



Training Parameters and Philosophies in International Competition by Dr. Joe Vigil (1995)

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The consummate coach, educator, motivator, and diplomat. The legacy he leaves, his record, provides true insight of this truly compassionate individual. This record reveals that not only is he a master of his sport, but as a champion of wisdom and understanding as well. He has legitimized the term Philosopher - Coach. His activities have made a lasting impact, not only in the world of sports but in the field of teaching, planning, and international relations among coaches and organizations. He would certainly have been at home in the company of the ancient sages as well as modern day leaders and scholars. Both he and his teams have been honored by university Boards of Trustees, state legislatures, national and international federations. He personally is a member of four halls of fame and is the only American to have ever been inducted into the Lasse Viren Foundation. His record will remain as a challenge to those who come behind him and serve as a model for those that dare to dedicate and commit themselves for the welfare of youth. The

complexity of this philosopher - coach is a study in competitive zeal and dedication. He has demonstrated a fiery passion for his work and an unflagging commitment to excellence. He has set a standard in combining relentless force and intellectual integrity. And so the Record: "The most successful in the history of collegiate sports in America." 17 - time International coach which included involvement in major world competitions such as the Olympics, World Championships, Pan-American Games, World Cross Country Championships. The only American coach invited to lecture and give clinics in all five continents of the world. Considered by many as one of the western hemisphere's best clinician of physiology and track and field. Fourteen-time National Coach of the Year in both track and field and cross country. 19 national championships - 14 cross country, 2 track and field, 3 Junior TAC Cross Country. The highest number of national championships any one coach has won in the annals of collegiate athletics. His teams have produced 350 All Americans, 87 Individual National Champions, 12 Team National Records, 12 Individual National Records. His won/loss record for 29 years stands at 3013 wins against 176 losses and 2 ties for a 94.2% won and 5.8% loss record. The highest win percentage ever recorded by single collegiate sport.

I certainly thought that the comments that Mr. Leonard made on international drug issues were interesting and very apropos to the times. On some of my coaching assignments I was involved with the Caracas scandal in 1983, where we had to send 18 athletes home. They weren't tested, but at that time they had a rule that if you test positive it would eliminate you from the '84 games. So 18 selected to come home. We lost other athletes, and found out later that they flew to UCLA to get tested. If they were negative they came back. It was very, very chaotic. I was also on the Olympic staff in '88 in Seoul, and I can't say things for fear of being sued as well. But the whole world is pointing their finger at us as a result of the '88 Olympics, and we of course are pointing the fingers at other countries. This has prompted a

real desire of mine to visit with coaches, with athletes world wide in my sport of track and field and distance running — cross country specifically.

Presently I have visited with the athletes of 37 different federations, and I will continue on this quest until I satiate my curiosity about what's going on. Most certainly drug use is rampant world wide, more so in some countries than in others, our own country included. In track, the one thing that I found to be true almost exclusively is that the African nations are doing it right by working hard, and some of them can't even read. And they're going out there and whipping everybody's tail. So I just wanted to comment on some of the remarks that Mr. Leonard made, and now I'll start talking about my particular assignment today.

First of all, I want to thank Mr. Leonard for the invitation of being here today. I want to thank him for the privilege of being here, because I think there are a lot of similarities between swimming and running. And of course a lot of similarities with coaches no matter what sport you're coaching. So I would like to share some of the experiences that I've had, both in terms of training principles, and talk about what is necessary to prepare athletes for international competition today, a topic that I think I'm extremely well qualified to talk about. I think we should also be very excited about some of the things that are happening, the new technologies that are arising in every sport. I know that as I walked through the vending area here, there are a lot of things that are going to help swim coaches and swimmers in the future, as much as in any other sport. Some good things are happening technologically. Not only genetic engineering, and I think that if we keep abreast of what's going on, that it would improve your coaching dramatically.

I think also that we should be excited about the new year that is starting now. We're starting a new year, and we're going back to our teams, and we're going to really challenge ourselves and the individuals that we work with, about what lies ahead. And, of course, we have the Olympic Games in our own backyard and we have to show the world once again that we can run a good show, but more importantly, we have to do it with the Olympic creed in mind. Once we forget sight of that, I think we're in trouble. As you approach the period of time for Olympic selections, whether they are either selected, or they make the Olympic competition in head on competition (and various countries do things very differently), I think there are some things that we all have to remember. I think you don't want your athletes to be satisfied with making the team. Too often their goal is to make the team, and once they make it, they relax. I think you have to promote excellence at all levels, from the time they make the team, the training that goes on afterward, the time they report in Atlanta, and on, and on, and on. But too often they are just satisfied with making the team.

