

THE BIRTH OF THE INDEPENDENT SWEDISH CENTER FOR AQUATIC RESEARCH (SCAR)

The quest to unlock human potential

Craig Lord

INTRODUCTION OF THE THEME

Craig Lord travelled to Lund, Sweden in January to witness the birth of the independent Swedish Center for Aquatic Research (SCAR) and the public unveiling of a system already in use by some of the world's best swimmers on a private basis since the 1990s. The program is designed to show that nature is the key to swimmers surpassing the kind of speed achieved artificially as swimming gasped for air when a shiny usurper was granted the wave for 22 months in 2008 and 2009.

The following articles consider "Nelmsing," the origin of the thought behind it, and travels with Shane Gould, the work of US coach Bill Boomer, the Shanghai squad of 33 young teenage pioneers growing up with USA coach Chris Martin, and a systems theory approach that places Brainswimming and neurological-response conditioning at the core of preparation. In effect, what it boils down to is a deeper understanding of the way people learn through movement, specifically through quality of movement.

Expect opinion to be divided about what Nelms sees as a code of how human beings operate in water. Down the years, he has shared his code with "a few trusted people," aspects of his work picked

up and used further afield. "People have taken bits and pieces and used them in different places," said Nelms. "This is the first time that a summary of all the pieces has been explained at one time."

Cherry-picking from the book of ideas creates problems: the work is not applied properly and those using parts do not link what they are doing back to the original source to check the accuracy of their interpretations, making the risk of misunderstanding founding principles high.

As Gould put it: "Open source sharing has been a noble element in the spread of swimming knowledge in the recent past; however, the pace of sharing has sped up with the internet age and the opportunities for self-promotion have expanded. Unfortunately, cherry picking the ideas has tended to dilute their effectiveness."

One of the core missions of SCAR is to promote a culture of integrity in knowledge sharing.

In the mix of any thinking and debate on the future of swimming speed is the role of sports science, a field (with branches of physiology and biomechanics) that has contributed significantly to swimming and continues to do so. Science has done well from the relationship too, its expansion in the sport in part down to the fact that all that measuring and ability to say "here is where it happened and why" a good fit with funding models, and the linear

thinking of federations and those responsible for performance.

Expressions of how a swimmer feels, how the brain and neural system of an Alex Popov or a Michael Phelps are part of their success stories are left to the book of swimming art and the poetry in such gems as this from Popov in 1997: "The water is your friend... just share the same spirit as the water, and it will help you move. If you fight the water, it will defeat you."

Can an expert swimming eye see that? You bet. But don't bet on it ever contributing to funding in the way that Olympic gold medals can be used to keep a sports scientist in the program—or at least until a time when it may be possible to measure "feel" and the function and efficiency, cause and effect of neural pathways in the realm of performance.

Until now, it has been the choice of Nelms and others to work with specific individuals and squads. What the likes of Thorpe, Coughlin, and Vollmer, to name but a few, have held up as the key to edge and future speed, has never entered the realm of official policy in the way sports science most certainly has. Such official status has often tipped sports science into the realm of law, not faith in the facts but the rigidity of application of "proven" benefits and an accompanying culture of teaching children to "do it just like Michael" locks down human reserves that might otherwise contribute to swimming speed, Nelms believes.

As you read the words we spread (and do with them what you will), it is important to keep in mind that Ian Thorpe is not rejecting all that made him so fantastically good between 1997 and 2004 when he says: "I believe if swimming is to move forwards, the Milt Nelms holistic approach is the only way to



Milt Nelms, Shane Gould, and Bill Boomer at Lund (SWE) conference during January 2012

go... it is the only way that swimming is going to get significantly faster. I won't be the one to show it to the world, but others will seek Milt out. His methods won't be adopted initially, because people are so set in their ways of doing things, and you must be open to lateral thinking."

Important, too, to note: while there is no getting away from the antagonism of Nelms towards certain long-established ways of doing things on the way from teaching pool to podium, he is at pains to point out the respect he holds for coaches and others who have done "the heavy lifting" (no substitute for hard work at the heart of many ways and means to carving champions) by the time he arrives to try to help swimmers find the hidden edge they may never know they had—an edge that could make the difference between 4th and gold, 9th and the finals or even podium. The name of the game and a critical part of funding models are they are happy to note the dishes on the menu but would rather not go to the effort of understanding the finer details of ingredient.

THE MEANING OF SWIMMING

Myriad are the views in swimming of when, where, how, and to what degree sports science should influence the preparation of world-class athletes of the kind with Olympic and World Championships podiums in their scope and on their wish list. Among those views is a common thread: that the benefits brought to the sport by science can lead to a "one-size-fits-all" approach to the pursuit of human speed in water.

