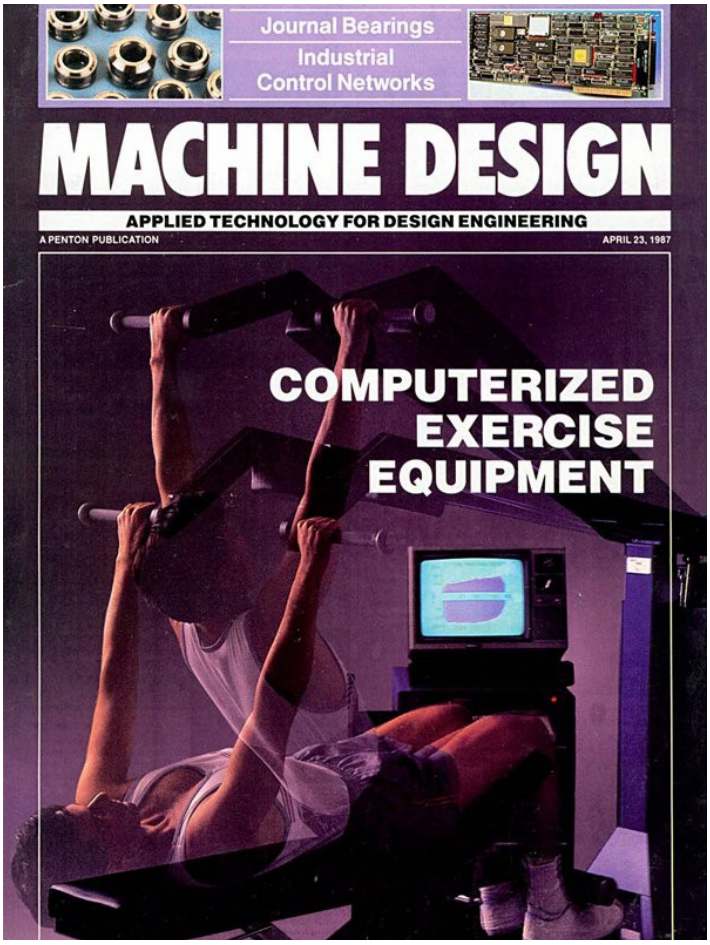
Chapter 11: The War Between Universal and Nautilus

I previously described that one of my first projects was with the Universal Gym Equipment Company and the inaugural use of our newly invented sonic digitizer installed in my kitchen. My work with the Universal Gym Company resulted in a beneficial relationship for both CBA and Universal. I created new designs and changed the old styles from ordinary standard exercise machines with which everyone was familiar into ones that were specifically built according to scientific principles.

Harold Zinkin, the owner, and his entire Universal staff were open to this new way of providing exercise machines that automatically adjusted to the exerciser's body and assisted the person in each lift. Harold had been a superb weight lifter and body builder during the days of bar bells and dumb bells on Muscle Beach, California. Harold was one of the early devotees of strength development in the armies of exercise and fitness enthusiasts who trained for many hours every day on the sunny beach of California. Although he was relatively short in stature, he was enormously tall when it came to thinking about exercise and equipment to increase strength.



One of Harold's best friends was the legendary Jack LaLane. Many of these famous exercise fanatics and the gurus of the fitness industry believed in myths or in the latest fad without scientific evidence to support their theories regarding strength development. Even today, the designers and the so-called experts in the exercise field believe in myths or speculation as to what people need just as people at the time of Copernicus thought that the Earth was the center of the Universe.

It was not that the relationship between resistance and muscle strength was new during Harold's days on the beach or even now. Probably as early as Milo the Greek, who lifted a baby calf every day until it was full-grown, people have lifted weights to increase their strength.

In 1948, DeLorme adopted the name "progressive resistance exercise" for his method of developing muscular strength through the utilization of counter-balancing the weight of the extremity with a cable and pulley arrangement. Two gifted individuals, Thomas DeLorme and Arthur L. Watkins, MD, published landmark papers on strength training. Since the publication of their papers, thousands of physical therapy students have been introduced to DeLorme & Watkins therapeutic exercise prescription methods, termed Progressive Resistance Exercise (PRE) and their 1948 prescription of 3 sets of 10 repetitions using 50%, 75%, and 100% of a 10 RM load. Today, many physical therapists are taught and prescribe therapeutic exercise theoretically using DeLorme & Watkins 3 x 10 model.

McQueen distinguished between exercise regimens for producing muscle hypertrophy and for producing muscle

power. He concluded that the number of repetitions for each set of exercise determined the different characteristics of the exercise.

Hundreds of studies have been published about developing muscular development through resistance exercises using different techniques. These techniques include isotonic, isometric, and eccentric exercises, the Oxford technique, double and triple progressive systems, super set systems, isokinetic exercise systems, chains and barbells, springs systems, and the list continues. Each system has been supported and refuted by numerous studies. Berger performed some of the best research and he concluded that six to seven repetitions three times a week is best for developing dynamic strength. Steinhause conducted other excellent research and he emphasized the need to increase the intensity, but not the amount of work, in order to develop maximum strength.

Throughout my own life, from a young teenager pulling against strings attached to the wall, to an Olympic athlete lifting traditional weights, I have been interested in muscular development and its application to athletic events. As a master's and doctoral student, I pursued research topics which reflected this on-going fascination with strength development. I prepared an article, titled "Resistive Training", which was printed in Clinics in Sports Medicine.

When a person uses any resistance device, there are two types of forces applied on the body. The internal forces produced by the muscular system and the external forces produced by the resistance device. Consideration of the magnitude of the externally applied resistance cannot be the only consideration in muscular training. Rather, the magnitude, action line, direction, and point of application are all characteristics which must be considered to develop maximum muscular training. Physical educators, trainers, physical therapists, and athletes deal constantly with muscle forces, both normal and super-normal, but little is actually known about the actual magnitudes of these forces.

The human body is a system of linked segments and forces which cause rotation of the parts about their anatomical axes. Both muscle and gravitational forces are important in producing these turning effects which are fundamental to body movements in daily living and sports. Pushing, pulling, lifting, kicking, running, and walking are all results of rotational motion. The linked segments are our rigid bones and the power to move the bones is caused by the contractions of our muscles.

To illustrate the mechanical principle governing the human muscular system, a good example is a seesaw. Nearly everyone has had the experience of going to a park and riding up and down with a friend on a seesaw. Understanding the principle of how to create the joy of going up and down is quickly derived from personal experience. If one child is

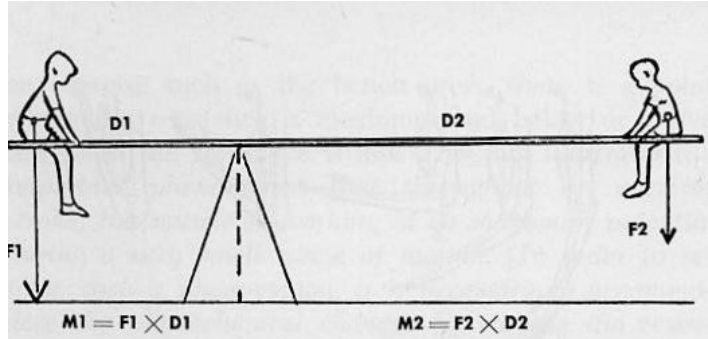


Figure 1. Illustration of the Principle of Moment.

Example: Assume the following:

D1 (Lever arm 1) = 100 cm.
D2 (Lever arm 2) = 200 cm.
F1 (Weight of child 1) = 80 kg.

In order to calculate F2 (Weight of child 2) we have to use the principle of Moment.

The moment produced by child 1 is:
F1 × D1 = 80 × 100 = 8000 Kg.cm.

The moment produced by child 2 is:
F2 × D2 = ? × 200 = 8000 Kg.cm.

From this simple equation one can see that F2 can be easily obtained:
? × 200 = 8000 ? = 8000/200 = 40 kg.

Child 2 must weigh 40 kg. in order to balance child 1 who weighs 80 Kg.

Moment of Force
http://arielnet.com/ref/go/1143

heavier than the friend, the bar has to be adjusted to accommodate the differences in weight. The location of where the bar is placed or balanced is called the fulcrum. Through the trial and error of experience, children rapidly learn that their size determines how they must adjust the bar.

What children learn, without the benefit of fancy mechanical terminology, is that the weight of the child and the distance from the fulcrum are both important in determining the force needed to balance the other child. This principle, widely used throughout the entire field of biomechanics, is the "Principle of Moments". The definition is: "the moment of a force about any point is equal to the magnitude of the force multiplied by the perpendicular distance from the action line of the force to that point." A diagram illustrating this principle is shown above:

Since a moment is a force multiplied by a distance, it may be increased or decreased in either of two ways. One way is to change the magnitude of the force and the second way is to change the distance from the fulcrum. In the case of the seesaw, if two boys are of equal weight, they must sit at the

same distance from the fulcrum to the end of the board. If one boy plays with a child half his weight, this child must sit twice as far from the fulcrum in order to balance.

