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The World Swimming Coaches Association

# NEWSLETTER

## WSCA Board of Directors Meeting

Shanghai, China April 3-4, 2006

*President Michael Ursu, Ralph Richards, Rohan Taylor, Osvaldo Arsenio, Larry Laursen, and John Leonard met for the WSCA Board during the World Short Course Championships in Shanghai.*

The following items were discussed and actions taken:

1. FINA Coaches Education. – resolutions to ask the Coaches Commission to move the program forward in the following ways:
  - A. Testing and accreditation in three levels, novice, intermediate and advanced/international.
  - B. FINA Clinicians to teach and attendees to be tested in accordance with the above to provide uniformity.
  - C. FINA coaching manuals to be developed by 2007.
  - D. FINA testing materials to be available by July, 2006.
  - E. Language issues (e.g., translation into other languages) to be addressed by FINA in 2007.
  - F. FINA to use manuals in countries where no recognized program exists. Where recognized programs do exist, FINA and WSCA will extend reciprocity to all previously Certified Coaches.
  - G. Ask FINA to support the Gold Medal Clinic in 2006.
2. Gold Medal Clinic 2009 being considered by various groups in the United Kingdom. More information will be forthcoming from Brian McGuinness shortly.
3. WSCA to list on its website all available world-wide coaching materials, with price lists and links to sources for purchase.
4. WSCA to provide original "template documents" for those bodies that wish to form a national coaches association. These to be placed on the website.
5. The WSCA Board will always meet prior to the FINA Coaches Commission.
6. Gold Medal Clinic to be held in conjunction with existing Coaches Clinics within the host nation to avoid duplication of effort.
7. WSCA Membership is currently just in excess of 7000 coaches worldwide.
8. WSCA's newest organization member is PASA, the Philippines, with Mark Joseph as CEO. Welcome from the WSCA Board of Directors.

Meeting adjourned on Wed. April 5, 2006. JL ●

**ASCA World Clinic**

September 6-10, 2006 - Washington, DC USA

**2nd WSCA-Europe Coaching Clinic**

September 29 - October 1, 2006 - The Nottingham Belfry, Nottingham, England UK

# The Physics of Swimming Faster Than They Should Be

DISCOVER Vol. 27 No. 02  
February 2006  
Biology & Medicine

By Karen C. Fox

*Can these sleek mammals of the sea really defy the rules of hydrodynamics?*

From Aristotle's claim that a dolphin could jump over the mast of a ship to tales of dolphins coming to the aid of drowning sailors, myths about this sea mammal have long overshadowed fact. But now the scientific facts themselves are adding to the legends. For instance, take the idea that dolphins swim faster than they should be able to. A host of physicists and biologists have for decades declared dolphin speeds (nearly 25 miles per hour) impossible, given the density of water and the amount of muscle dolphins have. Then researchers began scurrying to find out how the creatures do it.

"Hope springs eternal," says Frank Fish, a biologist at West Chester University in Pennsylvania. "Dolphins fascinate us—the public and scientists and everyone. And we always hope there is something that nature has figured out, some kind of special drag-reduction mechanism, that people might benefit from." The military, of course, wants to know so they can design faster submarines, Olympic swimmers want more effective swimsuits, and scientists just want to satisfy their own curiosity. So far, there is no shortage of theories: Dolphin tears spread over the body to reduce drag; body heat affects the flow of the water. Recent studies show that the truth is simpler. Dolphins have a shape that's the fastest form possible, their blubber helps make them faster, and they have skin properties that come out of a fluid-dynamics textbook.

The quest for dolphin-speed understanding began with zoologist Sir James Gray in 1936. A colleague had clocked a dolphin at about 23 mph. Gray was stunned. Moving through water, the dolphin was able to attain the average speed of a car driven in the city. Gray made some calculations about how much energy the dolphin needed and compared that with what he knew about muscles. His numbers showed the dolphin needed seven times more muscle than it has.