I want to share a story with you about not letting athletes relax. At Adams State College, the school that I used to coach at for 29 years, it got to the point where if our kids did not run 1,000 miles in the summer time, they couldn't come and try out for the team. Now you may ask the question, "How did you know if they had run 1,000 miles?". I really didn't. Yes, I kept track of everyone of them. They would write me a post card, "This is what I did week #1, week #2," and so on, and so forth, but you see, I wanted anybody that came out for the team to feel privileged that they were on that team. Just like if they make the Olympic team, they should feel privileged to be on the United States Olympic swim team or whatever other team they had to work to make their spot on that team. And once they ran the 1,000 miles then we would have a test the very first weekend they get there. And if they couldn't run 10 miles in 55 minutes, that's a 5:30 pace at 2,300 m (I live in Alamosa, south central Colorado, and the highest valley in the world at 2300 m high), and to run 10 miles in 55 minutes is quite a challenge. But it should be. They

were going to be on the best team in the country and we wanted them to realize that. If they ran that time for 10 miles, then they had an opportunity to try to make the team and wear one of those singlets and trunks that we used to hand out. I wish you could have seen the singlets and trunks that we had. We bought them from Dolphin 22 years ago. And those things are just barely hanging on. But you know what, they did not want to change. They used to call us the “green and gold” and they wanted to run for the green and gold of Adams State. And for them not to earn one of those singlets, was a disaster. And of course those that didn’t make the mark that we had set for them, we would tell them to hit the road and come back next year. Because there is no way you can make a team showing up for practice the first day.

That’s exactly what’s going on in America today. People show up and they want to be on the team and they don’t even let the coach know that they’re interested. And who do they think they are that they can show up and be a vital member of the team, that’s been very, very successful, where all other team members have worked very, very hard, to try to make that team. It’s just like people showing up in Algebra II without taking Algebra I. What do you think could happen there? They wouldn’t let them in class. And I think if we take more pride in the way we conduct our business whether it would be swimming, track and field, basketball, or anything else, and make them pay the price to be a part of the team that you are coaching, I think that they would understand that they have to do the work and they have to do the work right.

As we go on and we talk about excellence and values we have to demonstrate continuously what those words mean. I think we have to remember all the time that the decision to go after the goal is one thing, that the key to success is that staying with that goal is one thing, but pursuing it endlessly is what brings out excellence. And that is what we have to

remember. Many years ago I had a Finnish athlete that came to me, this was 1968 and he wanted to run in Mexico City in the Olympics, and after one year there he said: "Coach I don't really want an education". So he went to Brazil and tutored some Finnish children of families that were living in Brazil, and in 1971 he showed up at Helsinki and tried to make the National Team there, and he did, and he qualified for both the five and the 10,000 meters. But in Brazil he ran 50 kilometers per day (31 miles per day). And I'm sure there are days that he missed, but he ran more often than not, and his life-style was running 50 km/day. After he qualified, two weeks later he broke the European record in the five and 10,000 meters. But what he did is inspire the Finnish runners Lace Guren and Pecha Vassala to do 8,000 miles the next year in preparation for the '72 Olympics where Guren won two gold medals and Vassala won one in the 1,500. It's a tremendous amount of work that took place during that period of time.

I remember hearing about the Tar Humaran in the Northern Sonoran Desert on Mexico and how they used to play these kick-ball games of a 100 miles. I also heard that on Easter Sunday morning that they ran from their villages in the craggy wilderness of the Sonoran Plateau into the city of Chihuahua for services. So I counted my pennies and I said to my wife "I've got to go see this". So I arrived in Chihuahua one afternoon and I didn't even go to bed that night I was so excited. The next morning when the sun was coming up, here come the Tar Humarans. They had run 175 miles to go to Church. Now, I'm not talking about the Olympic Tar Humarans. I'm talking about every man, woman, and child, in the village.

I'm presently the global consultant for track and field for Reebok. And my travels have taken me into East Africa. I was visiting a high school about 150 miles west of Nairobi. When I got there I noticed there were no school buses. As I observed everything, I learned that all students ambulated 20

km/day. I'm talking about high school students. Those that went out for sport did 40 km/day. They were running a marathon every day in high school as a style of life! Is it any wonder that they are achieving great successes today, whether it would be the Moroccan or the Algerians, or the Ethiopians, or the Kenyans, or the Tanzanians? They're all third world countries and they are very similar.