Another important consideration for all movements is the relationship between the skeleton and the muscles which are attached to each of the bones in it. The human body consists of a reciprocating arrangement of our muscles and the levers which are our bones. When we move, we change the angle that the muscle pulls on the bone. For example, holding a weight in the right hand and bending the elbow, moves the weight upwards. As the elbow bends, the muscles attached to the upper arm constantly change the amount of force needed to raise the weight upwards. The length of the lever arm and the angle of muscular attachment to the bone are offset by changes in the ability of the muscles to develop torques about the joints. Therefore, there are three factors involved in movement:

1. The length of the lever (bone)
2. The angle of muscle attachment to the bone
3. The length of the muscle itself

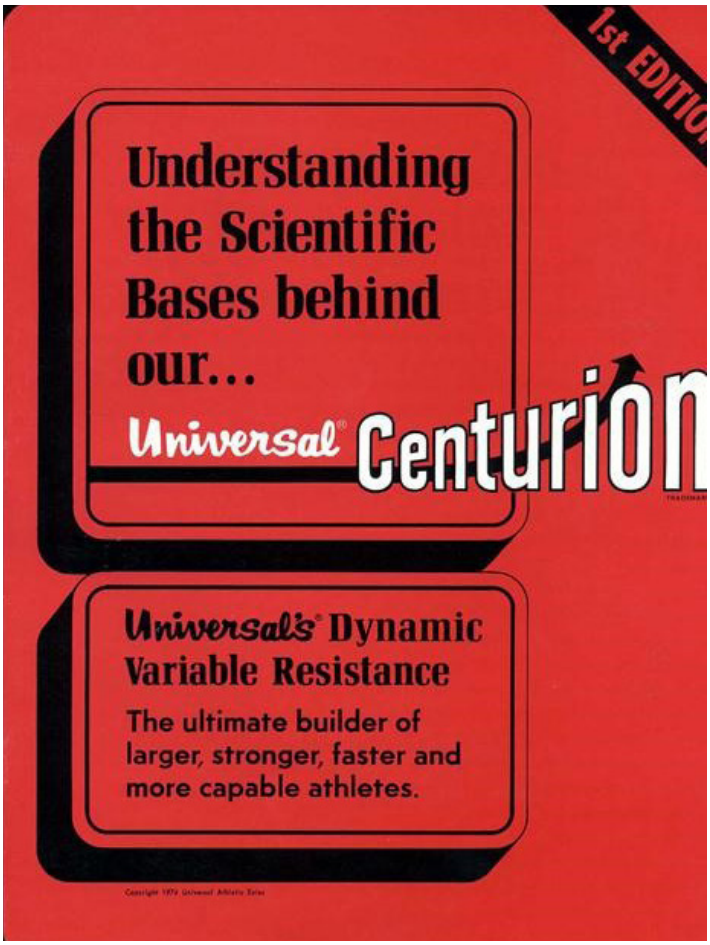
Some of the information about muscular activity is covered in the "Red Brochure" on the right.

There is a compensatory relationship between the geometric arrangement of the lever and the physiology of muscle contraction that allows smooth bodily movements.

In addition to consideration of the human body's internal leverage system, the levers and resistance of exercise equipment must be calculated to facilitate and optimize the increase in muscular strength. To facilitate maximum muscular involvement, the resistance must vary. To develop exercise equipment to achieve the best design, the resistance should vary according to the biomechanical data obtained under dynamic conditions.

Consider, for example, a well-known weight lifting exercises, the bench press. Using the normal barbell arrangement, the resistance varies by as much as 100 percent during the entire movement. At the beginning of the exercise, the force necessary to raise the bar is higher, while in the middle and at the end, the muscle effort will be less. To increase the muscular involvement throughout the entire exercise, the leverage system of the equipment must change. The resistance to the muscle must occur throughout the entire range of the motion in order to increase strength. To be effective, this resistance should increase or decrease according to the biomechanical data obtained under dynamic conditions for each separate exercise.

Another joint that can and should be studied because of its importance to everyone regardless of age or gender is the knee. The knee is crucial for locomotion. Just like that old song about the foot connecting to the knee joint and



The Red Brochure
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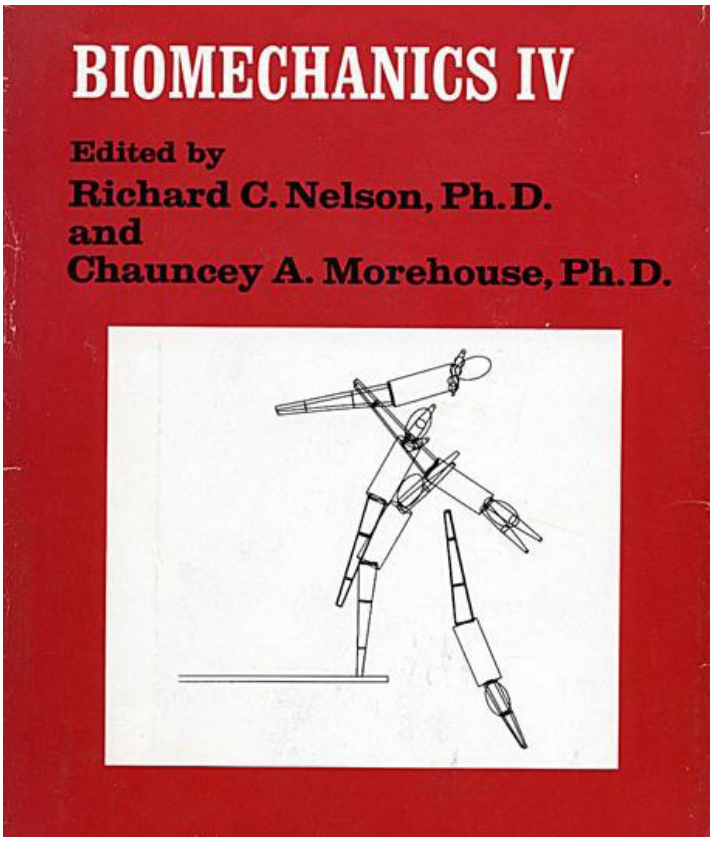
on up the skeletal system, anything which disrupts the normal function of the knee will affect the entire body. When a person limps due to a knee problem, the resultant forces are transmitted to other parts of the body in ways similar to those which I previously discussed for football and gymnastic injuries. Back and shoulder pains are commonly associated with long-term knee problems and can result in chronic complications elsewhere in the body.

In 1972, we collected data on the knee using X-ray photography. The X-ray gave us information on the internal structure and movement of joints, in this case the knee. The following is one analysis among many on the intra-articular forces at the knee joint during a squat exercise.

The figure on page 232 presents a sample of an x-ray used to determine the knee joint model. The figure shows a person executing a squat exercise with weight. The goal for the weight lifter is to increase the muscular strength primarily in the vertical direction. In other words, to win an Olympic gold medal, the lifter must raise the barbell with more weight than the competitors. To accomplish this task,



Forces at the knee joint during a squat
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the knee joint motion must produce more force components in the vertical direction and minimize those in the horizontal direction. The horizontal forces are frequently referred to as "shear forces".

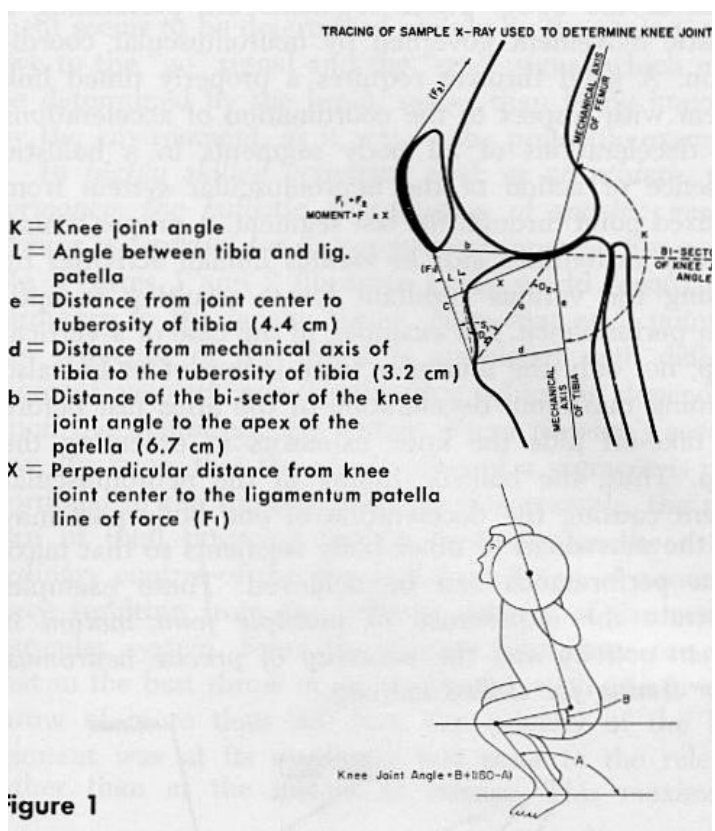
To evaluate the forces on the knee, the most important information can be gleaned by calculating the moment arm. The moment arm, shown in the figure as "x", is defined as the perpendicular distance from the joint center to the line of force generated by the muscle. As the knee bends, the moment arm changes. The goal is to minimize the shear force component and maximize the vertical force component. Quantification of the moment arm is particularly useful for this purpose. The changes in the moment arm of the joint should be considered when designing exercise equipment.