Like earlier scientific announcements that found horses' legs too weak to support their bodies and bumblebees anatomically unable to fly, Gray's paradox became a problem to unravel. His personal theory was that the powerful motion of the dolphin's tail causes water to attach tightly to the dolphin's skin due to a concept called laminar flow, which eliminates turbulence.

The conviction that Gray must be right remained but was untested. Any moving object—airplane or dolphin—splits the medium through which it passes. In the dolphin's

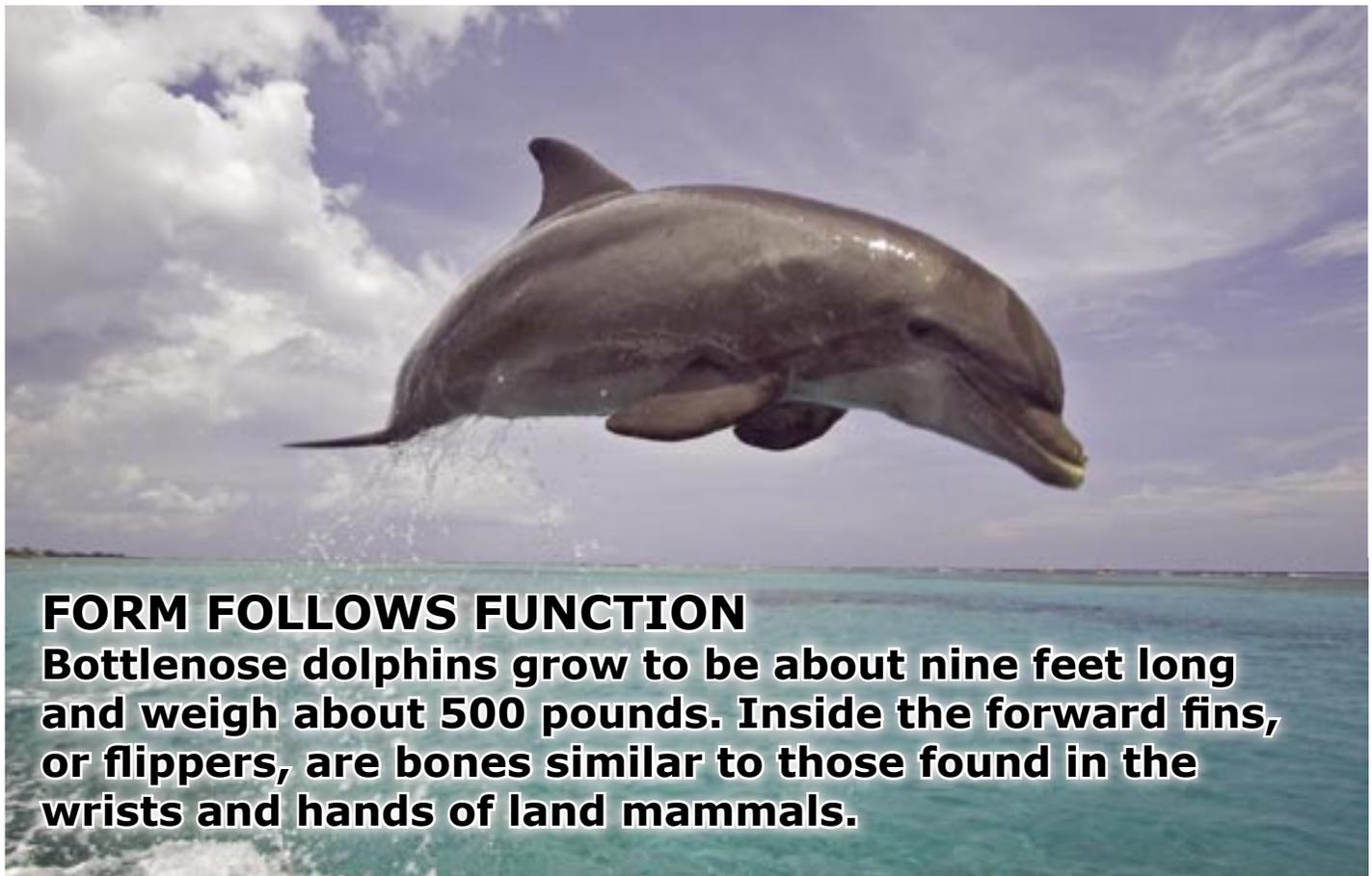
case, a thin layer of water flows along the body until it becomes chaotic, or turbulent. Chaotic waters increase friction, and thus drag. After Gray's pronouncement, scientists searched for the mechanism that stopped the turbulence. As it happens, Gray had made a mistake. His calculations for the amount of muscle mass a dolphin needs were based on sprinting levels that dolphins can't maintain. Once Gray's paradox had been solved, researchers moved on to better understand other factors about a dolphin's speed.