The issue is as old as the sport, technique, style, efficiency, aesthetics alive in *De Arte Natandi*, a Latin appreciation of how humans did and could move in water, penned in Latin by Everard Digby. Fast forward to Flying Gull when he winged his way past Tobacco, a fellow Native American Indian of the Ojibbeway, in a race with Englishman Harold Kenworthy in a 130-foot pool in London on April 2, 1844. Mr Gull clocked about 30 seconds for a distance of just 40 m, and a predecessor of mine as swimming correspondent for *The Times* newspaper in London wrote: "Their style of swimming is totally un-European. They lash the water violently with their arms like the sails of a windmill and beat downward with their feet, blowing with force and performing grotesque antics."

Then there was Charles Wallis, who watched Aborigines swim in Lane Cove River, Australia, using a sidestroke with a single-arm over-water recovery. He demonstrated the style on a visit to London in 1855. In the crowd was Professor Fred Beckwith, who went on to win the English Championship using the technique in 1859 and did so again when he defeated Deerfoot of the Seneca Indian tribe in a "professional" race in 1861.

A big breakthrough came in 1873, when John Trudgen, after observing South African Kaffirs (others suggest that he had in fact been watching South American Indians), copied their double-arm over-water action with breaststroke kick in a 160-yard race at Lambeth Baths, London, on August 11, 1873.

Skipping a few pages of history, Englishman Fred Cavill emigrated to Australia in 1878, watched natives in the South Seas using a movement not unlike that of Flying Gull, who swam in the way that he felt was going to get him from A to B in best shape. Cavill showed his sons, and Richard Cavill won the English 100 yard freestyle in 58.6 seconds using alternate-arm over-water action with legs trailing. After the race, he was asked to describe what he was doing. He said it was like "crawling" through the water. The term front crawl was born.

Richard's brother Syd wound up in San Francisco and taught the stroke to J. Scott Leary, the first American to swim the 100 yards in a minute, back in 1904. The style taught by the Cavills was taken up by Frederick Lane (AUS), who at 18 raced the New South Wales mile championship taking alternate arm strokes above the water and timing his pull to coincide with a scissor kick. At the 1900 Olympic Games in Paris, Lane triumphed over 200 m freestyle when swimming with the tide in the River Seine.

The term "crawling" is significant today not only because it is the term we have come to use for a specific stroke. It is a word that describes a land-based movement, for that was the way that Cavill "felt" it to be, the way a wider audience, most of whom would not have been swimmers or had any appreciation of what it was to swim, might come to understand what he meant.

Step aboard the time machine past De Breda, Bachrach, Kiphuth, and Sakamoto, through Counsilman, Daland, Haines, Gambрил, and Chavoor, Talbot, Guthrie, Carlile, Gallagher, Herford, and Sweetenham, and on to those producing the champions of today, and we arrive at a sport (one that had long been about the direct interaction of human and water) reborn after the life of an equipment-based usurper was mercifully cut short as those running swimming came to their senses in 2009.

The world-record book and the world rankings of the sport 300 and more deep are swamped by performances that could only have been achieved at the time by use of non-textile bodysuits that buoyed and boosted athletes to greater or lesser degree, depending on morphology and physiology of the individual. After 25 world records were set in Beijing 2008 in the early stages of a 22-month suit crisis that witnessed a farcical 250-plus global standards, the 2010 and 2011 seasons produced one

man capable of swimming inside best long-course shiny speed: Ryan Lochte. (Sun Yang got inside the one men's standard that had survived the Booster Bodysuit War.) A handful of world records at London 2012 would be an amazing outcome at a time when the swimmer, not the suit, is consort to the water once more.

The race and not the time is where it is at, anyway, many point out. It's a fair and reasonable comment in the complex world of performance but one that can hardly mask the fact that if you can travel at world-record pace or better, you are more likely to win the race. Anyone who can go into uncharted waters of the rare kind that Lochte swam into in Shanghai with Michael Phelps breathing down his neck will know that a podium place, at the very least, is guaranteed in London this summer. (How many events will see 4th crack the time of gold four years before this time round, even though history is stacked with such examples?)

The question is: What more can swimmers, coaches, and others do to make humans in H2O faster in future than humans in H2O-repellents were in the past, while staying true to the requirement to do no harm and to hold swimming up as a healthy place to send your kids?

"Lateral thinking" is where the answer lies, says Shane Gould, the only woman ever to win five solo medals at one Games, her three golds in Munich 1972 won in the 200 and 400 free and 200 medley. In Lund, the 55-year-old told her audience that Nelms, her partner, had chosen the moment to place his concept in the public domain because the time had come to share work that was now "solid" after years of research, consultations, clinics, and putting ideas into practice and witnessing results.

