. Armed with this revolutionary technology, we were able to test the subjects and know—within a tenth of a pound—whether the weight a trainee was gaining or losing was lean or fat and whether a particular training and recovery protocol stimulated and allowed for the production of lean tissue. Even more impressive, we were able to determine exactly, to the day, when this gain or loss showed up.

QUESTION: Were the subjects in the Nautilus North Study regaining previously held muscle mass?

ANSWER: *No. The subjects who took part in the Nautilus North Study had been training steadily for at least six months with high-intensity protocols and had been training only once a week in this fashion prior to the study. None of them was regaining previously held muscle mass, but they were hopeful about building new muscle mass. The subjects were not grossly underweight or overweight, nor were they underconditioned. All were young to middle-aged men, and several were fresh out of college, where they ran track and participated in activities such as football, hockey, and martial arts. None was previously overtrained, which could have enabled the subject to take advantage of the two-week testing period for recovery. Our test subjects were not made to drink lots of water before testing or to change their normal diets in any way. These were simply people who were fit, and in some cases already very strong, and who had an interest in seeing what effect a high-intensity workout had on the body and what if any gains could be produced from a solitary workout. Given that the subjects would not be regaining previously held muscle mass and were already fairly well developed regarding their individual genetic potential for mass and strength, any gains were noteworthy and of significance to those interested in building new muscle from exercise.*

A NEW MODEL FOR RECOVERY ABILITY

QUESTION: I'm still not clear on the whole issue of recovery ability. Are you saying that everyone now needs to train only once a week?

ANSWER: *What I'm saying is that as you get stronger, you will need to train less fre-*

Bodybuilders who train only as often as required make continued progress and look forward to each visit to the gym so that they can set new personal strength records.

quently. Think of it this way: When a beginner works out, it takes X units of time to recover from the workout; an intermediate trainee, with his greater energy expenditure, will require Y units of time, and the advanced trainee requires Z units of time. We should get out of the rut of thinking in terms of seven-day periods—particularly in matters pertaining to human biology. To recover from the stress of exercise, the body simply requires the amount of time that it requires, which will vary beyond the confines of the seven-day week. The measurement/recovery method is out of date with the new model of fitness. Perhaps a more accurate measurement would be to start at A units of time, and every time the individual grows stronger, it simply takes more units of time for full recovery—and then overcompensation or adaptation. Training within the confines of a "week" works well for beginners, not because it is a "two-day" or "seven-day" interval, but because the beginner's recovery happens to fall into this realm of time, whereas the advanced trainee's does not. In 1971 Arthur Jones offered the following advice in his Nautilus Bulletin*:*

> When anything is in limited supply, then it is simply common-sense practice to make the best-possible utilization of the quantity that is available—and when you are not sure just how much is available, it is equally good practice to use as little as necessary; in the field of exercise, the implication is clear—use your limited recovery ability as wisely as possible, and as little as possible in line with the actual requirements for producing the results you are after.

That statement still holds truth. Your limited supply of recovery ability does not get bigger, but the demands you are placing on your muscles and energy systems do. It follows that you should disturb your limited reserve of recovery resources as sparingly as possible by

training only as much as is required—not as many times as you can fit into an arbitrary period such as seven days.

LOSING BODYFAT

QUESTION: I want to lose bodyfat for a forthcoming contest. Can I do this by workouts alone, or do I need to diet?

ANSWER: *Losing bodyfat is almost entirely a matter of diet. Specifically, losing bodyfat is contingent on your consuming a certain number of calories each day that is below your maintenance need of calories. Exercise burns very few calories, despite what the magazines might tell you, and aerobic exercise, being so low in intensity, burns fewer calories per hour than more intense exercise such as Max Contraction Training. In fact, one pound of bodyfat will fuel you for up to eleven hours straight of aerobic activity. So, even if you have been religiously hopping onto that treadmill four to five days a week for a half hour or so per session, you are only making a dent in (perhaps) three to five ounces of bodyfat. There's more to it, though: without strength-training exercise, weight lost on your bathroom scale will come largely from water and muscle—not fat. Muscle loss is the last thing you want if you're wishing to lose fat. Muscle keeps one's metabolism (calorie-burning ability) high.*

Keep in mind that bigger muscles require more calories, but if you don't give your body time to build the bigger muscle, there is no reason for it to burn more calories. Analogies abound: the bigger the engine, the more energy or fuel it requires to run; the bigger the building, the more energy or fuel is required to heat it; the bigger the animal, the more food or fuel it requires to maintain its mass. The bigger your muscles become, the more calories they will require. Even a ten-pound muscle gain can result in substantially more calories being burned by the body on a daily basis (up to 1,000 extra calories a day, in fact).