The greatest contributor to the dolphin's speed turns out to be its shape. "Incredibly streamlined," says Jim Rohr, a physicist with the U.S. Navy's Space and Naval Warfare Systems Center in San Diego. "That's probably 90 percent of the mystery right there." Rohr studies bioluminescent plankton that give off a flash of light when disturbed. The phenomenon can be easily seen in the wake of an outboard engine at night. Rohr has spent a lot of time quantifying just how much movement is needed to get the glow going, so he was surprised when he heard anecdotes that dolphins never set off bioluminescence, something he had calculated a dolphin's motion would have to do.

Rohr decided to film trained dolphins in San Diego Bay on a dark night to see if they provoked bioluminescence. As the dolphins trailed behind the boat, Rohr saw the whole animal light up—a thin layer over the snout, a thicker swirl starting at midbody. The light layer corresponded to the thin layer of laminar flow. The brightness suggested an increase in turbulence. This switch from laminar to turbulent flow was expected, as it happens over submarines. On the other hand, if the dolphin's streamlined shape keeps almost half its body in laminar flow, that's enough to give it a helping hand in the water.

A dolphin makes use of what it's got. Touch a dolphin and you can feel the density of muscle—a body taut and powerful, consummately athletic. And yet part of the secret is blubber. Ann Pabst, a biological sciences professor at the University of North Carolina in Wilmington, has shown that blubber is far more than simple fat. It consists of a complex of fat cells and collagen fibers in a crisscross pattern that acts as a spring. If muscle moves the dolphin tail in one direction, blubber can help pull it back, like a Slinky spring snapping back. Thus blubber can conserve energy at various speeds, says biologist Frank Fish.

**Appendages that tend to cause a lot of drag on most mammals are streamlined on a dolphin. Hands are shaped as flippers, feet shaped as flukes; the ears, eyes, and nose (blowhole) are flush with the dolphin's skin. The eyes, researchers say, secrete a mucus that lubricates skin surfaces for increased swimming speed.**



## **FORM FOLLOWS FUNCTION**

**Bottlenose dolphins grow to be about nine feet long and weigh about 500 pounds. Inside the forward fins, or flippers, are bones similar to those found in the wrists and hands of land mammals.**

Fish studies the movement of the tail and its two side fins, known as flukes. He pretty much dismisses the mysterious ability to overcome drag. "Whether it supports a turbulent or laminar boundary layer isn't important," he says. "My experiments say the animal can produce enough thrust that it can support a turbulent layer." What the flukes have is shape. As the tail oscillates up and down, it provides lift that is channeled into forward movement, giving the animal thrust. Fish has placed dolphin flukes through CT scans to examine their shape as they bend. He has found that their geometry can change into an arch. The curve is crucial for one tiny moment of every stroke the dolphin makes—the exact moment it switches between up and down. Were the tail perfectly flat, it would lie in a plane with water flowing over it, and for an instant it would not provide any lift. When the tail arches, it probably never lies perfectly flat, and the dolphin doesn't lose thrust.