Nelms held back a lot of information while working with some of the world's leading swimmers and their coaches but, said Gould, "It reached a tipping point and a couple of things happened in the past year that made him ready to share his information. After many consultations and clinics, 10 a year, the work is solid now and it is time to share it. The theme of this conference is to acknowledge the work of Bill Boomer and Milt Nelms, to stake a flag and say this is where these ideas came from. For Milt, this is his coming out. He is presenting his ideas. It's not a secret society but a forum of non-published ideas. There has been too much cherry picking."

On a journey that would include "impulses, spaces, system theory, density, balance, line, torque, the Aquatic Signature (born 2002), Interanimation, body energy, shoulder-safe swimming, rhythm in water, and BrainSwimming," food for thought was provided by a challenge put to Gould by Edward de Bono, the physician, author, and creator of the term "lateral thinking." Back in 1999, when Australia was

debating whether to retain the Queen of England as a figurehead or become a Republic, Gould was at a book fair promoting her autobiography *Tumble Turns* when she met de Bono. At the time, he was offering his services to any 365 towns across the land that would like him to be their King of Australia for a day as a way of stimulating debate.

Gould invited him to stay in Margaret River in Western Australia and De Bono accepted. But it wasn't bloodline monarchy he was most interested in hearing about from the queen of swimming in 1972. His challenge was: Is there any way of doing things differently in swimming—a new way of swimming? Gould considered the meaning of swimming and concluded: "I don't know about swimming any more...so I jumped in behind a squad of 12-year-olds to learn their language and test the sets they were doing." Things hadn't changed much: "I noticed that many swimmers were doing things the way I was doing it 40 years ago. I thought, 'Great, but in all that time surely there must be a new way.'"

Through that and her work in training horses, Gould arrived at an answer for De Bono: yes, and "perhaps the new way should be how we see swimming, the learning process and how we train it." A year later, she met Nelms and Boomer in Pennsylvania, and the three believed "we had some treasure and it was something the swimming community had to know about," said the only swimmer ever to hold world records from 100 m to 1500 m freestyle and the 200 m medley.

Gould and Nelms went on a tour of discovery that took them to native communities in Fiji, to local pools that catered to pensioners, kids, and leisure swimmers, into the ocean and a dimension far removed from the pool. It also led them to talks with Aborigine women who could not quite understand the question "How do you teach your children to swim?" The reason was simple: to them it was like being asked "How do you teach your children to walk?" Answer: "We don't." The world provides an opportunity to learn, they explore, get stronger, and at some stage get up and go.

This, Gould believed, was significant in that swimming is "taught" along specific lines, even though it involves movement that comes naturally and is conducted in an element open to learning by exposure to experience. She showed a film of her grandson Kobi, not yet two years old at the time, feeling his way through the water with hands and arms, walking in an element that supported him. He puts the water to his mouth, feels and tastes it, listens to the sound of it moving, watches droplets hit the water and create a ripple. "He knew the sensations, that water is smooth and thick...Kobi was swimming."

Nelms, describing himself as "a student

of swimming," watched Gould swimming and "benefitted a lot" from doing so over the past 12 years. He also learned much from Boomer and his work as technical consultant to the late Richard Quick, cited by Boomer (who served as a consultant to the 1996, 2000, and 2004 US Olympic teams) among those he considers to be the most influential thinkers in the sport, along with the late Al Craig and others. Nelms, who worked with Quick on a series of videos outlining a new way of thinking about swimming speed, describes his own work as an evolution of the process of getting swimmers to be the very best they could be. "It is not an easier way but a way to be athlete friendly and performance friendly," he says.

NELMS—THE WHISPERER WHO JUST GOT LOUDER

In the realm of those who seek to turn gifts of nature and hard work into Olympic gold, Milt Nelms is known as the Water Whisperer, his aquatic alchemy shared in relative secrecy with the class of swimmer in the hunt for glory at London 2012 this July.

Of late, lines from the "Nelmsing" Code, the book of incantation from the holistic school of Brainswimming developed in partnership with veteran American coach Bill Boomer, have made their way into mainstream coaching—particularly since the USA federation included their work among the top 25 reasons for American dominance in the pool.

The complete book of Nelmsing, with brain training linked to a martial art designed specifically for swimmers, has remained under wraps. Believing a little knowledge to be a dangerous thing, the whisperer now wants to shout about swimming's X-factor for the first time, among his reasons for doing so to keep the body of his work together for it to be used as a whole and not inappropriately, as he sees it, in bits and pieces.

"A lot of the terminology and some of the ideas are getting out there but the intended quality of the movements and ideas associated with those terms don't match up with what I intended," said Nelms. "It keeps happening and at some point I've got to stop that. Some of this stuff might not help them if it's used wrong."

Shane Gould interjects, cites an exercise in Nelmsing called Loops (see panel on Nelmsing). "You can get a lot out of the loops but if you start doing them in low quality, then you miss the learning opportunity from the water—you're not going to get as clear and concise a message from the water."