Another vulnerable part of the body, which is routinely exposed to shearing forces, is in the lower back between the fourth and fifth lumbar vertebrates. For all of us who walk on two legs and also lift and carry packages, there is a risk of lower back pain and injury. For decades, there has been continued interest in the prevalence and etiology of lower back pain in industrial applications, injuries in the home, and sport-related problems.

Back injuries are commonly associated with the lifting of weights. Almost any weight lifting exercise, executed while standing with erect posture, is associated with great force on the vertebrate column. Kotani, et al., found a high incidence of scoliosis, prolapsed disc, and other injuries to the vertebral column and its associated structures in competitive weight lifters. The risk of degenerative and traumatic lesions of the spine is not confined to those engaged in competitive lifting since athletes in many different sports routinely incorporate weight training as part of their training routines. Young and inexperienced lifters represent another high-risk population as noted by Troup.

In a study of pressures in the trunk cavities when pulling, pushing, and lifting, Davis found that with increased stress on the vertebral column, the abdominal muscles are very active in relieving the load on the lumbar spine. Thus, the abdominal muscles counteract the shearing force to a certain extent. This factor illustrates the importance of well-developed abdominal musculature to aid in the prevention of low-back pain in weight lifting. The widespread use of the waist belt among weight lifters is not worn to support the back, as many people believe. Rather the function of the belt is to

Biomechanics of the deep knee bend



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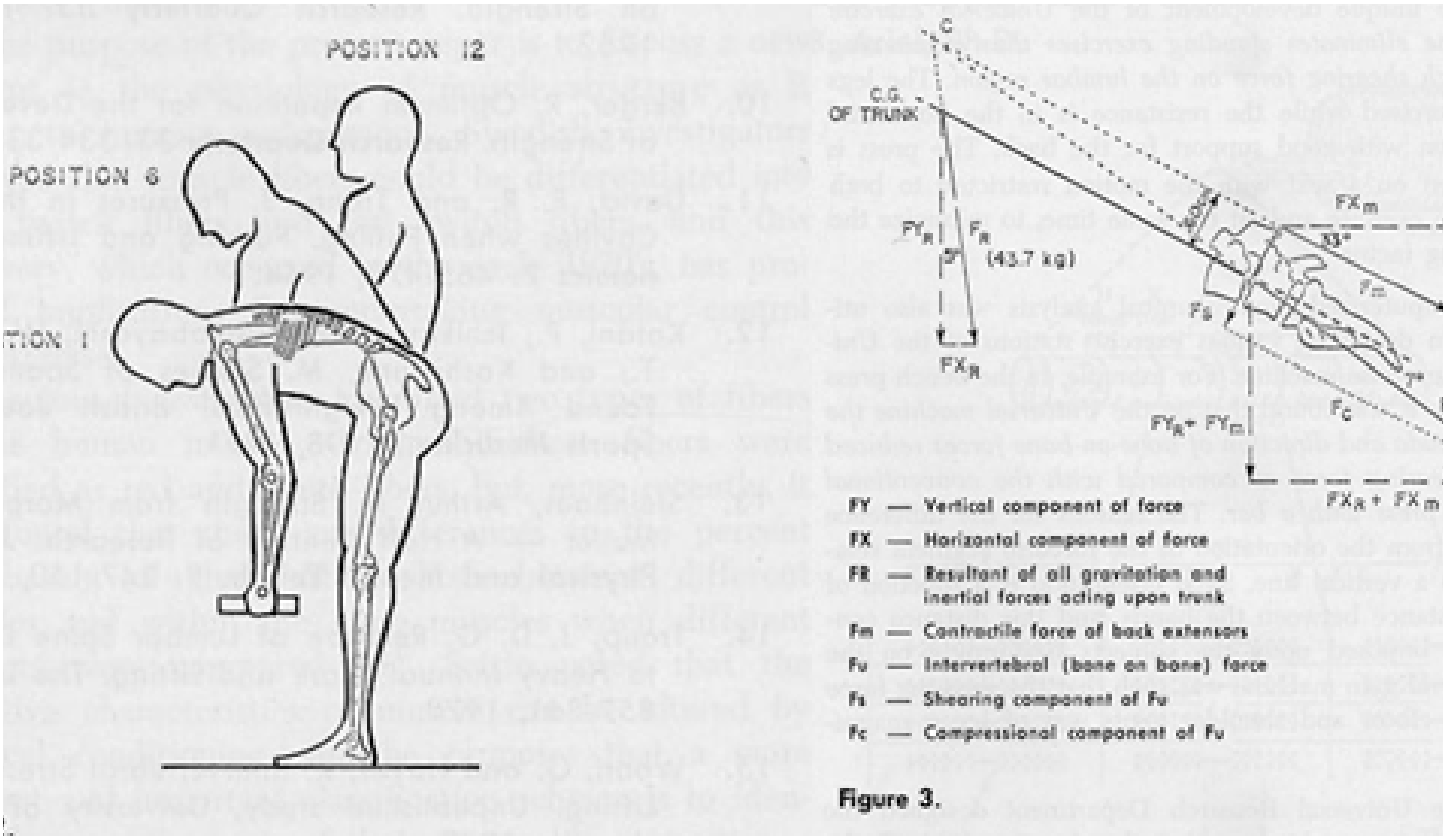

Trunk bending

increase the strength of the abdominal muscles to resist the shearing force on the lumbar region.

In 1973, there were no exercise equipment companies familiar with biomechanical calculations or with the ability to design their products to accommodate the dynamically necessary changes. Many manufacturers may have thought about the need to improve their designs, but they did not have the data to actually build new equipment. It was, therefore, a unique situation to be approached by a major exercise manufacturer to help them design better equipment. It was another indicator of the creativity and open-mindedness of Harold Zinkin of Universal Gym. He had been an innovator during his earlier years on Muscle Beach and now he was thinking of the future by seeking biomechanical improvements in his line of exercise equipment.

We used our CBA technology to evaluate the existing Universal equipment. Following these biomechanical analyses, we designed a new system which was able to change the resistance for each separate exercise according to the dynamic needs of the person exercising. This new system was labeled "Dynamic Variable Resistance" or DVR as it became known. These exercise machines utilized an appropriate resistance lever arm in accordance with the requirements of Kinesiology and human anatomy, and were based on the dynamically quantified biomechanical information. The design automatically determined the moment of force in each exercise and simultaneously considered the muscular and the dynamic forces due to the motion.

In 1974, Universal Gym introduced several DVR machines which incorporated the biomechanical research and development which we had performed at CBA. Two of the new scientifically designed exercise machines were:

1. Bench press machine: the Universal variable resistance bench press station demonstrated an automatic loading effect enabling total muscle training throughout the range of motion because of the cambar arrangement.
2. Leg press and shoulder press stations: this new variable resistance leg and shoulder press stations optimized the resultant force in the appropriate direction and at the same time minimized the shearing force. As discussed previously, a shearing force represents the intra-articular stress on the joint. The unique development of the leg machine was to eliminate standing posture when executing the exercises. The exercise is performed while seated and the legs

DVR Universal Machine
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are exercised against a resistance applied in the horizontal direction. By providing good support for the back, the press is executed on a seat with the motion restricted to suit the exercise and, at the same time, to minimize the shearing factor. Thus, high shear forces in the lumbar region are eliminated.

For nearly all of the newly designed Universal equipment, the total muscular performance exceeded 85 percent of maximum muscular movement involvement throughout the range of motion. This extended range of motion permitted maximum training for each muscular group involved.

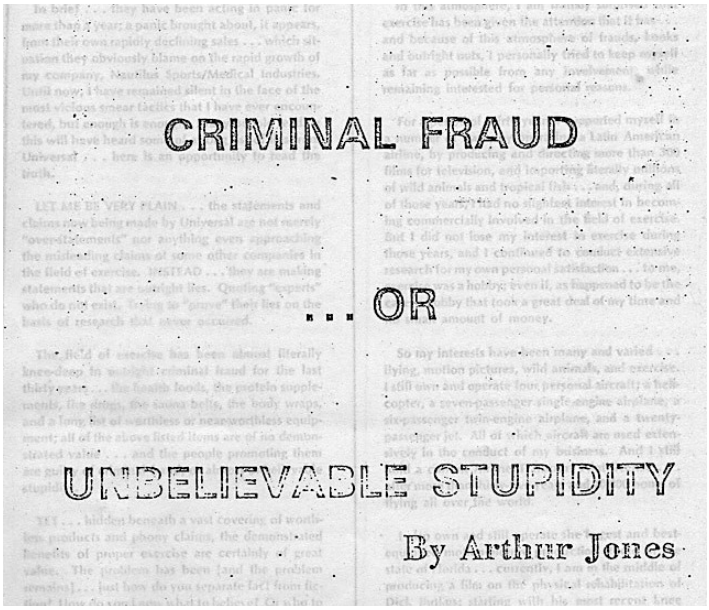
After Universal Gym introduced the first few DVR machines and explained the biomechanical principles which I had taught them, the reaction from their competitors was immediate and fierce. I realized how difficult it must have been for Galileo when the soldiers locked him out of his house for telling the world that his calculations indicated that the Earth rotates around the Sun. I am not trying to compare myself to Galileo who was one of the greatest scientists of the last 600 years, but rather, that we had each done something that was correct but revolutionary for its time.