Even though I live in an impoverished area of America, Southern Colorado, the school board has a rule there that if you live one mile from school, you get bused. They do more to inhibit the development of the cardiorespiratory organs, than they do to help it out. I'm telling you these stories, because you have to, as a coach, develop the life-style and the environment for the athletes that you're working with that are going to produce results. Without that environment there is no opportunity. As you look back in history any great thing that has ever been accomplished, has been accomplished by people who have gone into seclusion, in a laboratory for years upon years; if they're composing music they would go into the mountains in some cabin with their pianos, or whatever instrument they played, and composed. But they were by themselves: they and Nature. And so be it.

If you can control the environment of the athletes that you're working with, from the chaotic world of industrialization, then your chances for reaching that youngster would be much greater. All of you teach, you know that only five per cent of what you say is being listened to. You know that living in the city you can't even hear yourself think occasionally. So I think that as you set up your training camps or you decide to visit with your people that you go to remote areas to visit with. Hence training camps in places where you can be close to nature. Because even though you live in the city you can't help but being bombarded by all the technology and all the industrial noise that we have. And this is one avenue in coaching that I think will be addressed more seriously in the future.

People have to be within themselves to see the vision and operate at the highest level of human potentiality. But once you start getting bombarded and you start existing in a state of clouded consciousness, you can not get the best from yourself. As we go on, the same thing applies to any field of human endeavor.

Now that we get ready to select that Olympic team, I know what's happening out there in the world of swimming, the world of track and field, and every other world. There are club jealousies, university jealousies, about who's going to be selected as the coaches! It may not be for this upcoming Olympics but it happens for every international competition, and on, and on, and on, and on! It's a "good ol' boy" network, you know. "He's been here for 30 years, let's let him coach this time". And then you have a conflict because some times the most deserving people don't get selected. Individuals get selected for one reason or another, but never for the right one. You see, federations have difficult tasks of administering, and organizing, and raising money for special things like training camps, lectures, coaching education programs, like you have here.

I speak about this with great renown, because my friend Vern Gambetta and I have started the coaches' education program for TAC USA about 14 or 15 years ago? We struggled with it for eight or nine years and passed the baton on to somebody else, and hopefully they'll get more support than we got. We're still educating, but at a different level. So you see, you coaches out there, whoever gets selected, you have to remember that these federations have worked awful hard. You have to cooperate and be a team player. That's what this talk is all about. Scientific principles and being a team player. I think you have to do your part no matter what. Just because things don't go

your way, doesn't mean that you're going to quit. You always have to support your federation. It's one thing to build pride in your own individual teams, but it's even greater to try to build pride in your national team. And this seems to be a commodity that has eluded us in America.

I'll never forget talking to Alberto Juantorena and I asked him: "Why did you give your medal to Fidel Castro?". He says, "I wanted to do something for the glory of my own country, and that's why I gave him one of my own gold medals." These people are in unity.

We can select a cross country team on a given day and we don't see those people again until we're ready to fly overseas to competition. The Kenyans have a selection, and they work out together for six weeks. Is it any wonder that they dominate? They are in rhythm with one another, and the coaching philosophy of the coach that is going to coach them! We don't have that opportunity here, because everybody wants to do their thing. They're constantly living in the "I" and not in the "Us" situation. But here again, we live in a culture that practices and teaches narcissism at all levels.

One of the great problems is you're going to have a great athlete that is going to make that team. But once you get him over there, he is going to be overwhelmed: with the other 13,000 athletes living in the village, with all the noise that he is not used to, probably with food that he is not used to, and probably with logistical problems that he is not used to. He's going to lose his focus. Losing that focus is going to destroy the effectiveness that he had, prior to going to the Games.

Let me tell you about focus. I was in Yettaborg for the World Championships and Moses Kiptanui is a Reebok runner, so we had him in a hotel there, because the Kenyans don't stay together in hotels in track and field or in the village. After he won his second Mercedes, which is what the winners get, the Brits came up and asked him: "What are you going to do with two now, Moses?", and Moses says: "I want to do with the second one what I did with the first one. I parked it in a garage right outside Nairobi, it's got thirty miles on it, and that's where this is going to be to. You people don't understand that riding in an automobile and training for track and field are not conducive to one another." Now this is the attitude of some of the Africans.

I used to teach in high school. I used to have families that used to live right across from the high school, and they jump in their car, make a U-turn, park their car, and go to school. They couldn't even walk across the street! You see the differences? You see some of the things we are having to contend with? I know that our athletes have to be malleable. We have to get them ready for any given situation, we have to get them used to rolling with the punches, and then performing at their very, very best, as they do that. But before we can do anything, we have to be ready as coaches. Not only are we already putting up with sociologic stresses, training stresses, adaptability stresses, but we have to put up with the stress of getting ourselves ready and keeping up to date on everything that's going on.