Nelms nods and adds: "Exercise has the potential to affect growth of perception and it has the potential too to diminish perception or redirect perception in the wrong places." That leads him to another reason for going public: "I feel a strong

sense of responsibility to be very thorough. I have spent a lot of years working this stuff out but I have a 10% rule and don't even want to speak publicly about something until I feel like I'm talking in about 10% of the knowledge base. I want to be in a place where I feel that even if there is a change to be made to something, it is a small adjustment. That way I never take myself too far down the wrong roads.

"What happened in the last couple of years is that I feel a couple of big things fell into place. I now believe that the system might be able to help people in the water, and can be taught and replicated. People have to really pay attention to the first few sentences because it really is a very simple process: it's how nature works. Like all natural systems, this is very complex but also very simple if you get it right. It is a metaphor for a lot of things in life."

Nelms believes that the future of swimming speed relies on awakening strengths built into human nature through evolution but put to sleep by a modern sense-numbing lifestyle and by the drill of science-based instruction of technique.

"Many of the athletic components of our evolutionary process are now dormant in the 21st Century," says the American who lives in Tasmania with Shane Gould. "These dormant components give us potential for higher performance if we can activate them. If I see distortion, dysfunction in the nervous system—and the nervous system is really simple in the way it works and how it's supposed to move—I try to get the distortion out. Swimmers need to rearrange how they perceive the world and themselves in it."

Copying Michael Phelps will not work, he states. Change happens "if you can capture his coordination, his sensitivity to environment, his perception, his feel for water, you've got a chance to be more like Michael and join the pond of golden fish.

"Michael is the best swimmer who ever put on a suit," adds Nelms. "Not many can swim butterfly like he can—but his torso, arm length, execution, all aspects of him together, mean that his technique works best for him, works better than a stroke has ever worked for anyone. You cannot apply that to other body types."

So where to start if you're not a Phelps clone? "The magic begins when you start to build a library of experiences in a young swimmer," says Nelms. Determining the aquatic signature (see panel) of each athlete is the starting point of a system in which tapping into energy in the water and the "inner" body, brain training, and neurological-response conditioning are king over building brawn in pursuit of speed through a dense element kind to synesthetes (see panel),

unforgiving to those who struggle with it.

As Russian "Sprint Tsar" Alexander Popov once put it: "The water is your friend, you don't have to fight with water, just share the same spirit as the water, and it will help you move. If you fight the water, it will defeat you. We were born in water—it's like home to me."

How do you get someone to "share the same spirit" as water—and what is whispering? There is no hesitation in Nelms as he replies: "Everyone on the planet, I believe, is synesthetic in one way or another. They don't necessarily know it—but you can make them aware." How? Can he describe what it is that he does?

"It is very vivid to me when I do it," says Nelms. "When I was around real horse whisperers and watched what they did, it was crystal clear, like telling the difference between black and white. It looks like voodoo, but once it is explained to you, it's just as practical as cracking an egg, as simple as that. It comes down to seeing movement and seeing distortion. To the kid, the athlete, and to me it's not that remarkable. The whole process has about three moving parts. It is similar with horse whispering: it's binary—a go point and a no-go point."

A trained artist, Nelms often talks as though he is seeing the world in pictures, not words. So by "movement," is the water just as significant as the swimmer? "Yes, the water makes it easier because you see changes in the environment, not just the body...you've got double feedback. I never thought of it like that before: what I see relies on watching the water, understanding patterns in the water... you can't see the air move when a runner runs, but you see precisely what happens with water when a swimmer moves through it."

Gould admitted to having been frustrated by Nelms' refusal to give her "instructions" when she asked "Well, what do you want me to do?" Eventually she understood that he was not teaching in the traditional manner summed up by "lift your elbow higher," of what Teri McKeever, head women's coach to the US, describes as a learned dependence on certain ways of doing things according to a specific, targeted instruction.

Said Gould: "I'd ask him how he knew my hip was 'turned off' [as in not actively engaged and contributing to her kick]. He'd say, 'I can see how the water is moving. He would then give me an exercise, which would make me aware of a change, in the feeling I had and how the water responded.'"

Asked how that worked, Nelms replies: "I work with an athlete and I make a suggestion, say 'Can you move in a way that makes you more awake in your pelvis?' I see the water change in response to that, and then look at the kid and ask 'Did you feel that?' They say yes, suddenly you are talking a different language, the language of experience.

It can look like voodoo but it's fairly simple: I am creating parameters and telling someone what specifically to pay attention to but you leave the image up to them; once you have got the image, then you can assert influence on their metaphor."

The aim is to move with the apparent ease seen among great swimmers even as they toil: forward propulsion constant, energy from the impulse carried forward into the spaces between strokes, the "dead zone" in which drag is at its strongest now alive, water harnessed, wave caught.