From 1974 and for years after, thousands of Universal Gym machines were sold around the globe. Universal hired CBA to send me around the world to present my research at various conferences. We both benefited from this relationship since they received publicity from a well-known biomechanist and I was able to present the CBA technology in conference settings. My personal goal was to attract compa-

nies interested in our quantification technologies that would hire us to perform work on their products. We already had a proven track record of positive results and this was a wonderful opportunity to present my company in favorable settings.

The strategy was working well until one day when, unexpectedly, an article was published in the Athletic Journal, which was one of the main fitness and exercise publications at that time. The title of this article was "Criminal Fraud or Unbelievable Stupidity" and the author was Arthur Jones. I had never heard of Arthur Jones before that article was published but he blasted into my world like the meteorite that smashed into the Yucatan peninsula 65 million years ago causing the extinction of the dinosaurs. As events evolved, Arthur Jones was prehistoric in his thinking.

I soon discovered that Arthur Jones was the owner and the founder of the Nautilus Company. Nautilus was a major commercial competitor of Universal. The article was seven


CRIMINAL FRAUD

... OR

UNBELIEVABLE STUPIDITY

By Arthur Jones

Arthur Jones accusing me of "criminal fraud… or unbelievable stupidity"
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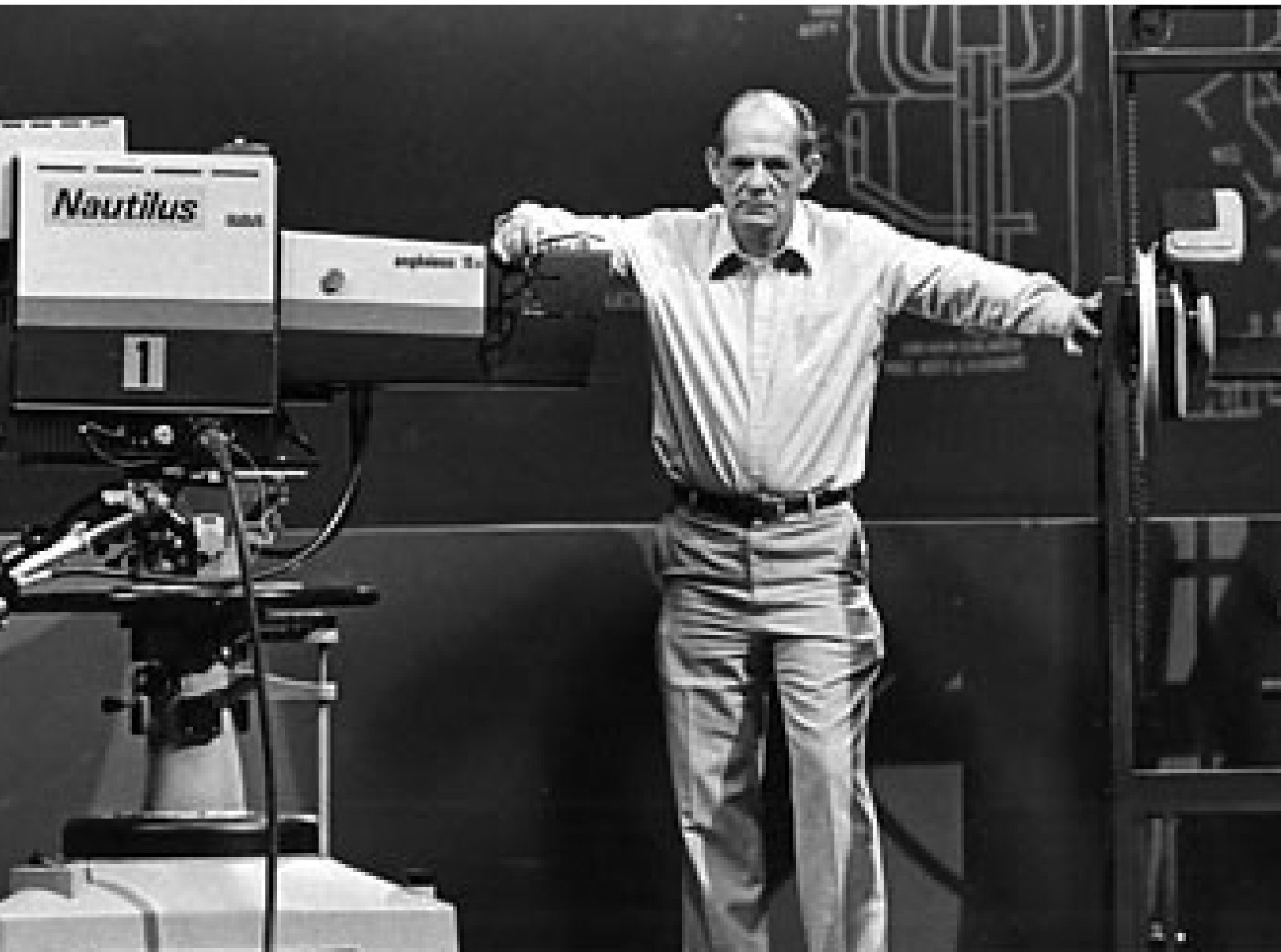

pages in length and hurled many outlandish claims against both Universal and me.

Arthur Jones was allegedly a wild and eccentric character in his own right. The claim was that he always carried a gun and, according to urban legend, he had people pistol-whipped when he was provoked. He owned two 707 airplanes which he used to fly his exercise equipment units from their manufacturing base in Colombia to the U.S. for sale.

In his younger years, Arthur Jones had lived in Africa where he filmed and produced a television program called "Wild Cargo". It was a popular show in America because it showed daring and exciting rescues of African animals which were in danger from situations such as environmental threats or poachers. After he had left Africa, he moved to a small town in Florida, Lake Helen, where he had based his Nautilus Company. He had a collection of unusual pets including snakes, spiders, quails, and a big crocodile named Jack. I always knew him to be a great animal lover. In fact, in his later years, he flew 63 baby elephants to his farm in Lake Helena from Africa where they were to be culled. (For those who do not realize it, "cull" is a fancy way to hide the real meaning which is the "selective slaughter of wild animals".) Arthur saved these baby elephants from death.)

To the best of my knowledge, Jones never finished elementary school and, most certainly, had no advanced academic education. He was what is known as "street smart" and had used his imagination and intuition to develop monstrous exercise equipment. Unfortunately, his machines were massive and, although extremely well made, they were exactly backwards for the purpose of dynamic strength development. The machines had to be used at a slow, deliberate speed. If the exerciser tried to move quickly, enormous inertia was generated which caused the weight stack to move upward rapidly. The result was that the exerciser could develop hypertrophy, but not the strength needed for dynamic athletic activities. Athletic activities require fitness training to be dynamic rather than slow and steady.

Athletic events are nearly always explosive movements. Hitting a golf ball or swinging a baseball bat involve sufficient muscle resources contracting together to hit the object as far as possible. These explosive events require muscles to contract together, in synchrony, with power rather that with a slow, regulated pattern of control. A slow controlled movement, such as painting with a brush or tracing a line with the finger, does not require a dynamic burst of muscular contraction. These two different types of movements dictate different types of training protocols. Training for slow movements will not improve batting in baseball. Performance in explosive events, such as the shot put, will not be improved with slow controlled exercise regimens. Therefore, the Nautilus equipment was fine for some activities but not for sports training.

Ed Burke in the 1968 Olympics
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It seemed that Arthur Jones first encountered the Universal Gym DVR machines in 1974 at a Trainer Convention in Kansas City. I did not meet him at that time but it was reported that he was extremely angry. The stories of his ranting and raving were legendary. After the show closed, Jones began his attack on me and on Universal.

In his Athletic Journal article, Jones talked about his company and all of his ventures. However, I will present the statements that are relevant to this story.

On page 1, Jones stated:

> *Think it is about time for somebody to make some very plain statements… and if you are involved in any aspect of coaching or physical training, then the following may well be one of the most important things you will ever read.*
>
> *Universal Athletic Sales Company is guilty of outright CRIMINAL FRAUD… or, if not, then they are certainly guilty of almost unbelievable STUPIDITY.*

Additionally,… they are guilty of libel, slander and malicious lies. As well as utterly false claims and phony documentation.

LET ME BE VERY PLAIN… the statements and claims now being made by Universal are not merely "over-statements" nor anything even approaching the misleading claims of some other companies in the field of exercise. INSTEAD… they are making statements that are outright lies, quoting "experts" who do not exist. Trying to "prove" their lies on the basis of research that never occurred.

The field of exercise has been almost literally knee-deep in outright criminal fraud for the last thirty years… the health foods, the protein supplements, the drugs, the sauna belts, the body wraps, and a long list of worthless or near-worthless equipment; all of the above listed items are of no demonstrated value… and the people promoting them are guilty of criminal fraud, or almost unbelievable stupidity.

YET… hidden beneath a vast covering of worthless products and phony claims, the demonstrated benefits of proper exercise are certainly of great value. The problem has been [and the problem remains]… just how do you separate fact from fiction? How do you know what to believe? Or not to believe?

The last was a good question but one he forgot to ask himself. He was clearly entitled to his attitudes, ideas, and concepts although I did not agree with most of them. This is a free country and you are allowed to believe whatever you want. Some of his complaints were probably hyperbole but, apparently, it made him feel good to expound on them. However, his personal and unjustified attacks on Universal and me were factually wrong, scientifically incorrect, and a mirror image of his own claims.

