

MOUNTAIN STATES

Newsletter | Summer 2022



Technical Paper: Balance & Center of Gravity

by Mark Tarrant

The following essay is an abridged version of Mr. Tarrant's Instructor Training Report #18.

When Philippe Petit walked the wire between the Twin Towers in 1974, every scientific principle related to balance, gravity, center of gravity, horizontal forces, vertical forces, and rotational forces was at work, but his walk was pure art. The artist who practices rock stacking understands the fundamentals of balance and centers of gravity, but he is creating his art through the tactile senses and an innate feel for the way things balance.

Balance is both science and art. The physical laws of motion apply to balance, obviously, but overthinking the scientific principles while playing the game disturbs the art of playing. Karate is an art that has been made more effective through an understanding of scientific principles related to human movement, but the proficient player moves his body naturally and without consciously thinking of those principles. We can analyze balance and center of gravity scientifically, or we can examine those elements through rational intuition—artfully. Or we can do a little of both.

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Technical Paper: Balance (cont'd from p.1)

If we think about Mr. Petit's high-wire walk, we notice that the vertical forces (the downward force of gravity and the upward force of the wire) are constant—nothing he does affects those forces. Similarly for the rock stacker, the net effect of the vertical forces cancel out. Neither artist needs to consider those forces in order to obtain balance. (He certainly may want to worry about those forces for other reasons, but not for balance.) What forces, then, must he consider in trying to find and maintain balance?

Two force factors remain, and both affect his balancing act: the horizontal forces acting laterally and longitudinally, and the rotational forces acting horizontally and vertically. Since the rotational force has a vertical component, and that component is already accounted for, the only forces that matter for balance are the combination of all horizontal forces. Balance, therefore, is primarily concerned about horizontal motions. Assuming that one has physical structures in place to prevent himself from falling (for Mr. Petit, that would be the wire, his feet, and his legs), the largest challenge then is controlling movements front and back, and left and right—the horizontal motions.

Horizontal forces move the center of gravity away from the base over which one is attempting to balance. The center of pressure can be viewed as the point on the base directly below which the center of gravity would fall were it not supported by an upward vertical force (the wire and Philippe's legs). As horizontal forces move the center of gravity, the center of pressure moves as well. Depending on the area covered by the base—that is, the area between one's feet or stance (very small for the feet on the wire)—the horizontal forces can move the center of gravity near or past the edges of the base, increasingly influencing



balance. So, the size, area, and strength of the base matter in equal measure to the horizontal forces moving the center of gravity. One loses balance because changes to the center of gravity shift the center of pressure toward or past the edges of the base area. It is difficult for Mr. Petit to stay in balance not so much because he has poor control over his horizontal motions, but because his base (his feet on the wire) is so small. He makes micro-adjustments to keep his center of gravity over the wire. If he were walking on a 2x4, those adjustments would not be quite as critical. On the wire, his “stance” covers a very small area. On a 2x4, his stance is spread out slightly more, so balance is slightly easier. If he were to walk the wire without a balancing pole, he would need to extend and twist his arms, to twist and bend his hips, or to extend a leg, to keep his body in balance. Those forces are the rotational forces (remember, rotational forces have both vertical and horizontal components) of which only the lateral forces come into play for balance. The twisting of the arms and body serve to counteract the other horizontal forces that are moving the center of gravity off his “stance” supported by the wire. And there we have what is called dynamic balance, which is precisely what occurs in karate movement, and all explained without Newton!

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“You must not fall. When you lose your balance, resist for a long time before turning yourself toward the earth. Then jump. You must not force yourself to stay steady. You must move forward.”

– Philippe Petit

5 Questions: Sensei Bruce Green

What role did karate play in your move to Colorado?

A close second place to landing a great job at the newly created by the U.S. Congress Solar Energy Research Institute (SERI—now the National Renewable Energy Laboratory). For a young guy just starting to develop my career, this was a huge step forward. But right on the heels of this development, I saw my prayers answered (see answer to second question below) to one day train with sensei Yaguchi. Thus, these two significant events were very much intertwined. And also enticing was the prospect of moving from Illinois to Colorado and John Denver's Rocky Mountain High. Dreams can come true!

Would you please describe a memorable experience that influenced or altered your thinking on karate?

I have to answer with a threefold answer, all pertaining to my first exposures to sensei Yaguchi. I first met Yaguchi sensei in late 1972 when he headlined a training clinic at Ohio State University. My first real karate instructor, Greer Golden, hosted Yaguchi sensei's visit. I was a young, barely eighteen-year-old brown belt who didn't know much about anything. We were confronted by this Japanese guy with a crew cut and an attitude! Then, in late spring of 1973, I went to the All-American Karate Federation (AAKF) collegiate nationals in Brookings, South Dakota. Sensei Yaguchi (still crew-cut days) did a five-person sparring demo where he sparred one after the other with, in this case, some of the senior American instructors. Watching sensei Yaguchi spar is just special; so utterly natural, flowing, and devastating—this very memorable event made a huge impression on me, just seeing elite karate. Finally, I went to the 1976 AAKF Bi-Centennial Goodwill Tournament in Philadelphia where sensei Yaguchi (no more crew cut) did a mesmerizing demonstration of Kanku Dai to Japanese music. Thereafter, I really began to dream and pray toward one day training with sensei Yaguchi.