Losing bodyfat is almost entirely a matter of consuming fewer calories than you require to maintain your present physical mass. You can also build muscle while losing fat if you train intensely and not too frequently.

There are really only three ways you can lose body fat: decrease your number of dietary calories, increase your number of exercise calories, and, most important, cause your body to burn more calories even while at rest. *Remember, you cause your body to burn more calories at rest by improving your muscle-to-fat ratio—that is, by building your muscles. The key factors in muscular growth are* stimulation and overcompensation*; stimulation is the result of high-intensity training, such as Max Contraction Training, while overcompensation can occur only when the body's recovery ability is not eroded.*

The triceps muscles require heavy weight and intense contraction in order to be maximally stimulated.

BUILDING THE TRICEPS

QUESTION: I really want to have big triceps—ideally, like Mike Mentzer's! Is there any one factor that I need to apply to my triceps training that will make them as big as possible?

ANSWER: *There isn't just "one factor" to building muscle. It is important to know the anatomy of the muscle you are training, the physiology of the growth-and-repair mechanism of the body, and how frequently to apply the training stress.*

The triceps muscle has essentially two functions: (1) extend the forearm, and (2) bring it closer to the torso. During my association with Mike, he often expressed his respect for the work of the anatomist A. A. Travill (1925–1996), who was the head of the Anatomy Department at Queen's University from 1969 to 1978. By all accounts, Dr. Travill was an excellent teacher, physician, philosopher, and historian, and Mike, not coincidentally, had similar qualities and areas of focus. The following comment by Mike on the subject of the triceps reflects his debt to Travill:

> According to the research of A. A. Travill, the three heads of the triceps contribute different degrees of work depending upon the level of resistance imposed on the muscle. During the

course of normal activities and light weight training, the medial head of the triceps does practically all the work, with the lateral head adding a little and the long head doing virtually no work. Interestingly enough, Travill discovered that after the resistance exceeded a certain level, the threshold level, the lateral and long heads of the triceps become much more heavily recruited, with the medial head still heavily involved.

While no one knows exactly when the threshold level is reached, it appears that it's very high. Tom McLaughlin, Ph.D., once pointed out in an article in Powerlifting U.S.A. *magazine that, of all the muscles, the triceps often show the least improvement among beginners. He attributed this to the fact that the medial head, which remains largely invisible under the lateral and long heads, is doing most of the work. Mike was in concurrence on this point:*

> My own observations support much of what Dr. McLaughlin says. I often hear bodybuilders remark how difficult it is for them to develop the long head and especially the lateral head, which McLaughlin referred to as the "totally lazy" head of the triceps.

In order to exercise all three heads of the triceps, therefore, the workload should be very heavy. In addition, it is important that both functions of the triceps be worked, which is what the kickback with Max Straps achieves. Beyond knowing the best exercise to perform, ancillary issues such as volume (how many sets you perform in a given workout) and frequency (how many workouts in a given period should be performed to allow for the production of optimal muscle growth) also factor heavily into the bodybuilding equation. Since any amount of training, whether of short duration or long duration, makes inroads in the recuperative abilities of the body, sufficient time must elapse between training sessions to allow for a complete recovery of the physical system. Only once the body has recovered all of the energy it expended during a workout and other daily activities will growth take place. If a bodybuilder is spending endless hours in the gym needlessly overtraining, then all of his energy will be spent in an attempt to overcome the exhaustive effects of the workout, with nothing left over for growth.

Only once the body has recovered all of the energy it expended during a workout and other daily activities will growth take place.

Muscle is one of the most important tissues of the human body. With Max Contraction Training you will build a stronger, more muscular body in the quickest possible time.

The acquisition and preservation of energy is the most pressing concern of all living bodies. Energy is necessary for survival in fending off enemies, finding food, and reproduction, while large muscle growth contributes little if anything to chances for survival. So, while intense training is a requirement for rapid muscle growth, the training must be brief and infrequent to allow the growth to take place.

MUSCLE—WHO NEEDS IT?

QUESTION: What, in essence, are the benefits of training with Max Contraction?