On page 2, Jones continued:

"…Then, later, Burke told a number of people that I made threats against his life although, even later, he assured me to my face that he had NEVER made such statements to anybody; that, in fact, he had never said anything to anybody that could even be twisted into being a critical statement regarding me or my products. Ed Burke is a liar and, in due course, we will prove it in court; with a long list of witnesses that will put him in jail where he belongs… highly respected medical doctors, coaches, trainers, people that a judge will not doubt."

Meeting with Ed Burke 45 years later

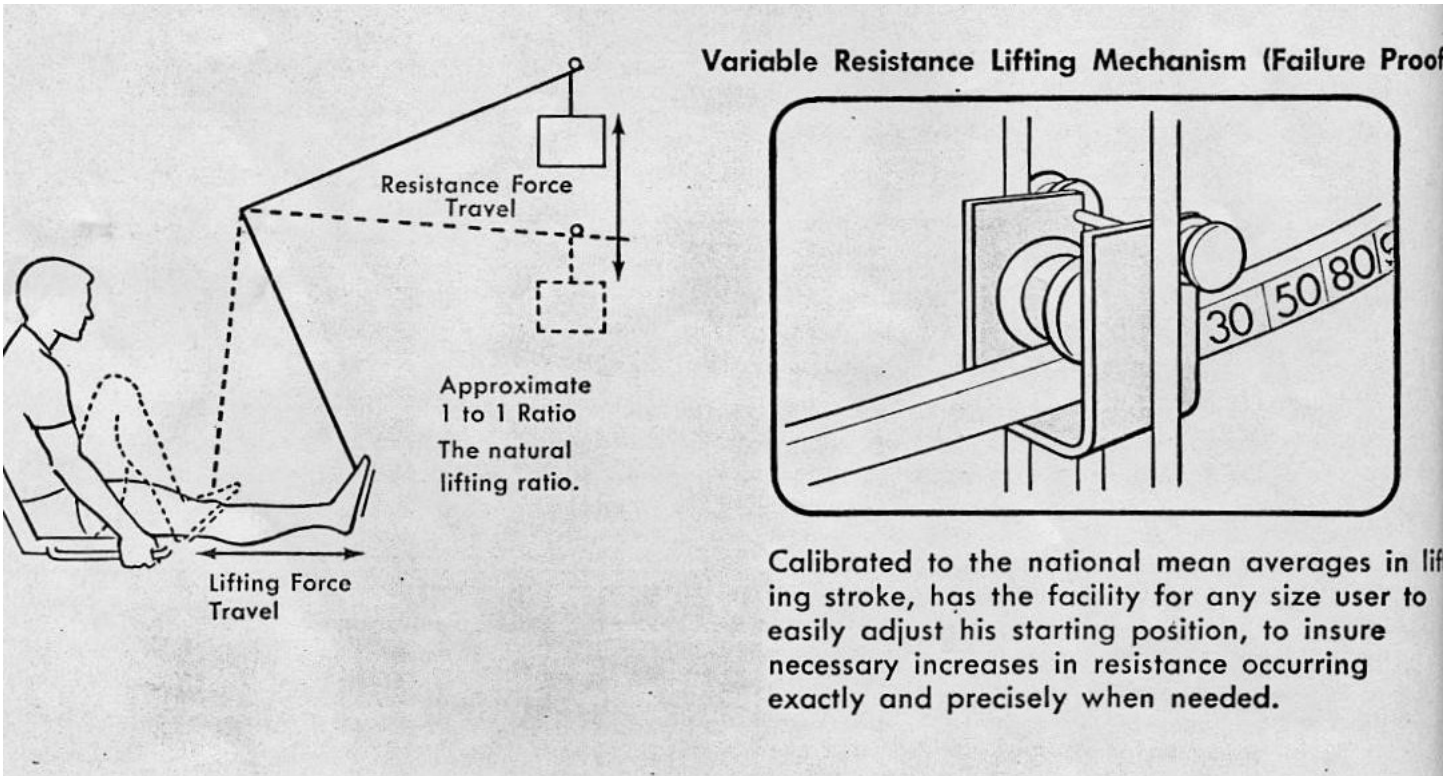
The man Jones was attacking was Ed Burke, the American hammer throwing champion who had competed in the 1968 Olympics Games in Mexico City. Although he had not thrown far enough to win an Olympic medal, he remained the U.S. champion. Long after the events described here with Arthur Jones, Ed Burke resumed his training and decided to compete in the 1984 Los Angeles Olympics. He received the great honor of being elected by all of the American athletes to carry the flag as he led the United States Team into the stadium at the Los Angeles Olympic Games Opening Ceremony.

In 1974, Ed had been working for Universal for many years and I worked with him at shows presenting the Universal machines. I was aware of the fact that Jones had threatened Ed at various times and once he put a gun to Ed's head. In addition, Jones had threatened Ed and his family so many times that Ed felt the need to move from Fresno, home of Universal, to another city. Since I spent time with both of them over the years, I can say without dispute, that Ed Burke was and is an honorable, honest person. I cannot say the same about Arthur Jones.

On page 3, Jones continued his rant:

"A few months after that telephone conversation, Universal suddenly sprang their "HERO" onto an unsuspecting world… the "great doctor" Gideon Ariel, according to their ads, had invented a new and totally revolutionary type of Universal Exercise machine with variable resistance. Which variable resistance, of course, was "exactly correct"?

Well the facts are that Gideon Ariel is an outright fraud… AND, rather than provide a perfectly balanced "variable resistance," their machines DO NOT VARY AT All, remain absolutely constant in all positions.



Mechanism for Dynamic Variable Resistance
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When I first saw their initial ads, concerning the new Centurion line of Universal machines that supposedly provided variable resistance, I simply could not figure out how it was supposed to VARY. Then, when I first saw the machine itself, I instantly realized that it doesn't vary, that it is exactly the same in every position. So I approached the great doctor, Gideon Ariel, and I asked him… "How much does your leg-press force increase during the full stroke?" And he said, "The exact amount for the mean average." (Which is pure double talk nonsense.) I said, "Tell me in figures, so a dumb guy like me can understand. What percentage does it increase?" Because… in order to vary the resistance you must vary the torque; and in order to vary the torque you have to change either the leverage or the perpendicular force, or both… and since both remain constant in this machine, it should be obvious to an idiot that the resistance doesn't vary. Then I offered to bet him a thousand dollars that his machine didn't vary at all, that the resistance remained absolutely constant in every position. He refused to bet."

"Later that night I offered to bet one-hundred thousand dollars against a "used dough-nut" that the Universal machine didn't vary at all; this bet being offered to and refused by Chuck Coker, the President of Universal. When I first met Gideon Ariel, I didn't know him from Adam… but it didn't take long to check him out… and, in any case, it was obvious at first glance that he was either an utter fool or guilty of criminal fraud. If he really believed his statements, then he was almost unbelievably stupid. And if he was aware that his statements were lies, then he was guilty of criminal fraud. Take your pick; there is no other choice, fool or fraud."

Jones was correct in saying he did not understand how the DVR functioned. He was clueless and wrong about how the mechanism functioned on the DVR machines. His ignorance and outrageous hatred were staggering. The most amazing part of the entire attack was that he was wrong about all of his scientific claims and, therefore, guilty of exactly what he was accusing others of doing or being.

At this point, I should not have been surprised to read that one of my old adversaries from the University of Massachusetts, Dr. Plagenhoef, would come back to haunt me through the distorted lens of Arthur Jones.

"Having thought so, and having discovered much what I expected to after meeting Ariel, I invited Professor Stan Plagenhoef of the University of Massachusetts to

come to the Trainers convention in Kansas City for the purpose of confronting the great doctor Ariel.

Professor Plagenhoef, you see, was Gideon's former teacher… and, at the moment, is bringing charges against Ariel for fraud, lies, false statements and false claims and similar outrages.

Then I said… "Gideon, l want you to know that your Professor, Dr. Plagenhoef, stood up for you… you see, Gideon, I was worried about you; I thought you are guilty of criminal fraud… so I asked your professor if it was really possible for you to be stupid enough to believe your own claims. And he assured me that you were… he told me that you were so dumb that you were capable of believing almost anything.

For your part, be you coach, trainer, doctor or athlete… it would pay you to investigate the facts; and if you have been unlucky enough to purchase a Universal machine advertised as providing "variable resistance," then you are also in a position to bring charges of fraud against Universal."