Linear, logical thought, and communicating ideas demands words that specifically convey meaning. Among the first questions Nelms asked Ian Thorpe when they started to work together (post-Athens 2004 when the Olympic 200 and 400 free champion was interested in getting more out of himself as a sprinter with Olympic bronze over 100 m in his treasury) was "When you go through water, what are you trying to do...tell me what it feels like or looks like." Nelms had asked the same of Gould. Where Gould said she wanted "to avoid the thickness and get to the thinness of the water," Thorpe replied: "I want to avoid the black and find the white in the water." Each had their own metaphor.

"The way the brain is set up it makes sense," says Nelms. "You will associate a movement with a smell sometimes, expressions of vibration, colour, sound might be used. Someone who is synesthetic with colour, well, you don't want to express it to them in a sound or tell them they have to express it as a sound. They have to understand the feeling for themselves, use their own metaphor."

Nelmsing "is not revolution but evolution," says the man with his name on the tin. He notes that coaches have done "the heavy lifting" by the time he arrives. Boomer agrees but believes many programs lack "the chaos that prepares the nervous system for the assault of world-class performance" and also lock the door to human reserves by drilling a child to "swim like Michael."

To turn the key, Nelms created a martial art for the swimmer after a pilgrimage of personal experience that included Pilates and Yoga. "They don't work for swimmers—there are too many manufactured movements," says Nelms. Exercises with Nelmsing Cords made of woven stretch fibres "mimic swimming shapes and movements on land to get internal organs to activate so you can breathe properly and learn to relocate energy to where it is most useful," the maker explains.

"Our response to tension is often to relax," he adds. "But you want to perform and don't want to lose the energy—just relocate it to where it is needed. We are westerners. We have these logical academic brains. What I set out to do in the movements (Nelmsing Cords) was to move energy inside the body, in waves and pulses."

To translate, Nelms, a trained artist, turned to geometric form "to provide imagery that the brain can work with." He divided the body up into cylinders, with four sections in the legs and four in the arms, four across the torso, and two on either side of the chest.

"The kids learn to identify and manipulate those cylinders through using the cords," he says. "How they perceive it is not actually what happens but we get them to imagine that's how it happens for understanding. They think their body is one big flat thing but through Nelmsing, they can feel specific parts of their body, wake up parts of the body at a time, make the brain aware of how each part works, and how it all works together."

The process makes the swimmer aware that "they have to pull with the whole body, not just arms. When they get it, they go faster. They need to engage the legs, the hips, the pelvis, not just "kick"—to feel what the water is doing around them, to respond and move with it. The changes that can happen are amazing."

It would be amazing to see a handful of world records fall in the pool at London 2012 after 25 in Beijing, but if and when they do fall, the protagonist's engagement with the water, the transfer of energy (consider the rock in the roll of Phelps and Magnussen, the gain of Lochte as he fires into and out of turns, the seamlessness of Coughlin and Kitajima), the inner momentum tangible in great athletes will be a part of the success story. That such skills can be unlocked through work of the kind advocated by Nelms and backed by the hard graft of the likes of McKeever and her assistant at CAL Berkley Christina Canane is beyond doubt for many. The change in Dana Vollmer on her way to the best ever in textile for the world title in Shanghai last year and what she told the media in the mixed zone served to spread the word more widely.

Whatever happens in London this summer, Nelms will be elsewhere and averting his gaze. "Here's my curse," he says. "I have kind of a holographic image in my mind...when Dana goes 56—and that's why I never watch swim meets and I have never watched that swim [on video or live] because it makes me crazy—I feel kind of guilty: [instead of shouting hurra!] I watch and say 'shoot, there's a 54 in there if we can just do this and that.'"

So, during the Games he will be in the ocean surfing in front of his house in Tasmania with Shane—or someplace without a TV. Not what you might expect to hear from one steeped in the art of performance, perhaps. "From a very practical perspective, and I know this will sound like I'm trying to be ultra-altruistic, I really feel that the kind of commitment it takes to be a coach and an athlete is truly extraordinary. My commitment is very, very

high but I don't pay the price of living the life that those people do. And I feel like what I do can really help a lot but somebody else has done all of the heavy lifting when I get there.

"Dana took a big risk in doing the things she did. Teri took enormous risks too but the only reason I was even able to talk to Dana Vollmer was because of Teri McKeever. She opened the door. That's the sport of nice sounding end of it, what a great guy. Here's the other end of it: if something out of my control doesn't work and they swim like sh*t, people go 'Milt's been working with that kid and look what that did to him.' The fact is," Nelms says in confessional tone. "I don't have a lot of control anyway. Usually if they are going to be really good, they are already good. I can help at the elite level to sometimes get that little bit more."