Convinced that the key to the dolphin's speed is drag reduction, engineers have turned to the mammal's skin. Much of the research is controversial. There were some fascinating attempts to prove skin can delay the transition from laminar to turbulent flow, including a 1977 Russian experiment in which women volunteered to be dragged naked through the water to see if ripples caused in soft skin would smooth water flow. They didn't. Although most dolphin skin research has not added up to much, Yoshimichi Hagiwara, a professor of mechanical engineering at the Kyoto Institute of Technology, has not given up.

Hagiwara got interested in dolphin drag one day when he visited the Echizen Matsushima Aquarium in Mikuni, Japan. There he learned a curious fact: Dolphins shed the entire outer layer of their skin every two hours. Hagiwara wondered what advantage such extreme "dandruff" offered to justify the additional food needed to produce this shedding, especially because dolphins require far more nourishment than most land mammals, ingesting 4 to 5 percent of their body weight a day. Hagiwara fed what he knew about dolphins into computer programs that examine water movement across ships' hulls or through pipes. He adjusted his models to map individual flakes of skin as they twirled through the water. Because he wanted to compare those results with live-action motion, he and his students Hiroshi Nagamine and Kenji Yamahata built themselves a dolphin—a long, rectangular Lucite channel supported by what looks a lot like a giant Erector Set. The skin for this dolphin was made of rubber silicon, the dandruff made of silver glitter glued on with water-soluble glue. Once in the water, the glitter flaked off over time, simulating the real thing. Water flowing across the skin formed tiny vortices as expected, but the flakes of dandruff helped disrupt the vortices, damping turbulence. The Lucite dolphin findings have been backed up by computer models. Hagiwara's research is continuing because scientists still know very little about how dolphins actually swim.

"The trouble is the dolphin doesn't give up its secrets very easily," says Fish. "Maybe that's why it's smiling." ●

# Breathing Coaching Sport

## A Fresh Perspective

London  
March 06

By Coach Shev Gul

Swimming - Running - Cycling

### Summary:

In this paper Coach Shev Gul will be bringing a breath of fresh air to the subject of most effective breathing technique in sport generally, and why the coaching and the medical community continue taking the breathing action for granted? The difference between ineffective shallow "chest breathing" and the natural diaphragmatic "deep breathing" technique; since our infant days, how we have lost this nature-given ability, or 'nature's gift'.

He will be looking at some details (swimming and running context), at the method of effective breathing technique development, progressive practices and drills designed and developed by Coach Shev Gul for dry land and pool training workouts.

Also he will be touching on some tips: how an athlete can instantly refresh and recharge the batteries between the workout repeat sets and before, during and after a race-competition.

He reminds us again that, "Relaxation at high speeds is the most important factor in winning the workouts, races and the Olympic gold medals" *JW, GT - Popov*.

And, the only way to achieve it is by re-learning and re-educating ourselves, our coaches, and our athletes, how to breathe properly, correctly and more efficiently through natural Diaphragmatic Breathing "deep breathing" Technique, which will enable athletes to perform even better in training, in races and in their recovery.

### DIAPHRAGMATIC BREATHING TECHNIQUE - DBT

In sport performance, there is a strong and a natural link between the following four areas of the human mind-body system.

Effective Breathing Technique  
Physiology  
Internal State  
High Performance

Proper and correct breathing technique is central to the ancient practices of Yoga, Qi Gong, Ayurveda and other meditation disciplines. Diaphragmatic "deep breathing" awareness and practices are important parts of training for martial arts practitioners, musicians, vocalists, public speakers, dancers, as well as for athletes.

All our bodily actions: talking, singing, playing wind instruments, the outward force-power application with our arms and legs; hitting, kicking, pulling, stretching pushing, lifting, throwing etc., are done during the exhalation phase of our breathing process (a martial arts

fundamental, for maximum work-power creation and application).