I prepared some things that I think are very, very important. I formulated the biologic law of training. I would like to go over it with you. The structure and performance capability of an organ and/or organ system is determined by its genetic constitution. A lot was mentioned previously about genetic engineering. This is before that. And number two, the quality and the quantity of the work carried out. And here is where the coach comes in, on number two, where you manipulate the variables of intensity and volume in

all your workouts. Two little words, but that's what makes athletes progress from one level to another one. We have to know that the greater the demand, the greater the stress that's placed on that organ within its physiologic limits, and the physiologic limits that I'm talking about right here are adaptation limits. The more intensity it adapts, the more efficient it becomes.

I grew up in an era with long slow distance, where coaches would advocate to go out there and train slowly, and that's the way that you could get your best results. They forgot all about the intensity factor right here. And I say to you today, that all organisms, whatever their genetics are, whoever their coach might be, whatever system you're using, that the organism has to be totally trained. And if you're talking about slow and fast twitch fibers, I think you have to stimulate both at the correct period of time in their training regiment, but you also have to make sure that they're adapting from the previous workout before you can go on.

This next transparency is Englehardt's Law. We talked about variables just a minute ago. The training process has two aspects. Number one is the stimulus, the manipulation, what you do to the athlete. There is always a physiologic breakdown. If there is no physiologic breakdown, the minimum threshold level of training has not taken place. I'm not talking about a regeneration day, or a day when the body is trying to recover, trying to adapt to restitution of one kind or another. But if it's training and you're working towards development, which is caused by a hard tempo swim, or weight training session, an interval session of one kind or another, you're going to have that physiologic breakdown. And the response is the adaptation. How the organism responds is how it adapts. Unless there is a recovery, there is no chance even for performance restitution, let alone for performance

improvement. This rest and recovery is an absolute part of the training process.

Now we have to learn some markers as we work with athletes on what takes place. We have to learn a whole plethora of things, in order to work with an athlete. No one ever said that coaching is going to be simple and easy. I developed a schematic description of the scientific conception of elite coaching. I don't care what level you're coaching at, you're eventually going to run across an individual that you can consider elite. Whether he is elite high school, or elite age group swimmer, or in college, or post collegiate, or whatever. We started off with the genetic constitution, and the quality and quantity of training, and the biologic law. Here we have the athlete and here we have the coach, and all the training adaptations that take place. As you go on, you can see that you have to go through all the development of a profile to put everything into a database system, to find out where they should be, and what some of these markers are.

As you go on, you find out that as you work with computers, and you work with a physician if you don't understand some of these things, that the training intensity, the heart rate, the lactate, and the acid base balance of an individual are the important factors. I have a lot of dirt roads to work on where I work at, and I have two portable lactate analyzers that I take with me. If we're doing a 30 km run, in the middle I stop and I analyze their lactate threshold. I know what the lactate threshold is for every one of my athletes because I run them through a testing protocol.

This is how you can determine that you're not overworking them. A couple of years ago, I had the Japanese National Team and the Korean National Team

training at altitude. And of course they believe in the philosophy of mega-mileage. Every Wednesday we used to go on a four hour run. And they would average nine miles per hour, for four hours, for 36 miles. These of course are marathoners. Every Thursday morning I would take them to the hospital for blood profiling and I would get the results a couple of hours later. We would sit them down, and you could see who had done tissue damage to their muscles by the concentration of CPK leakage into the blood. What enzymes were being deleted, what nutrients were present or not present, and you could make presentations on the spot. Our million dollar babies, as I refer to them — the people that have healthy shoe contracts and are making a lot of money — wouldn't even spend \$25 on one blood test to find out where they're at. And they can train, and train, and train, and they don't feel good, but they don't know what's wrong with them until finally it's too late. In order to correct whatever is wrong with them, they have to take the year off.

When you are time, time waits for no one as you all know. The most precious gifts that a man can have, are his time and energy. And that's why coaches have to be on top of their game because if you're going to waste their time and energy, and the individual is not going to get the best results, for the time he's putting in there, you haven't done your job. So it's an ongoing process of learning.

Of course, I'm talking to the wrong people. You people are here to learn. And you've learned a lot. I've learned a lot just walking around visiting with people and listening to some of the sessions. They have been marvelous. I'm talking about the people that don't ever attend these things, that don't ever try and improve themselves in terms of either theory, or the art of coaching. But as you can see, once that you've read all these results, and you're reading the individual athlete then you have to have individual adjustment, whether it be short, or medium, or long terms plans in their training. Whether that

planning is going to be for a microcycle, a mesocycle, a monocycle, or even a quadrennium cycle. And of course you have to make corrections in the extent of the training, and then apply them to the individual athlete, so he can further adapt to them so he can get on up to his goal of victory and success.