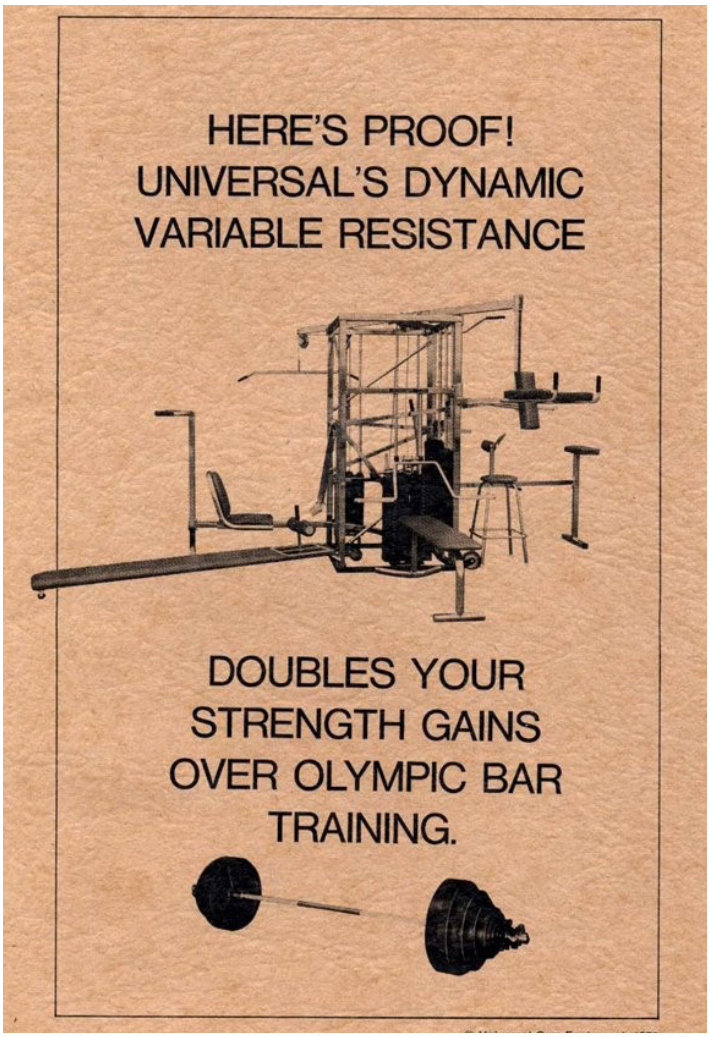
I was not surprised that my old adversary, Dr. Plagenhoef, was attacking me even with the likes of Arthur Jones.

What did shock me was that my professor, the one who had taught me biomechanics and accused me of not knowing enough about engineering to have my own company, was unable to understand how the mechanism that I had devised for the Universal machine varied the resistance. Not liking someone is insufficient reason for misunderstanding basic physics and engineering principles.

An engineering professor of mine, Paul Tartaglia, and I had designed a sleeve mechanism which we attached to the bar. This mechanism consisted of a roller that always applied the force perpendicular to the bar. What this accomplished was that when the bar was pushed, the moment arm became longer and the resistance increased. A diagram illustrating this system is shown on the left.

It was understandable that Arthur Jones lacked sufficient engineering education to make the appropriate calculations to realize how the force applications were made possible by the DVR mechanism. But when Professor Plagenhoef was unable to make the correct assessment, I could only surmise that he did not want to recognize the simplicity and cleverness of the device. Either he did not calculate how the device worked or was merely blinded by hatred for me personally.

After the spectacle of the show, Harold Zinkin arranged for me to travel to Universal's home site in Fresno, California. Based on the accusations, despite the craziness of source,

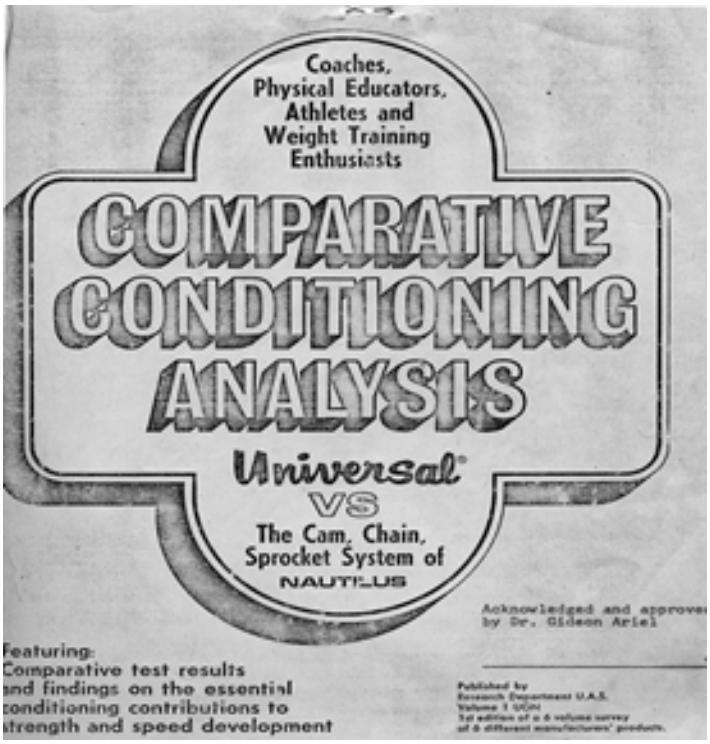


Truesdail Laboratory Report
http://arielnet.com/ref/go/4013

we concluded that it would be a good strategy to have the machines tested by an independent professional equipment testing company. One of the leading companies for this task was Truesdail Laboratories. I was familiar with the company since they had been instrumental previously in the Johnny Carson case.

Truesdail Laboratories agreed to test the equipment and provide detailed results. Universal provided the machines for testing with the specific purpose to determine whether they varied in resistance as I had calculated. There was no question that the resistance changed. However, the primary issues were the accuracy of my calculations and the functionality of the equipment to perform as desired.

The measurements obtained by Truesdail positively confirmed that the DVR performed as we claimed. As a scientist, I was very happy to discover that Truesdail's results varied less than one percent from the results which I had calculated. The machines did, indeed, vary as the person exercised exactly as



The Green Brochure
http://arielnet.com/ref/go/1151

they had been advertised to do. Now, Universal had an independent third-party confirmation regarding their claims. Arthur Jones' diatribe had been wrong on many levels, and now Universal could proceed to prove this in a public forum. Step one was to print and circulate the Truesdail results in a handout available at all of the trade shows. The cover of this brochure is shown above, and the text is available on-line in its entirety from the indicated link.

After the Truesdail results had been published, Harold Zinkin again asked me to come to Fresno as soon as possible. I flew from Amherst to Fresno where Cliff Coker, who was Chuck Coker's son, met me at the airport. Cliff had served in the U.S. Marines in Vietnam and was a war hero with a chest covered with medals. On the way to Universal's office, Cliff told me that Universal was launching an incredibly important project and that he had been selected to head this initiative. I was pleased to hear that Cliff was going to be placed in a leadership role. For the last several years, I had come to know him and was very impressed with his abilities as a planner and leader.

When we arrived at the Universal, I walked into Harold's office and saw a large conference table surrounded by a number of individuals with serious and intense expressions on their faces. Harold Zinkin sat at the head of the conference table with one of the Universal engineers, Dennis Kiser, their sales manager, Ed Burke, and the president of Universal, Chuck Coker. Cliff Coker, the head of research and development, and I sat down at the table and all eyes focused on Harold. I imagined that this environment must be what every campaign resembles before the combat begins.

Harold said, "Gideon, here is what the plans are for the immediate future. Universal is going to file a multi-million dollar lawsuit against the Nautilus Corporation and individually against Arthur Jones."

Cliff continued the thought, "The claims are based on the erroneous statements Jones made in the Athletic Journal, defamation of character issues, and the physical threats Jones made at the Kansas convention."

"What do you want me to do to help?" I asked, pleased that they were going to do something about the outrageous lies and misinformation Jones had published.

Harold leaned forward and said, "We want you to analyze the Nautilus machines. We want to know specifically and scientifically what the Nautilus machines actually do with regard to their claims of providing resistance as well as whether the other performance parameters they claim are correct. We will send an official request directing you to conduct this research.

"Of course," I said. We can perform all of the analyses and prepare a report for you. I then suggested how we could acquire the data and, afterwards, I would perform the biomechanical analyses on the Nautilus equipment.

This project required some subterfuge. We had to take films of the machines without alerting Arthur Jones or any of his sales staff about our activities. Fortunately, Ed Burke and Cliff Coker had many contacts in the exercise and fitness world so they were able to find the Nautilus equipment and arranged for us to film the various machines.

After we had the film, it was business as usual, biomechanically speaking. We used the CBA equipment, personnel, and technology to evaluate how the Nautilus machines performed. After we had the data on the Nautilus, we compared them with the Universal machines.

CBA provided a detailed, in-depth report to Universal Gym. The report included details about each Nautilus machine and a specific comparison with the appropriate Universal model. It was lengthy and filled with scientifically calculated biomechanical results obtained under dynamic conditions.

Following the receipt of the report from CBA, Universal prepared a large brochure to detail the findings we had made. This brochure had a bright, electric green cover, so we referred to as "The Green Brochure". It can be read it its entirety on-line following the link on the top left.

The beginning pages of "The Green Brochure" identified specific pieces of equipment and presented detailed analysis regarding their strengths and limitations. Needless to say, the DVR on the Universal equipment provided more resistance throughout more of the exercise stroke. These strengths were specifically identified. For the Nautilus machines, on the contrary, the limitations were explained in detail and provided the biomechanical and engineering flaws inherent in the equipment.

In addition to quantifying the specific equipment and presenting comparisons, there was a section which addressed the "Principles and Terms" as they related to the conditioning of the human body for strength and fitness. The message presented in the section was to make it clear that any resistance, which a muscle had to overcome, would be beneficial in the development of muscular force. There were differences of opinions between the two companies regarding training principles and the relative effectiveness.