Of course, that little bit more among the very best in the world can be of immense value if being the best you can be turns talent, skill, ambition, and toil to gold.

THE FEEL

Some swimmers have a heightened "feel" for water. Synesthesia (ancient Greek meanings for "together" and "sensation") is a neurologically based condition in which stimulation of one sensory or cognitive pathway leads to automatic, involuntary experiences in a second sensory or cognitive pathway. In one common form of synesthesia, known as grapheme, letters or numbers are perceived as inherently coloured, while among the 60 or so other forms of the condition, people have been known to perceive and interpret numbers, days, months, and events as personalities or associate sounds to specific visual motion. It is estimated that synesthesia could possibly be as prevalent as 1 in 23 persons across its range of variants. The subject of intensive scientific investigation 100 to 150 years ago, synesthesia was largely abandoned as a topic of research by 1950. The birth of the neuroscience age in the past 20 years has relit the torch on the subject.

THE AQUATIC SIGNATURE

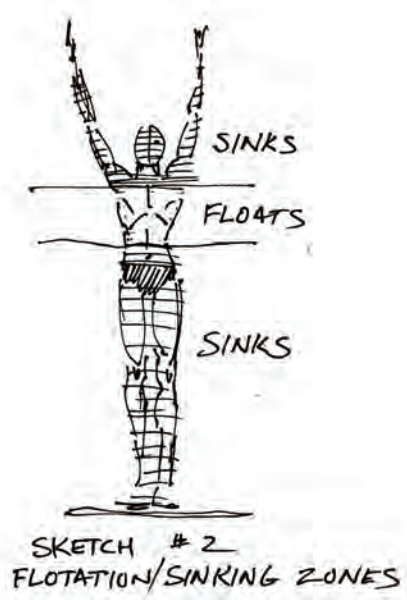
The concept behind the term "aquatic signature" was first used and spoken of publicly by Bill Boomer in the late 1980s, while the actual term itself developed out of a conversation between Boomer, Nelms, and Gould during a Christmas spent at Boomer's place in Pennsylvania in 2002.

The human body naturally shapes itself in the water in a typical way, which is called the Aquatic Signature. The Angle and other traits of the Aquatic Signature vary greatly from person to person, but the basic character is the same for all human beings.

The aquatic signature is an indication of the amount and the location of buoyancy that is



naturally in a person's body. The chest contains the lungs, so this part of the body floats upward. Everything from the lungs downward towards the feet is heavier than water, and tends to sink (tummy,



that is horizontal and close to the surface is a much better position for swimming. Refer to Sketch 3.A swimmer's most common way of moving from an Aquatic Signature to a horizontal position close to the surface is to use forceful leverage by kicking downward on the water while lengthening the body. Refining this level swimming position is one of the things that makes faster swimming possible.

Green, Yellow, and Red Effects:

There are three resistant effects that slow the swimmer down, and require energy to overcome.

Listed in order from least aggressive to most aggressive, the effects are:

1. The resistance of the water as it passes over the skin, hair, and material of the swimming suit.
2. The resistance of the body as it creates a hole in the water.
3. The resistance of the waves and turbulence of the water as the body moves forward.

The least important of these three Effects in competitive swimming is the first. The other two are more important. In point 2, the size of the hole the body makes in the water is where problems can occur: the bigger the hole, the more of the heavy, thick water that is displaced, and the further that the water will need to go to get out of the way of the swimmer.

The quality in point 3, problems are created by the size, direction, and amount of turbulence in the waves made by the body as it moves forward. The hole in the water needs to open up and close behind the swimmer. This fact, plus the forms and fluctuations in the body, are

Sketches by Milt Nelms

hips, legs). Everything above the lungs tends to sink as well (shoulders and arms, head and neck).

The Aquatic Signature is a poor swimming position, especially when trying to go fast. A position

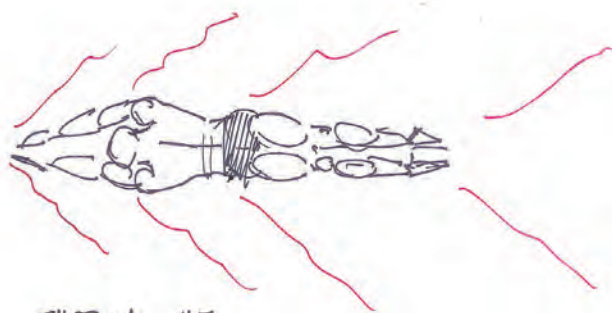
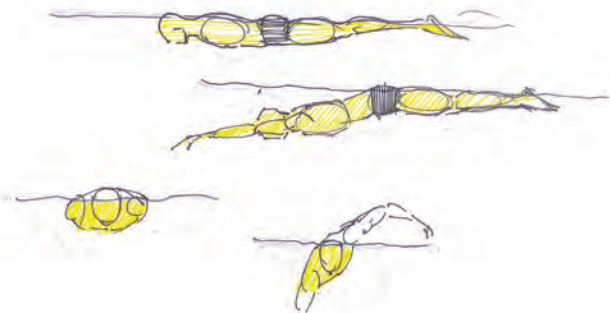
what cause resistance.