At the same time you have to constantly bombard yourself with the results of basic research in biochemistry, psychology, physiology and biomechanics. That's where you develop your models and theoretic descriptions of whatever you're going to do, whether it be working with medicine balls or whatever. I heard Vern Gambetta's presentation this afternoon and he was talking about starting off at a certain level, and then increasing the number of throws, or whatever he was doing. So the principle of progression is always with us. Then, of course, eventually the athlete will work at a much, much higher level.

The one thing that we always have to remember is that the greater the understanding between the interrelated variables that it takes to be a success, between the athlete and the coach, the greater the chance that athlete is going to be going from one level to another, or being successful from one competition to another one. By really knowing your athlete, the chance in discussing these variables with him on almost a daily basis, will augment the opportunity for success. There are some coaches that only see their athletes once a week, sometimes not even that often. In university settings, or club settings, maybe only once a day.

I had a rare advantage of being at a small school, where I was their academic adviser. I would walk around and I would actually take attendance at

breakfast, to make sure they were eating right. That's because I loved my job and I loved the kids I was working with. Then I would have an interaction with them two or three other times during the day. Maybe I would walk over to the science building, or the sociology building, or the education building, just to see that everything was on track. And it gave me the opportunity to see what interests these athletes had. In winning them over, I found out that it was the interest that they had, and it was nothing more than the ability that I had to visit with them about it, and it was an invitation to start discussing the human potentiality that that individual had. A lot of coaches don't want any interaction with their athletes. And I say to you, get out of it. Because the more you know about him, and I'm not talking about social knowledge, I'm talking about knowing your athlete and what makes him tick, the more you're going to be able to help him.

I'm also deeply indebted to the USOC in Colorado Springs, they have bent over backwards to help me out in anything that I've ever asked. And I know that swimming has a fabulous research facility there in ICAR, and I'm sure that they would do the same for any swimming coach that would want any knowledge about his basic physiology or hormone level or whatever, and it's there for you if you treat it correctly.

This chart on training parameters, deals with both the external and internal loading. The external loading are the manipulations that you apply to your athlete. The volume, and the intensity, and the low density, that's the interval time and the training frequency. We know that whenever a person breaks down the physiologic integrity of the body, whether it be the heart, or anything else, that they are down to almost zero units of energy production. But even at this low ebb, we found out that through exercise you can restore that physiologic integrity. And the higher up the ladder you get, the more you can work them out in terms of training frequency. Finally when

you start working with elite athletes, 20 or 21 workouts a week is not uncommon, even for college students. I can't think of anything less exciting than sleeping in bed doing nothing. So get them up and get them going, get them running. That's what they are there for — to become a great student, and the best possible athlete they can possibly become. Anything else is not important.

Internal loading, the one thing that is very subjective when you work with these athletes, unless you run them through a laboratory, is the subjective feeling of well being, and the interpretation of the symptoms of fatigue. You see, you may only have them two, three, four hours a day, but what happens to the other twenty? How are they bombarded by their friends and the problems that their friends have? What kind of news did they receive in a letter, or over the phone? Are mom and dad splitting up? It really crushes them sometimes, especially if the youngster loves his parents.

I'll never forget the last year that I coached. I had a young man from Indianapolis. He was an All-American five times, and one day he came into my office and I could just see he needed some attention, so I left the office and said, "Let's get my pickup, we'll go downtown and get a cup of coffee". We went downtown to get a cup of coffee, and he broke down and started crying and told me about his parents splitting up. He loved his family. I went to pay for the cup of coffee, and who do you suppose was there? Our compliance officer. He saw me pay for the cup of coffee, he saw me give the young man a ride, and I got put on report. That was the deciding factor in my decision that I wasn't going to coach at the college level anymore. You can't even help youngsters anymore.

All these problems that the athlete gets and harbors, during that period of time, that they are away from the coach, we don't know anything about it. But we can certainly see it in his practice performances on a day to day basis. You don't know what is actually happening, but you know it's there. Perhaps a loss of enthusiasm for what he is doing or a reduction in practice times over what he did a month ago. You know something is wrong. You know something is wrong and you have to get to the bottom of it right away. So you see, the training parameters are certainly important.

There are similarities between track and field and swimming. Here's swimming and here's track and field. The third horizontal column: 100 meters, the equivalent to 100 meters, 200, 400, 1500, and on, and on, and on. So we have a lot of similarities. This chart merely indicates the short duration, medium duration, and long duration sports, by the various disciplines.