In swimming too, in all four strokes, the main work is done during the exhalation phase of our breathing process which must be executed properly, correctly and fully during the swimmer's arm stroke cycle.

Breathing (exhaling and inhaling) correctly is critical in maintaining the level of oxygen for energy, keeping the correct pH levels in the body, and enough carbon dioxide for bodily functions.

### Why coaches continue to take breathing for granted?

Because we take breathing for granted, the information on the benefits of diaphragmatic breathing technique (DBT) is not widespread in today's medical community! Illness and pathology, not wellness - better mindbody performance of an individual or a sport person - are not the priority of most healthcare practitioners!

In addition, things that are free and can't be patented (like breathing) do not attract funding for research. So, little finds its way into popular medical and sport science research journals. And that's why it has escaped the sport research scientific community's close attention. And, our Olympic coaches pay little or no attention to this 'free' bodily function subject too! (as I have personally discovered during my consultations with numerous top Olympic coaches at various sport conventions).

### Shallow "Chest Breathing"

Unfortunately we continue living our lives and raising our athletes on a poor diet of shallow "chest breathing" habits.

The good news is that the poor and ineffective breathing habits can be reversed.

Among infants, correct breathing comes naturally. Observe a baby as it breathes to see its belly rise and fall with each breath. As we grow older we "suck in that gut" and "puff out that chest" as we try to look slimmer!

Such resistance to the natural breathing posture will restrict oxygen intake, which can lead to numerous physical as well as emotional problems.

Shallow "chest breathing" invites problems by delivering less air per breath into the lungs. Less air per breath leads to a higher number of breaths, putting in motion a series of physiological changes that constrict blood vessels. An imbalance between the oxygen and carbon

dioxide levels in the lungs delivers less oxygen to the brain, the heart and the rest of the body.

Shallow "chest breathing" promotes early fatigue in athletes, affects their rhythm and timing and, as their stroke technique falls apart, inevitably causes them to start losing speed.

### **Learning the natural Diaphragmatic Breathing Technique is the answer!**

Effective breathing technique has a dramatic effect on an athlete's physiology, his/her internal state (relaxation) and on his/her ultimate performance.

Through the Diaphragmatic Breathing Technique (DBT), one learns how to control the inhalation and the exhalation process of the breathing action.

Proper and correct breathing technique = more energy for the body, more food for the working muscles and better metabolic action at the cellular level.

With natural Diaphragmatic Breathing Technique, our brain (human body's biggest O2 guzzler!) is supplied and nourished with more oxygen. And, a brain with plenty of oxygen will operate and control the physiological functions of the body more efficiently. This will result in the formation of a positive internal state, a relaxed state being induced into the athlete which, in turn will promote a superior performance to be achieved.

### **Progressive Diaphragmatic Breathing Technique Practices - Dry Land**

First, with the help of a trained breathing coach, one has to learn how to use and control the diaphragm movement correctly.

The key to a DB technique is,  
On inhalation: Quick and large volume of the air is to be taken in.

On Exhalation: A prolonged and even discharge of the air is maintained throughout the cycle of the motion being executed (arm cycle-swimming).

A puffing action at the end of the exhalation phase will enable the athlete to completely empty his/her air tank - lungs.

Note here; the amount of air being inhaled is always a function of the amount of the air being exhaled.

The DB technique must be learned and developed on the dry land first.

The breathing process is a naturally occurring, automatic and reflex action.

Therefore, during exercise and sport performance, one does not and should never be thinking about their breathing action.

Below are some progressive DB technique development practices:

### **Walking**

Learning the DB technique first through walking action, is the best way to familiarise the mind and body system, with the timing and the rhythm aspect of the Diaphragmatic Breathing Technique-process.

Unilateral practices.

Breathing in on every second step-stride. LHS (left-hand side) and RHS (right-hand side) practises. Just before the back foot is about to be lifted off the ground, a quick and large amount of air is taken in (via mouth).