The bigger the wave, the more agitated the wave, and the more oblique the angle away from the body of the wave, the greater the problem in point 3.

SKETCH #5
GREEN EFFECT



SKETCH #6
SHADED AREAS SHOW YELLOW EFFECT



SKETCH #7
SHOWING "RED EFFECT"

SKETCH #8 - SWIMMER WITH FLOTATION
ADDED TO THE LEGS, CHANGING THE
SIGNATURE SO LESS ENERGY NEEDED TO BE
LEVELLED



The resistance made by the three resistance traits increases as the body moves faster through the water. Growth of resistance as swimming speed increases moves through points 1, 2, and 3 in sequence.

ROUGH GUIDE TO NELMSING THE PRINCIPLES:

Perception (governed by the brain) is the primary tool for quality of movement, the thing that sets

apart great swimmers who have the ability to make best use of energy in their own bodies and in the water

Making swimmers aware of how powerful a tool perception of self and element is through a systems theory model of training creates resilience by building diverse capacities in a young swimmer

That resilience gives swimmers the ability to adapt to training, racing, and unexpected stresses or surprises in their lives, throughout their sports career

Training is geared at avoiding "21st century maladaptive structures in the body, and 21st century maladaptive functions in the nervous system."

Nelmsing builds optimal "animal" robustness into the body

TRAINING TOOLS The Coaching Loop

An exercise in which the swimmer is asked to sink into a squat on the pool floor, push up vertically, arms out front, arch out and over the water, dolphin-style, dive vertically back down to the floor and repeat many times over on a regular basis.

"This is about reversing the sensitivity we lost to the environment through modern lifestyle,"

says Nelms. "It is all about paying attention to the water and the flow, on the back of legs, the side of body, the shoulder, the foot, the face. In Loops you may ask the swimmer to concentrate on one aspect, one feeling, one part of the body. You can teach tons of stuff by doing that. It is about developing a brain language and getting the swimmer to build a library of metaphors with which they can understand and replicate the quality of movement that causes them to swim faster."

The point of the loops is this: the effectiveness of any exercise is dependent on quality of movement. The loop is like a multi-tool or a Swiss Army knife—one tool with lots of purposes and functions to get the desired result. The loop is a tool with which to heighten sensation in the swimming that follows. Done well, it can do just that; done poorly, it can introduce bad habit just as drill-driven technique teaching can.

Density Training

The name given to focus on four key elements of swimming training: metabolic processes; technique; quality of movement; and perception. Within those, specific attention is paid to guiding the swimmer to understand how their body energy flows; to perceive "arms as legs" so that the shoulder joint can be engaged in the way the hip joint is used in walking and running; to understand the rhythm and flow of water and how to make the most of it; and to identify "inhibitors" to performance and overcome them. Breathing is an inhibitor.

Nelmsing Cords

"The most powerful instinct is breathing," says Nelms. "If you feel unsafe or unstable, your breathing is affected fairly quickly. It is important that athletes have a sense of place. The instinct of an animal—and that's us—placed somewhere it has never been before is to work out where they are, what's around them so they can figure out how not to get eaten." He cites an exercise undertaken by the California squad of coach Teri McKeever: "They do skipping with a rope on deck, they skip for a while looking off at the horizon, then she will say 'turn face the flag, then face the corner, face the far wall' and so on. Their brain gets a sense of place, they have confidence in the environment, they're more attentive, they perform better."

Exercises with the cords mimic swimming shapes and movements, and make the athlete aware of energy pathways in the body and how to transfer energy from one place to another. "When I was making a video of the movements, I was grimacing with the effort. If you make your mouth hard (tense) in the ocean, you can't breathe. It's a reflex—and unhelpful. What I try to do in that circumstance is to pick up that tension in my hand. It is a biofeedback thing in which I relocate the energy in the grimace to somewhere I can use it."

THE SHANGHAI PIONEERS

Utopia for the Water Whisperer, a trained artist, is a blank canvas. "I'll guarantee eight gold medals if you give me 30 swimming toddlers and leave them with me for 10-12 years," says Milt Nelms through a broad smile that suggests he means it but understands how such tall claims are likely to be

received in a world full of folk who tried and missed by a mile, and others who can actually lay claim to astonishing numbers of Olympic medals.

Shanghai and its vast and expanding swim program are the closest thing to date to granting Nelms his wish. The latest coach to be hired, American Chris Martin, for much of the past decade based in Scotland, is now in charge of 33 young teenagers who form the first junior squad in the world to adopt Nelmsing as a policy and regular practice. They work in a program where the senior team is guided by British coach Dave Lyles and a host of Chinese coaches.