ANSWER: *The benefits are many, including increased muscle mass; prevention of muscle loss; increased bone mineral density; better regulation of body temperature; increased basal metabolic rate; reduction in bodyfat; improvement in blood sugar metabolism; increased cardiovascular efficiency; enhanced flexibility and joint mobility; reduced blood pressure; lower cholesterol; reduced low back pain; reduced arthritis discomfort; increased gastrointestinal transit time; enhanced respiration; reduced stress levels; improvement in athletic and recreational performance (such as golf and hockey); reduced difficulty in performing day-to-day tasks; improved appearance; greater self-confidence from attaining a goal and demonstrating the efficacy of the human mind; reduced chance of injury; enhanced strength, shape, and power; increased strength of joints and ligaments; improved ability to strengthen and rehabilitate injuries; and, of course, the huge savings in time that attends training in Max Contraction fashion, allowing you to enjoy more of what life has to offer instead of being a slave to the gym. All of these benefits are obtainable through one session per week (or less) of proper Max Contraction exercise.*

Training Charts for Advanced Max Contraction Training

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Chest, Shoulders, and Triceps

NAME _____

DATE _____ **TIME** _____

INSTRUCTIONS: In the spaces below, fill in the weight you used and the time of contraction, as well as the number of reps in the Omega Set. For example, if you were able to contract against 100 pounds for 6 seconds, with 4 Omega Set reps, you would write "100/6/4."

EXERCISE	SET #1
CHEST	
Pec Deck	_____
LATERAL HEAD OF SHOULDERS	
Lateral Raises	_____
POSTERIOR HEAD OF DELTOIDS	
Rear Lateral Raises	_____
TRICEPS	
Max Straps Kickbacks	_____

BODYWEIGHT: _____

MOOD WHEN STARTING: _____

LENGTH OF WORKOUT: _____

COMMENTS:

Upper Back, Traps, Lower Back, and Biceps

NAME _____

DATE _____ **TIME** _____

INSTRUCTIONS: In the spaces below, fill in the weight you used and the time of contraction, as well as the number of reps in the Omega Set. For example, if you were able to contract against 100 pounds for 6 seconds, with 4 Omega Set reps, you would write "100/6/4."

EXERCISE	SET #1
BACK	
Max Straps Pulldowns	_____
TRAPS	
Nautilus Shrugs	_____
LOWER BACK	
Lower Back Machine	_____
BICEPS	
Close-Grip Chins	_____

BODYWEIGHT: _____

MOOD WHEN STARTING: _____

LENGTH OF WORKOUT: _____

COMMENTS:

Legs

NAME _____

DATE _____ **TIME** _____

INSTRUCTIONS: In the spaces below, fill in the weight you used and the time of contraction, as well as the number of reps in the Omega Set. For example, if you were able to contract against 100 pounds for 6 seconds with 4 Omega Set reps, you would write "100/6/4."

EXERCISE	SET #1
HIPS/GLUTES	
Nautilus Hip and Back Machine	_____
QUADRICEPS	
Leg Extensions	_____
HAMSTRINGS	
Leg Curls	_____
CALVES	
Standing Calf Raises	_____

BODYWEIGHT: _____

MOOD WHEN STARTING: _____

LENGTH OF WORKOUT:

COMMENTS:

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Notes

CHAPTER 2

1. William D. McArdle, Frank I. Hatch, and Victor L. Katch, *Exercise Physiology: Energy, Nutrition, and Human Performance* (Philadelphia: Lea & Febiger, 1986), 318.
2. Hans Selye, *Stress Without Distress* (New York: New American Library, Signet, 1974), 28–29.
3. "Muscle: The Myostatin Connection," *www.ultimate-exercise.com*.
4. Ibid.
5. Doug McGuff, "The Dose-Response Relationship of Exercise, Part 2: The Narrow Therapeutic Window," *www.ultimate-exercise.com*.

CHAPTER 3

1. *High-Intensity Training the Mike Mentzer Way* (Chicago: McGraw-Hill, 2004), 80.
2. Mike Mentzer, "Metabolic Momentum," *The Revised Heavy Duty Journal* (1979).
3. Ibid.
4. Address to the 29th Annual Convention of the Southern District of AAHPER, Atlanta, February 28–March 3, 1961; reprinted in *Towards an Understanding of Health and Physical Fitness* (Dubuque, Iowa: William C. Brown Co., 1963), 302–5.

CHAPTER 4

1. Arthur Steinhaus, speech presented to an institute on "Physical Education and Personality Development," George Williams College, November 9–11, 1934; published with proceedings of the institute as a supplement to the *Research Quarterly of the American Physical Education Association.*
2. Arthur Steinhaus, revised from a paper first published in *55th An. Proceedings, Col. Phys. Ed. Assn.*, 1952.
3. Arthur Steinhaus, keynote address, Conference for National Cooperation in Aquatics, Indiana University, November 15–16, 1961.
4. *Journal of Exercise Physiology* online 7, no. 6 (2004): 52–68.
5. Physiologists H. S. Milner-Brown and colleagues empirically validated the fact that the load imposed upon muscle during contraction is the major factor dictating the type and volume of muscle fiber recruitment; the results of their research were published in the *Journal of Physiology* 1973: 230, 350. See also *Journal of Neurophysiology* 55, no. 5 (May 1986): 1017–29; and *Journal of Neurophysiology* 57, no. 1 (January 1987): 311–24.