Finally we get to our training phases. I think you have to be a master at this. As I was listening to Vern Gambetta expound philosophically last night, he said, "When you learn something, you learn something, but how much do you have to learn before you to master it?" Mastery of something is what you have to have as a coach. You have to have a mastery of the training phases and what they do for you. At the very, very basic level, we have aerobic training, which constitutes workouts of between 140-160 heartbeats, and that of course would allow for any bradycardic or tachycardic individual. The way you determine what their basal heart rate is in the morning when they get out of bed, and you can see whether they are normal or abnormal, too slow, too high, or whatever. The basic workout at the aerobic conditioning level elicits a production of about 2-3.5 mmol of lactic acid which correlates to between 60% and 75% of max VO₂ uptake, and this is nothing more than the type of workout that you would do.

Now, in their base training, before they report to you, you have to have a goal of where they are going to be at. And sure there are days when they don't feel well, and they can't do the workout, they are deriving benefits at the low end, but not as much as they are at the high end of aerobic conditioning. They might have eaten something, their blood chemistry might have been altered the last 24 hours, because of some medication or drug they might be taking, or whatever. But, whenever they receive the level of training that you think is appropriate, then you can go on to anaerobic conditioning. But the aerobic conditioning is the first thing that you handle. At our particular institution, whenever a person could run a distance, in a distance run, at 80% of their max, then they have covered all of the aerobic conditioning that they could cover in that particular calendar year. From there on it was maintenance of this particular system.

This is what happens when you go to the Olympic Games, or World Games, or any other type of competition. With all the excitement, you lose strength. I'm not only talking about max strength, or relative strength, I'm talking about aerobic strength. Two, three, four, days, five days of not doing what you ought to do, you will have a marked decrease in aerobic capacity, which in fractionalization reduces your anaerobic strength and your anaerobic threshold inside of a week of not focusing on the task at hand, to be at your very, very best for that international or state competition, or whatever level you're coaching at.

In anaerobic conditioning you work from 160 to 180 heartbeats. Here again you have a range, as you can see, and it is from 75%-90% max VO₂ uptake, and from 3.5 to 5 mmol in lactate concentration. The one point I want to make is, you don't want to be a slave to a stopwatch, you don't want to be a slave to a cardiometer, and say, "Oh! I exceeded that zone. I had better slow down". You know, the one thing about motivation is that you can do

great things when you are motivated. Like a student, if he really is into a class in physiology, and you assign the next ten pages for tomorrow, that doesn't mean he can't go home and study the next twenty. And that's the same thing with the athlete. If you prescribe a certain workout and you tell this athlete I want you to stay there, if he's having an unusually good day, it's all right for him to exceed it. I realize it's like walking on a thin line, but you have to go over the edge every now and then, to find your defining moment of what it is that you can actually do. Sometimes it can be the workout that motivates them on to do great things.

One of the great runners that I had was Pat Porter. He was an eight time National Champion in cross country, eight consecutive times. He's got the record. And then he won three Collegiate Cross Country Championships, so he won eleven National Championships in eleven years. I'll never forget the day that he found himself. We were driving to Boulder to run against University of Colorado at their invitational. He pokes me on the shoulder and he says, "Coach! I'm going to win tomorrow." I very impulsively said, "I'm sure Pat, that if you believe you can win, you will win!" And I left it at that, but underneath I said, "Who does he think he's kidding?! He's running against Rick Rawhouse who's the American record holder at 15 km. He's running against another young man, Schroton, that had just won 21 Big Eight titles, from England, and was the World Junior 5,000 meter Champion. And he was going to win? This little skinny kid from small Adams State?" Well we got there the next day, and his folks ran up and said, "Coach, how's Pat going to do today?" and Pat was standing right there, I had to say, "Pat's going to win!" and lo' and behold, they had two 5,000 meter loops, and they stayed together for about five k. At 5 k Schroton took about a 50 m lead and eventually the other two caught up. Then Rawhouse took a 75 m lead, then the other two caught up. By that time they were at five miles and Porter took the lead and kept it thereafter. Coming back home I said, "Pat how did you know you were going to win?" And he said, "You know coach, every day that I work out I push myself to the limit. I know that I was working harder than anybody

else. And if I work harder than them, I should be winning.” And he wasn’t defeated for the next eleven years. Just because he knew that he went over the edge in workout. Had I had a heart rate monitor on him, and limited his workouts, he would have never found himself. Being an obstinate coach I would have slowed him down to a particular heart rate.

Now, I don’t know much about swim stroking. But I know that each is a different human being. Genetically the origins and insertions may be of different widths, on their various bones, which is going to produce a different stroking angle in the event that they are swimming. So, I say to you, know about these things, because they are very, very, important.