"I knew that Chris would be diligent and apply the program," said Nelms, a regular visitor to the Shanghai squad. "His is an holistic approach and Shanghai was the perfect place to introduce it. Culturally, they are used to expression through movement and martial arts, they are more in tune with expressing experience through feeling."

Martin, who coached American Nelson Diebel to Olympic gold in the 100 breaststroke ahead of Britain's defending Olympic champion Adrian Moorhouse back in 1992, leapt at the chance to move to China last spring. "Before I die, I want to see how I can expand my coaching by trying to find ways of harnessing the complexity of swimming," he told an audience of mostly Scandinavian coaches at SCAR in Lund in support of Nelmsing and the Systems Theory approach to coaching advocated by Bill Boomer.

"The best situation is to have really good control of what I do in training—so I decided to go to a place that is unique and new," said Martin. In attempting to translate the need for inner body strength, flexibility, and balance, Martin turned to the bamboo pole for help.

"You need to get swimmers to understand that they have control of energy, the kind of energy you see in a whip," says Martin. "We use bamboo as the tool: it bends and energy moves from one side to the other and in all directions. That's what happens in the body. I get them to imagine at their core running straight through them top to bottom is a bamboo pole. It is a tool for perception, for the brain to recognise what it needs to do to make you better as a swimmer."

Videos of the kids being put through their Nelmsing paces, cords on land and loops in water, are shown in tandem with slides on systems theory and how it can be applied effectively in swimming may be interpreted as pioneering or experimental.

Nelms rejects the latter. Noting self-testing, the vast amount of work done with "people who couldn't swim" right through to work with the likes of Coughlin, Thorpe, Vollmer, and others, Nelms says that the only way the process can be described in terms of laboratories is the way clinical tests

are conducted. "By the time it gets to the humans they are pretty certain of how it works," he says. "I think the first thing to consider when working with

human beings is the whole hippocratic thing: do no harm. I don't experiment on people."

The way the Shanghai program was laid out by Martin in Lund certainly suggests that those in his care are engaged in tried and tested exercises, that they are being introduced to concepts that enhance self-awareness at a young age and in a way that leads to them understanding why they are doing what they are doing.

CONCLUDING PANEL

At the end of the Lund conference, Nelms revealed that he had observed events at the 2007 World Championships in Melbourne and paid particular attention to the men's 200m butterfly in which Michael Phelps led the way into a new era. Nelms later watched a film of Kiwi fly swimmers down the years from Mosse to Loader and on. It occurred to him that "what we were seeing was that the game of swimming had changed. The butterfly style being used was an exercise in rebalancing the aquatic signature. I knew that had come from Bill Boomer's work. I knew where it came from. None of the athletes and very few of the coaches would have known that he was the first to talk about the change that we were now seeing across a range of swimmers."

Swimming progress had long been about "looking at things in a way that others don't see at first." Neuroscience is the new cool, part of a new way of looking at things. There are dangers, says Nelms: "People are using braintraining, plasticity and other buzz words but not taking a systems approach. They are taking us down the wrong road. We have to watch for misapplication. It is about how the swimmer learns through movement. The body can't work without the brain so we're talking about what already is: it is the quality of movement that makes the difference and the systems approach is fundamental to the code."

In our next edition of the magazine we will look at how Boomer came to bring his ideas into the 1990s through his years at Rochester with Al Craig, how he came to team up with Richard Quick, and how the idea of the aquatic signature has shaped future thinking.

Nelms refers back to a time when he was working things out with "my old, broken down body." Even when he was confident that something was working, he says, he remained "reticent to show Shane...swimming is very meaningful to her and I don't want to introduce any thought on things that I may not be certain about. Generally what I do, I work things out through myself and then observation and then make an initial stab with someone. If it looks like it is taking I go with it; if it looks like it's not taking from the outset, I stop, go back, and think about it." ■



Shane Gould (AUS)

FURTHER READING

Evolution

Pandora's Seed: The Unforeseen Cost of Civilization by Spencer Wells, 2010

Manthropology: The Science of Why the Modern Male Is Not the Man He Used to Be by Peter McAllister

The Brain

My Stroke of Insight: A Brain Scientist's Personal Journey by Jill Bolte Taylor

The Mind and the Brain: Neuroplasticity and the Power of Mental Force by Jeffrey M. Schwartz and Sharon Begley

In Search of Memory: The Emergence of a New Science of Mind by Eric R. Kandel

Systems

The Web of Life: A New Scientific Understanding of Living Systems by Fritjof Capra

Collapse: How Societies Choose to Fail or Succeed by Jared Diamond

Thinking in Systems: A Primer by Donella H. Meadows