CHAPTER 8

1. *Max Contraction Training: The Scientifically Proven Method for Building Muscle Mass in Minimum Time* (Chicago: McGraw-Hill, 2004), 49.

CHAPTER 11

1. "When you exercise your muscles intensely, muscle cells are damaged, releasing enzymes into the bloodstream. The degree of damage can be measured by the level of these enzymes in your blood. . . . Potassium—given off from the muscles to prevent overheating—and glycogen—the main fuel of muscular exercise—are used up and must be replaced."—Gabe Mirkin and Marshall Hoffman, *The Sportsmedicine Book* (Boston/Toronto: Little, Brown, 1978), 187–88; "Training can bring about considerable improvement in both aerobic capacity and glycogen content of the muscle."—Herbert A. deVries, *Physiology of Exercise for Physical Education and Athletes* (Boston: William C. Brown Co., College Division, 1980), 17; and "At heavy work loads of 70–80 percent of capacity, glycogen stored in the muscle cell provides the energy for contraction, and endurance time depends on the level of glycogen storage in the muscle at the beginning of exercise."—Ibid., 44.
2. Glycogen storage capacity is enhanced in strength-trained athletes . . . rate of muscle glycogen synthesis appears to be enhanced following strength training—Per A. Tesch, "Skeletal Muscle Adaptations Consequent to Long-Term Heavy Resistance Exercise," *Medicine and Science in Sports and Exercise* (1988), American College of Sports Medicine. The finding of increased glycogen levels was confirmed in bodybuilders by P. A. Tesh, E. B. Colliander, and P. Kaiser, "Muscle Metabolism During Intense, Heavy-Resistance Exercise," *European Journal of Applied Physiology* 55 (1986): 362–66. This agrees with data compiled following endurance-training programs and also in endurance-trained athletes by K. Piehl, "Glycogen Storage and Depletion in Human Skeletal Muscle Fibers," *Acta Physiologica Scandinavica* (Suppl.) 402 (1974): 1–32.
3. "When muscular work is such that glycogen depletion is brought about, the muscle responds by large increases of glycogen storage. This response is complete within twenty-four hours on a carbohydrate rich diet, but may take eight to ten days on a carbohydrate-free diet of equal caloric content."—Herbert A. deVries, *Physiology of Exercise for Physical Education and Athletes* (Dubuque, IA: William C. Brown Co., College Division, 1980), 43; and "The 'overshoot phenomenon'—that is, when a muscle is worked hard enough to bring about glycogen depletion, then it develops the ability to store greater than normal amounts of glycogen . . . the overshoot phenomenon works only for the muscle that has been worked, and the glycogen storage level varies considerably from muscle to muscle."—Ibid., 44.
4. "Depending on how hard you have exercised, recovery can take from ten hours to ten full days. Muscle pain may indicate that you are running out of glycogen—and this is good. The more often you deplete glycogen from the muscles, the more glycogen the muscles can hold."— Gabe Mirkin and Marshall Hoffman, *The Sportsmedicine Book* (Boston/Toronto: Little, Brown, 1978), 187–88.

CHAPTER 12

1. Address before the Congress of Physical Education and the International Sport Student's Camp convened in Berlin, July 23–August 17, 1936, in connection with the XI Olympic Games, under the auspices of the Ministry of Education of the German government. Published in *JHPE* 38 (June 1937).
2. R. A. Berger, "Comparison of the Effect of Various Weight Training Loads on Strength," *Research Quarterly* 36 (1963): 141–46.
3. Ibid., 144–45.
4. Fred Hatfield, *Bodybuilding: A Scientific Approach* (Chicago: Contemporary Books, 1988), 34.

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About the Author

John Little is the author of more than thirty books on bodybuilding, martial arts, history, and philosophy and is the creator of Max Contraction Training (max contraction.com). Little is the owner, along with his wife, Terri, of Nautilus North Strength & Fitness Centre, which has been described as one of the leading fitness research centers in North America. Little's research and articles on health and fitness have been published in such magazines as *Muscle & Fitness*, *Flex*, *Men's Fitness*, *Ironman*, *Inside Kung Fu*, and *Blackbelt*. He is also an award-winning filmmaker.

For more information on John Little's Max Contraction Training, please visit his website maxcontraction.com.