As the same foot moves forward and is about to touch the ground, A long, continuous and even exhalation action via mouth (with a puff at the end) is executed.

Repeat 10 x 6 step-stride cycle

Breathing in on every fourth step-stride. LHS and RHS practice

Bilateral practices.

As above, but breathing in on every 3rd, and 5th step-stride.

### **Treadmill - Gym**

The next phase of progressive dry land practices can be effectively achieved on a treadmill in the gym.

Starting on 3-4 km/hr treadmill speed, and then progressing on to 5, 6, 7 and up to 8 km/hr speeds, the DB technique is practised and consolidated further.

### **Using Arms (for swimming) - Dry Land**

Now, move the practise to the arms (swimming specific).

Simulating -choreographing- arm action corresponding to all four strokes used in swimming, one can further consolidate the learning of Diaphragmatic Breathing Technique.(full details on the sequence of the drills can be obtained from coach Shev Gul, gulshev@aol.com).

### **In The Pool (for swimming)-fc**

The progressive pool practice that can be used by coaches to teach DB technique to their swimmers and athletes can be summarised as follows:

1.. Holding onto the rail with one arm and the swimmer's body on its side, extended arm/hand on the rail, face down, the upper arm resting on top hip, legs kicking to maintain floatation.

Swimmer performs -practices DB technique sequence as taught by the coach, trained in the correct breathing method (DBT).

Repeat: 6 times on LHS and RHS each.

2.. Push and Glide (BLV)

Swimmer pushes and glides from the wall, in Body Long Vessel (BLV) position.

DB control action is practised with one arm action, over a distance of 10 yards.

*continued on page 6 >>*

Repeat: 6 times practising on RHS and LHS each.

3.. Super-Slow Swimming

The next phase of DBT drills are performed while swimming in super-slow mode (SSS), until swimmer becomes fully competent with the technique.

4.. Normal and High Pace Swimming

Finally, swimmer starts incorporating his newly learned DB technique skills in fast swimming modes, until it becomes a reflex action.

**Fly, Br, Bk Strokes DB Technique practises.**

For full details on the suitable progressive practices for the remaining three strokes, contact Coach Shev, gulshev@aol.com

For further information on Effective Breathing in Sport,  
 Contact: Coach Shev Gul, London  
 BSc, ASCA, FIOS(cc), NLP MP Sportsmind Consultant  
 E-mail: gulshev@aol.com  
 Web: www.swimmtech.com  
 77a Derwent Rd  
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**Thanks to ASCA for its leadership and educational programme support extended to its member coaches.** ●

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<p><b>"A Rising Tide Lifts All the Boats!"</b>  <i>Be a part of the rising tide of the World Swimming Coaches Association</i></p>																													
<p>The World Swimming Coaches Association exists to elevate the profession of coaching in swimming in the international sporting arena, to a position of influence and to improve swimming. WSCA also provides and develops international friendship and support of coaches, elevates the level of coaching in all nations, and increases public awareness of the good work that swimming coaches perform in all nations. Coaching Education is a primary function of the Association.</p>																													
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# Letter to the Editor

## *Shev Gul's Letter to the Editor*

### *Reply on "Paralysis Through Analysis and Shallow Chest Breathing v Diaphragmatic"*

Dear John

My thoughts on,

- Paralysis Through Analysis
- "Shallow" Chest Breathing v Diaphragmatic Breathing
- A Prediction ! - See end of this letter

#### **RE: PARALYSIS THROUGH ANALYSIS!**

As requested, I would like to summarise my thoughts on the subject, and hopefully in due course, we'll get some more stimulating responses on the following topics from the rest of the ASCA member coaching community too, via ASCA's on-line articles, Newsletters and American Swimming Magazine, The Journal of Swimming Research mediums, etc.