It was explained that there are two primary types of muscular contractions within the human body which are involved with athletic and normal movements: concentric and eccentric. A third type of muscular contraction, isometric, involves the generation of force by the muscles involved but there is no movement of the limbs associated with the generated forces.

Since fitness training involves limb movements, the research focus was restricted to evaluations only of concentric and eccentric motions. Concentric contractions are when the muscles pull one limb segment towards another which reduces the angle between the two segments. With concentric contractions, the muscle becomes shorter. For example, holding a weight in the hand and moving the arm so that the forearm moves upwards towards the upper arm will reduce the internal angle at the elbow. Eccentric contractions are the opposite movements. The muscle lengthens and the angle between the segments increases in size. Holding a weight in the hand, with the weight touching the upper arm, an eccentric contraction would lower the lower arm resulting in increasing the internal angle at the elbow. Another set of terms frequently used to define concentric is "positive work" and eccentric is "negative work".

Daily life activities and sports are blends of these two types of muscle contractions. Walking is an excellent example since it requires bending and flexing of the leg joints, the

Resulting strength levels for both experimental groups as published in the Truesdail report
http://arielnet.com/ref/go/1150

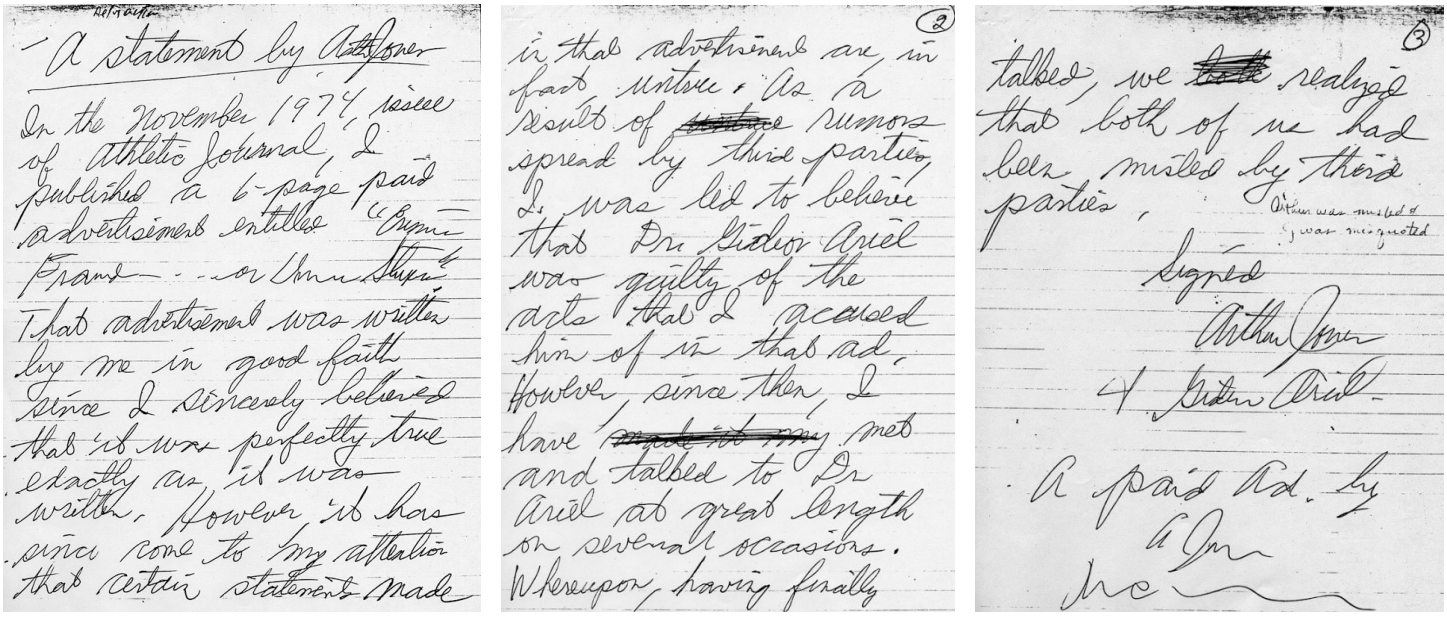
TABLE 1

STRENGTH LEVELS FOR BOTH EXPERIMENTAL GROUPS (in lbs.)

Subject*	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	7th Week	8th Week	9th Week	10th Week	11th Week	12th Week	13th Week	14th Week	15th Week	16th Week	17th Week	18th Week	19th Week	20th Week
A	175	175	180	180	185	190	185	190	190	190	190	185	195	195	190	195	200	200	205	205
B	175	175	180	180	185	185	190	190	195	200	205	210	210	220	220	225	230	230	235	240
C	205	205	210	210	210	210	215	215	215	215	215	220	220	220	220	215	225	230	230	235
D	205	210	215	220	225	225	235	235	245	245	250	255	255	260	260	265	265	270	275	280
E	215	215	225	225	220	230	230	230	235	240	245	245	240	245	250	250	250	250	255	255
F	215	215	225	235	245	255	255	260	265	270	270	270	275	275	275	285	285	290	295	295
G	220	220	220	225	225	225	230	230	230	235	235	240	245	245	250	250	255	260	260	260
H	220	230	230	240	245	250	255	260	265	270	275	280	280	285	290	290	295	300	305	310
I	220	220	220	225	230	230	235	240	245	250	255	260	265	270	275	280	280	285	290	290
J	230	230	235	240	245	250	255	265	275	285	290	295	300	310	315	315	325	330	335	340
K	230	235	240	240	240	245	250	250	250	245	250	255	260	260	265	270	270	270	275	275
L	235	235	240	245	250	255	260	265	270	270	280	285	285	290	290	300	305	305	310	320
M	265	265	270	270	275	280	280	280	285	275	285	285	290	285	280	295	300	295	295	300
N	275	280	300	315	315	320	320	325	325	330	335	335	340	340	340	345	350	350	350	355
O	300	300	300	315	315	320	320	320	320	320	325	320	325	325	315	320	330	330	325	325
P	300	300	310	310	315	325	325	325	330	330	335	340	340	345	350	350	355	360	360	365
Q	325	325	330	330	340	345	345	350	350	350	350	350	345	350	355	355	350	350	350	350
R	330	335	340	340	340	350	350	350	355	360	365	365	370	370	375	370	375	370	375	380
S	340	340	345	345	345	340	340	345	350	350	350	350	350	355	355	355	355	360	360	360
T	340	340	345	355	355	360	360	365	365	370	375	375	380	380	380	380	375	380	385	385

Olympic Bar Group in black numbers — Universal DVR (Dynamic Variable Resistance) Group in red numbers

*The two groups, each contained 10 men, were matched for similar or equal starting strengths.



A statement by Art Jones

In the November 1974 issue of Athletic Journal, I published a 6-page paid advertisement entitled "Bunk Frank ... or Uncle Sucker" That advertisement was written by me in good faith since I sincerely believed that it was perfectly true exactly as it was written. However it has since come to my attention that certain statements made in that advertisement are in fact untrue. As a result of ~~untrue~~ rumors spread by third parties, I was led to believe that Dr Gideon Ariel was guilty of the acts that I accused him of in that ad. However, since then, I have ~~made it my~~ met and talked to Dr Ariel at great length on several occasions. Whereupon, having finally talked, we ~~both~~ realized that both of us had been misled by third parties.

Arthur was misled & I was misquoted

Signed
Arthur Jones
& Gideon Ariel

A paid Ad. by
AJ
Inc

Arthur Jones' handwritten retraction

stabilization of the torso, and balance is assisted with arm motions. Exercise training can focus on many levels. Many people are merely trying to produce strength for a healthy daily life while others are attempting to win Olympic medals or achieve other maximum goals.

There were major differences between Universal and Nautilus in achieving these varying goals. The philosophy of training principles and the relative conditioning effectiveness was the ultimate goal of strength development and fitness. The manner and construction of the equipment for each, however, significantly affected the results of training.

One of the most obvious differences was the emphasis on concentric (positive force) with the Universal equipment compared to the heavier reliance on eccentric (negative force) with Nautilus. This was manifested primarily through the construction of the machines. Universal employed the DVR device, which allowed the exerciser to maximize the concentric contraction throughout most of the exercise stroke. Nautilus advocated negative resistive training or eccentric motion and they recommended slow movements in both directions.

With regard to the Nautilus equipment, it was unknown whether the slow speed was recommended because of the belief that strength was developed most readily with this exercise technique, or rather that slowness was necessary because of the equipment design. The design of the weight stack and cam arrangement on the Nautilus equipment precluded rapid movements. If an exerciser moved quickly, the inertia due to this rapid movement resulted in the weight stack flying up in the rack. The result was that with very little initial effort, large displacement of the weights resulted. In other words, with a relative small effort at the beginning of the exercise, the weight stack would essentially "lift itself" due to inertial forces. Therefore, in order to exercise more of the musculature, the exercise action had to be slow so that the weights were moved by the person rather than by inertia.

"Negative resistance training", that is eccentric, is simply the exertion of maximum muscular effort while lowering a weight from the extended or ending position back to its original starting point. In the previous example, when the weight in the hand was lifted up to touch the upper arm (bicep curl) this constituted the concentric portion of the exercise. Returning the weight downwards to the starting point would be the eccentric phase of the exercise. Although there is a natural muscular system of concentric-eccentric action, Nautilus placed greater emphasis on the lowering or negative phase of the movement. Furthermore, the performance which they espoused was to execute the exercise strokes, in both directions, with slow, controlled speed.