But more importantly is the intuitiveness of the art of coaching. The greatest coach I ever knew in track and field never took a life science course. He was Alex Francis from East Kansas. He would just do things because he thought they were right, and 99 times out of a 100 they were right.

So we go on, and they are able to adapt to anaerobic conditioning. How do you know when they are adapting? After you raise the intensity of training, there are markers. If their basal heart rate goes up 10% the next morning, and stays up for two or three days, then it’s time for you to lay back on them and give them more days of restitution or more recovery days. So you have to know something about your athletes.

Finally you get back to anaerobic capacity training, where you go from 180 to 190 in heart rate, from 90% to 100% max VO₂ uptake, and from 5 to 8 mmol of

lactic acid concentration. When you take a look at the time period right here, of about three minutes on down to eight or ten at altitude. This chart just came out several years ago, thanks to Dave Martin, he portrayed it very beautifully. But for fifteen years I was running time trials at altitude of two miles. I didn't know why I was doing it, it just seemed right, but it fell within this category. Three weeks before our national meet, we would run a two mile time trial. And they would certainly challenge the anaerobic capacity training there. Then they would jog for 20 minutes and they would do three all out miles. And the miles, each one, had to be faster than the average of the two miles in the two mile time trial. So if they averaged 9:00, or 4:30 mile, I would require 4:25 to 4:29 miles. The second week before Nationals we would do that again. The first week before Nationals we would do that again. By then we were running pretty close to 4:01, 4:02, at altitude. I say this because Vern Gambetta knows that it is true. And it's hard to tell people that I had people in training that would run 4:01, 4:02 for a mile at altitude. When at that altitude they had never broken a mile in competition. But this is how motivated you can get for a workout.

Our workouts are so charged up that we would have three, four, five hundred people who would go out there to see if somebody just couldn't break the four minute mile in a workout. And we had a great following at that particular time. But we fell within the confines of all these parameters here. And as you take a look at the physiologic applications, we stimulate the slow twitch fiber at one level, the slow twitch and fast twitch A and B at the next level, and finally in the level that we are talking about, we start actually producing glycolytic enzymes.

The limiting factor in anaerobic work is the amount of glycolytic enzyme that you have to metabolize the lactic acid. But if you do lactate tolerance workouts to the point where it taxes the individual, it's a stimulus and a

response that produces a greater concentration of these enzymes. As you get on to the next level right here and you see that you have increased neural stimuli, I want to remind you that the nervous system is always alive even when you are sick, even when you are asleep, even though you are laying in bed doing nothing. There's constant alpha particle stimulation going throughout the body because you are alive and these cells have to stay alive. The degree of alertness is controlled by the reticular activating system. So in any workout, if your athlete is awake, really awake. The more awake they are, the greater the opportunity for the necessary hormones to transmit neural stimuli to the neuromuscular junction. And as these stimuli start arriving very, very, rapidly, whatever your potential might be, it is this rush of stimuli that stimulates the vesicles in the end-brushes of the nerves to produce more hormones and more enzymes.

For the individual that only trains at a certain level, at a certain intensity all the time, he is not taking advantage of the potentiality that he has physiologically in the neuromuscular system. And this is what we mean when we say you have to be totally trained. You have to work from zero to maximum within a given microcycle, a number of times. The closer you get to your key competition, the more you work at that level to refine yourself to put the finishing touches on any particular workout.

And finally the sprint workout up here for whatever refinement that you need.

Here are some notes about a performance range of endurance, and the effects of strength and speed upon a performance, specifically for various events. So we have long duration, medium duration, speed duration. We

have the basic endurance. I have already told you that once I got back into school, that we cut down on the volume a bit, but as the season goes on, we cut down the volume more in relation to the events that they are in. Notice if we're talking about a long duration endurance event, the speed quality is very minimal compared to medium, compared to short duration. If we're talking about strength, the same thing. Very little strength in long duration, greater strength in medium duration, and much more strength in short duration events. So in developing training programs for individuals, you develop a training program optimally for whatever event that they are in. So if you have to spend more time in strength training right here because they are in short duration events, do so. Because you are working on fast twitch fibers, and if you are working on fast twitch fibers, you are working on a different energy system and a different set of enzymes.

And remember it takes 21 to 28 days for enzymatic induction to take place, full enzymatic induction. Now this is on an average. Some athletes that you work with, genetically may be predisposed to producing greater concentrations in a shorter period of time. But likewise there might be some athletes that it takes longer, because it's also determined by the nutrition habits that you have, and the amino acids that you have to build this capacity in enzymatic induction all the way.