The ref questionnaire - The Breathing Profile of A Swimmer (attached below), is intended for the benefit of advanced and elite swimmers, and for the swimming teachers and coaches - to encourage them to think 'outside the box'!

And, I do agree with you that one should use a much simpler approach (to avoid "paralysis through analysis") when it comes to empowering the swimmers of age 10 and under.

To keep in touch with the grass roots of our sport (outside my club coaching and my Cali.Stroke Technique Clinics), since 1995, I'm still teaching-helping my borough twice a week, with their 6-10 years old and the adults Learn To Swim Programmes and enabling them to learn to swim correctly, efficiently and in the shortest possible time;  
(see Foamless Practices, Shev Gul, The Swimming Times, 1999, Article pages of [www.swimmtech.com](http://www.swimmtech.com))

#### **A Priceless Learning and A Life Skill**

My other biggest contribution to the 6-10 year olds, has been to empower them with a priceless life skill, and to plant the seeds of awareness on "the benefits of the natural diaphragmatic (deep belly) breathing" process for maintaining a healthier mind-body system and for achieving higher performance in their future sport activities.

#### **How do I teach the 6-10 age group swimmers this (belly breathing) skill, without inducing 'paralysis' into their tender minds?**

I challenge them to discover for themselves, and show me that they can make their abdomen (belly) move outward and inward, as effective-visible as when they make their chest rise-expand, out and in, through the breathing action.

The class chooses the best 'belly breather', and he/she is rewarded, with a noisy round of applause! After helping the rest of the class master the "belly-diaphragmatic" breathing technique, then, for the rest of their term, they are encouraged to breathe only and always diaphragmatically (deep belly) during their interval-rest periods.

This life skill will serve them well for the rest of their lives: whether they need to de-stress and re-energise themselves later on during their working lives, when they exercise just to keep fit, when they become an athlete-compete in a sport, to recover from a prolonged physical exertion or a sudden shock to their mind-body system, and when they just need to relax and chill-out after a long and hard day's work (teaching and coaching!).

A priceless learning and a life skill indeed. A best life skill-gift that a teacher and coach could give to 5-10 year olds.

#### **RE: CHEST (SHALLOW) V DIAPHRAGMATIC (BELLY) BREATHING**

Why are the swimming coaching community, the swimming governing bodies and the world's leading swimming coaching associations! still taking the breathing process-action in sport (in life!) for granted, and why do they continue being "passive" and not providing the sporting community with the scientific knowledge base and its unquestionable proven benefits to the athletes development and better performance?

(for an answer, see below coach Shev Gul's, article headed, 'Effective Breathing Coaching In Sport - A Fresh Perspective, or visit [www.swimmtech.com](http://www.swimmtech.com)), the Articles page).

Here below are numerous healthy refs and studies, supporting the benefits of the Diaphragmatic Breathing Technique (DBT) in sport (and in life!);

- T.K Cureton; Respiration in Swimming and its Relationship to Speed and Efficiency.
- Bachrach and Handley; The pioneering swimming coaches -Front Crawl
- Cecil Colwin; Breathe Better, Swim Faster, American Swimming Magazine, 2003, issue 5
- Margaret Brouceck; Grabbing large breaths and exhaling slowly are keys to winning races. Swimming Technique
- J Weissmuller (Tarzan!); Relaxation(\*1) at high speeds is the key to winning races
- G.Touretski & Popov; Rhythm(\*2) and Relaxation(\*1) are the keys to swimming faster
- Wilmore & Costil; Physiology of Sport and Exercise

*continued on page 8 >>*

- T.Noakes; Lore of Running
- S.Gul; A-Z To Breathing Process - The Breathing (O2) Code, ASCA World Clinic, 05-Poster Presentation
- Placido Domingo; "To increase your lung capacity, move your diaphragm all the way to down"
- Other sources: Countless written material on Breathing Technique (DBT) In Martial Arts, Wind Instruments, Singing, Dancing, Gymnastics, Meditation etc.