Arguments have continued, before and after that time, concerning the efficacy of concentration on eccentric contractions for athletic achievements. There appears to be no scientific basis that training in a negative or eccentric fashion will improve the strength of athletic performance. There does seem to be more basis for training all of the muscles for dynamic or explosive events.

Athletic events are primarily concerned with the development of "functional strength". Functional strength has

been defined as the force variations in a particular displacement (direction). The first rule in any weight-training program should be to train the muscle in a positive manner to enhance the development of functional strength. The characteristics of athletic functional strength include the ability to instantaneously change the degree of: speed, force, direction, and intensity.

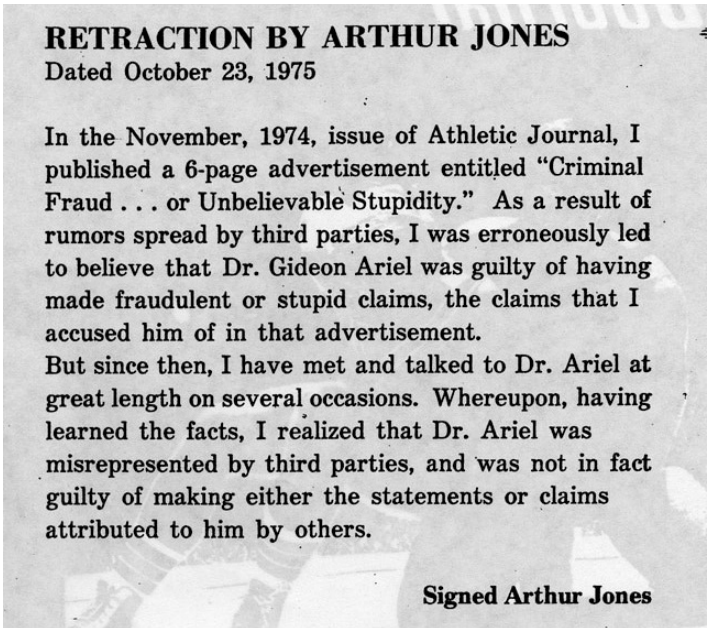
When exercising a muscle in a negative fashion, the motion or direction, as well as the speed of the movement is opposite to the required (positive) motion and develops a negative central pattern which may be detrimental to functional strength. Negative training over a long period of time may actually produce impaired coordination as well as a reduction in athletic ballistic efficiency (speed of the movement). There may as well be reductions in the biochemical activities within the muscle although this remains to be proven.

In other words, the athlete should be able to generate the maximum amount of force at every point of the movement rather than slowly under control. When a shot putter throws the shot, the direction is away from the athlete out into the field. Training should be a dynamic, explosive activity just as throwing the shot is. Using eccentric training, on the other hand, would be appropriate in this example, if the shot putter wanted to catch the shot. Yoga training requires slow, deliberate movements and may be enhanced with concentric, eccentric, and even isometric exercises.

The second rule for a weight-training program is to "train to perform". Every athletic activity has its own unique muscular demands. For example, some activities may require greater leg strength while others require greater arm strength. In addition, they also may differ in the direction in which the force is applied. In general, a high jumper needs more leg strength to be applied vertically while a long jumper requires greater leg strength for translation in a horizontal direction. Each of these jumping events requires leg strength but the performance criteria for each event are different. Strength development must be developed appropriately in conjunction with the correct performance technique. Therefore, the ability to exert a maximum force at only one isolated joint angle, such as with an isometric contraction, would not contribute to the efficiency of either of these sporting performance.

Due to these differences, it is essential that training routines develop "functional strength" as well as "train to perform" in ways which closely simulate the desired activity. It would appear rather obvious that maximum athletic performances cannot be achieved through negative training, isometric programs, or exercising every athlete with the same fitness protocols.

The advantage that the Universal DVR equipment had was that the exercise motions more closely reflected the anatomical and neurological system in the human. The DVR maintained a natural lifting ratio while the resistive intensity was instantaneously adjusted to accommodate the mechanical changes. The adaptive mechanism, which the DVR provided, allowed for maximum muscular efforts throughout the entire range of motion. Only Universal was superior in the ability to accurately adapt to the complete resistive needs of the exerciser's movement and successfully employ them into a failure-proof lifting system.



RETRACTION BY ARTHUR JONES
Dated October 23, 1975

In the November, 1974, issue of Athletic Journal, I published a 6-page advertisement entitled "Criminal Fraud . . . or Unbelievable Stupidity." As a result of rumors spread by third parties, I was erroneously led to believe that Dr. Gideon Ariel was guilty of having made fraudulent or stupid claims, the claims that I accused him of in that advertisement.
But since then, I have met and talked to Dr. Ariel at great length on several occasions. Whereupon, having learned the facts, I realized that Dr. Ariel was misrepresented by third parties, and was not in fact guilty of making either the statements or claims attributed to him by others.

Signed Arthur Jones

Arthur Jones' published retraction

Fortunately, the third-party evaluation of Truesdail Laboratories corroborated all of these claims. I had maintained confidence in the calculations that CBA and the Universal engineers had made and in the products that had resulted from them. It was gratifying that an external, unbiased third party had verified our calculations and designs. Universal's marketing department immediately began to distribute the "Truesdail Report".

Eventually the report reached Arthur Jones. Apparently, his response was rapid. When Jones got the "Green Brochure," he begged Universal to take it out of the market place. His urgent communications to Universal reflected obvious desperation since his previous behavior was nothing short of belligerent.

Arthur Jones' request for Universal to take the "Green Brochure" out of circulation prompted a phone call from Harold Zinkin. He asked me to come to Fresno as soon as possible to discuss the future with regards to Arthur Jones.

The next day I was once again flying cross-country to meet with Harold Zinkin about Arthur Jones and Nautilus. This was prior to the long lines and extensive security checks

of our modern world, so most of the time was spent flying. Still, the entire Arthur Jones episode was dysfunctional, unproductive, and the opposite of uplifting. Whereas the DVR development had been a rewarding challenge, its defense against the opponent could politely be described as a major pain.

Once again, the meeting consisted of Harold Zinkin, Chuck Coker, Cliff Coker, and Ed Burke. This time, however, additional participants included Universal's attorneys. We sat around Harold Zinkin's large conference table and there was the sense of great victory among the Universal staff. The primary focus of the discussion concerned Arthur Jones' sudden proposal to settle the legal battle between the two companies. He had expressed his willingness to compensate for damages and pay legal fees.

The next afternoon, the meeting was with Arthur Jones in Harold's office. The initial discussion was limited to Harold and me with Arthur Jones. The two attorneys, one for Universal and one for Nautilus, waited outside the room. I have no doubt that the lawyers were concerned and perplexed about what they must have envisioned as shenanigans going on behind the closed office door.

I sat quietly at the table without saying a word. I had no need to speak, as yet, while the presidents of the respective companies hammered out some of the large details. After a long discussion and finger pointing by both Harold Zinkin and Arthur Jones, they arrived at a tentative agreement. I listened to their proposal as it developed and, when they asked how I felt about the terms, I agreed with most of them.

The proposed out-of-court settlement consisted of the following steps:

1. Arthur Jones would publish a retraction immediately to his statement in the Athletic Journal. The retraction was to appear in that same journal and in several other mutually agreed upon media sources.
2. Arthur Jones would pay cash to me (I prefer not to mention the amount, but it was substantial).
3. Payment to Universal would be separate from Arthur Jones' payment to me.
4. In addition to the cash payment, Arthur would pay me an additional $200,000 in installments each month and were to be referred to as "consultation fees" for movie making. This reflected Arthur Jones' plan to produce some fitness movies in which I would appear as one of the guests.

I was displeased with the movie option since the relationship between Arthur Jones and me had been quite contentious. However, Harold convinced me that it would be good for both companies and, to the outside world; it would look as if the "War" between Universal and Nautilus had ended. Reluctantly, I agreed, but only because of my deeply felt respect for Harold.

At one point during the conversation, I asked Harold about what would happen to Ed, Cliff, and Chuck, who had been attacked by Arthur Jones as well. Harold answered that the damages specified in the agreement were to cover only him and me. He would work with Ed, Cliff, and Chuck from within his Universal compensation. Because of the confidentiality of the settlement, this is the first time I am revealing some of the terms of the agreement.

Unfortunately, peace and quiet lasted only a short time. Within two years, another incident occurred with Jones which started a new legal battle with him. He, predictably, stopped sending the required payment to me, and the wasteful time spent traveling to Lake Helen, Florida mercifully ended. That episode was relatively short and, actually, I was only a sideshow in Arthur Jones' on-going problems with the IRS.

The wars between Universal and Nautilus as well as between Arthur Jones and me were finally finished. Corporations and individuals often try to destroy innovative people who have new ideas. These attacks frequently do not obtain the desired result because their own ideas are no longer relevant or because they prefer to avoid competition. I felt vindicated that the DVR, which my staff and I had proposed for Universal's exercise equipment, had been proven to be scientifically accurate and correct. The biomechanical motion analysis system had produced accurate data. Science and knowledge always win, but sometimes it takes time. The entire Nautilus experience poisoned my attitude and I was more guarded about new ventures in the future.