In going on I just want to talk about one more thing here, and that's how to establish team dynamics. I think one of the hardest things to do is to get individual performers such as we have in track and field and in swimming, and develop a team concept. How do you bring the team together? How do you develop that interaction athlete to athlete, athlete to coach, athlete to other school activities, or work activities? How do you get them to believe in this team concept? The first thing you have to do is have some kind of a covenant. Some type of philosophy that you hand out for the rules and

regulations for that team. Like a policy handbook that we have for the Olympic Games, so that they understand what it is that the team has to do to march forward. And they are an integral part of that particular concept. What are the values that you have to convey to the individual athletes? What is the course of action that they're going to take, where you go over meeting, after meeting, after meeting, stating some of the same principles day, after day, after day, because you know that as surely as I'm standing here, when you say something, a certain percent never get the word, and when the Latin philosopher coined the phrase, "Repetita, Materia, Studiora, Est," — "repetition is the mother of learning." We find it to be true in coaching today. So you have to have a spirit to succeed as a team, and if the team succeeds, no matter what you do, you will be happy. And only through a team covenant and goals, from that covenant will you know that you are doing a good job.

I think that you have to have the power of a motivator of some kind. I know you are going to sit there and say that intrinsic motivation is the best. But I'm here to tell you people that there are times in your life when you perform better because of someone else! And it goes that way down through history. If you can recall the tremendous influence that Churchill had with the English people during the second World War, when in the eyes of defeat, just his example of courage led the Brits to victory, because of the power of the motivator. Or some of the things that Napoleon Bonaparte did, when they would see him on the battlefield, his soldiers fought with a greater fervor than if he wasn't there. Or Douglas MacArthur, his presence alone would make his soldiers braver in any field of combat. And so be it with an athlete. I think that athletes are motivated either by a team leader, another team member, a coach, or someone else in the organization. And because of them, they may do something else. But if you can teach your athletes to succeed, for someone else, for some other reason other than themselves, then I think you will get more out of it.

I think also you have to teach mental toughness. I don't care what the covenant states, or what your team rules state, make him adhere to it. One of the things that is wrong with drug education today is people are not adhering to the rules! You have to follow the rules, people. And the only way you can do it is to be mentally tough. It's through consistency in what you do in your life. Consistency is the way to mental toughness, and you have to teach it every day of your life. It's all right if you put your arm around your athletes during a bad moment that they are having. That's not saying that you are soft. It's all right that you tell them that you love them. They will know this, but at the same time, when you treat them as a team member you can be tough with them and make them do the workout. Make them do what's prescribed for today. There are athletes who used to come up to me and say, "Coach, I don't feel good today, can I take it easy?" And I would say, "Sure you can! Just follow me around as I coach the other guys." And he would follow me around and we would talk, and before I knew it he would start working out. And he had the best workout in his life, because he was motivated by watching his teammates. He didn't have a chance to watch his teammates when he was working out. He would say, "Gee, are they doing that much work? Heavens, I can go out and do my work too, then." And they were motivated to do it.

Finally, you have to make them make a commitment to themselves. I remember when I was in high school we could work out on Sundays. I would have a Sunday afternoon workout. But I wouldn't call it a workout. It was Dad's day and the fathers would show up and they would give rundowns. And they would work on their kids. And I would have each kid stand-up and tell the team what they were going to do that next week. "This is my goal for the team, and this is my goal individually." Believe you me, whenever they're making this commitment, in front of their teammates and in front of their dads, they're going to try a lot harder come the next morning or afternoon workout. Then the mothers got in on the scene, and they were bringing in cookies and tea. It got to be a ritual after Church. They were

making commitments, and in the seriousness of the moment, the commitment they made, they lived up to that next Saturday.

Of course we used to talk about making goals and making goals realistic in whatever you were going to do. You see, one last thing that I want to talk about, is that as you go out to your various schools or to your various clubs, don't go out as though you were doing them a favor. You've got to ask yourself, "What am I contributing that's positive to this organization?" I'll never forget having teachers that would come into a classroom with their problems on their shoulders. You could pick it up right away. You have to leave your problems outside.

I got in the habit of detecting some form of negativity in my athletes, by looking in their eyes and seeing what type of enthusiasm they had. If I detected any negativity of any kind, I wouldn't let them workout with the team that day. But you had to know your athlete. You see, no one has any right to transmit negativity to a team member, or to an organization. Your job is to contribute positivity in anything that you do. As you go out of here this weekend, and you go back home, and you start working out with these youngsters, and you start working out with your clubs at whatever level you're working at, you ask yourself, "How is this club going to be better, as a result of my being here?" You're charged with being the leader of that team, and the leader has to be positive and you don't talk about negative things.

Thank you very much.