And let's hope that it will not drag on (I am confident it won't) as long as the discussions on the topic of `Lift versus Drag` which have been with us, now for well over 50 + years!

### **(\*1) Relaxation; Where does it come from - its source of origin?**

For the past 2-3 years I've been trying to find an answer; to 'decode' the true meaning of the word 'relaxation' (at high speeds) in J Weissmuller and G Touretski & Popov's following famous observations (ref; see video, Popov, What's The Limit?)

" Relaxation at high speeds is the key to winning races "

" The 3 Rs -Relaxation, Rhythm (\*2) and Range- are the keys to fast swimming "

Since breathing technique is linked and has a direct effect on one's physiology, internal state and on one's ultimate quality of performance in sport, it is clear to deduce that, the only possible source for relaxation and rhythm in swimming, has to come from an athlete's effective breathing technique-capability.

(for detailed explanation, see The A-Z To Breathing Process-The Breathing (O2) Code poster -a copy with ASCA).

Note: Rhythm(\*2) Is a function of breathing too.

My most recent noticeable personal contribution in empowering with the effective breathing technique, has enabled several athletes to perform even better at their chosen events.

1. Jemma Lowe (15!), competed in the finals of Commonwealth Games March 06.  
See Feedback page of [www.swimmtech.com](http://www.swimmtech.com)
2. Darren Hunters (24), qualified (Cali.March 06) to compete in the 2006 Ford World Ironman Championship.
3. Jason Gatenby (34), Converting Volvo to a Speed Boat! See Home page, [www.swimmtech.com](http://www.swimmtech.com)

### **A PREDICTION !**

Once the teaching and coaching community, the athletes and their respective governing bodies and their teaching and coaching associations see and realize the benefits of empowering swimmers with the natural Diaphragmatic Breathing Technique, their weekly training requirements (by volume) will be slashed down by at least 50% !

Thanks to ASCA for providing us with a healthy and stimulating medium for learning, for development and for the analysis and discussions of new ideas and concepts relating to swimming sport.

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For more info on breathing related info, visit [www.swimmtech.com](http://www.swimmtech.com), The Articles Pages

## **THE BREATHING PROFILE**

### **Characteristics of a Swimmer**

Finding about a swimmer's breathing profile would be an invaluable info resource and an educational exercise for both the coach and the swimmers too - it will help them to become the 'thinking coaches and athletes!'

- \* Frequency?
- \* Describe how do you roll your head to initiate the breathing action?
- \* Describe the position of your head to initiate the breathing action?
- \* Describe the position of your head during the exhalation?
- \* How do you breathe (i.e., mouth or nose)?
- \* Timing of head roll in relation to your forward arm/hand position?
- \* Timing of your inhalation in relation of the back arm/hand?
- \* Timing of your start of exhalation?
- \* The exhalation pattern throughout your stroke cycle - the duration of your exhalation?
- \* When you inhale, what part of your chest do you think you are using?
- \* What are the main muscles involved in breathing action - swimming?
- \* To increase the volume of air inhaled (the aim), what breathing muscle must be engaged.
- \* What type of breathing relaxation techniques are you aware of, before a race and immediately after the race?
- \* Which organ is the biggest O2 guzzler?
- \* Do you know of any dry land breathing practices for swimming?
- \* How does O2 contribute in the production of energy for the muscles to do the work?
- \* "Relaxation at high speeds is the key to winning races." Where does this `relaxation` come from?
- \* Can a better `breathing control technique` help delay/slow down the Lactic Acid action?
- \* Why correct and most effective breathing technique must be learned first on dry land ?

For Breathing Control Technique coaching and to swim faster contact:

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[www.swimmtech.com](http://www.swimmtech.com)  
Tel- 00 44 20 8886 1119  
The End. ●*

The American Swimming Coaches Association



# World Clinic 2006

September 6-10  
Washington, DC

## Early Registration Form

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- New/Renew US Members
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