What character traits were held by your early karate role models that drew you deeper into the art?

As a consummate high school jock (soccer, wrestling, and pole-vaulting), I thought I knew something about self-discipline and perseverance. However, these traits, as well as dedication, loyalty, and patience became manifest in my exposure to this newfangled physical activity called karate-do. Frankly and at that early stage of my life, I needed a good dose of character development that serious, traditional karate-do training can encourage. Thankfully, sensei Greer Golden, who was one of the first three graduates (i.e., Golden, Dalke, and Ingber) of the N. American JKA Instructor Training program (run by senseis Nishiyama and Yaguchi in L.A.), knew and followed the formula so well developed by the JKA (i.e., character development through rigorous, challenging, and sincere training). (cont'd on p.4)



1976 AAKF National Bicentennial Goodwill Tournament
(Photo by Bill Berg.)

5 Questions: Bruce Green (cont'd from p.3)

It was an easy transition to training with sensei Yaguchi and experiencing the same emphasis on rigorous training and character development.

There is another trait one can learn, and the dojo kun describes this trait: integrity. Very early in my karate life (1975), we had Frank Smith come to Ohio with sensei Golden hosting, for some clinics. To say Frank could be commanding and downright frightening is an understatement (see *Mind and Body – Like Bullet*, pp. 61, 65). My girlfriend and I hosted a gathering that weekend for Frank, and it subsequently gave me great respect for Frank; he was the consummate, gracious gentleman toward my future wife during his visit and the entire weekend—what an overall example for someone young and very impressionable like me. I admired his style, and it showed integrity.

You have been teaching karate for many decades and to hundreds of students. What do you enjoy about teaching karate?

Seeing people of all ages overcome the challenges that they bring with them when it comes to learning something different like traditional Japanese karate-do. Seeing firsthand many examples of character development and personal improvement being achieved from karate training. Experiencing people's gratitude and appreciation for what they get from training. And finally, seeing people dedicate themselves to long-term karate training.

Having attained the highest ranks in our karate system, what would 8th Dan, A-ranked, international competitor Mr. Green tell your younger, wide-eyed karate self about the art you are going to spend a lifetime practicing?

I would have to say, "My friend, you won't believe what the future holds and what I'm going to tell you. And guess what? It's incredible and great!" I would describe how this path would allow me to establish many cherished lifelong friends, interact with lots of interesting people, and delve into a culture of great beauty, relevance, and integrity. Finally, I would try to convey how this new form of exercise—which we know is so much more than that—is of great practical value for safety, personal development, fitness into waning years, and mental health.



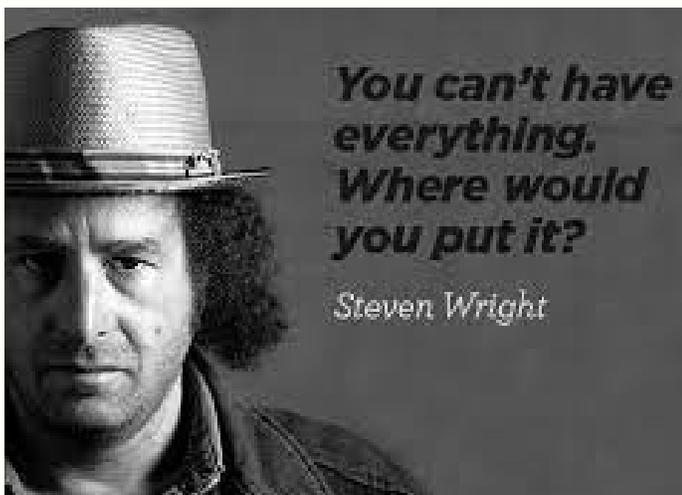
Dan Mueller, Bruce Green, and sensei Yaguchi
N. American Goodwill Invitational, Winnipeg, Canada, 1981

Mr. Green began his training in 1970 and was a finalist in the JKA National Collegiate Karate Championships from 1973 to 1975. In 1980, Mr. Green was appointed Assistant Instructor to Sensei Yaguchi and in the same year became Chief Instructor of the JKA of Boulder (Now Boulder Shotokan Karate). In 1995, Mr. Green graduated from the JKA-ISKF Instructor Training Program as one of Sensei Yaguchi's first students to graduate from the Mountain States Region. Mr. Green became a Certified Examiner through the JKA-ISKF in 1996 and is now an A-ranked Instructor, Examiner, and Judge.

Technical Paper: Balance (cont'd from p.2)

Master Nakayama says that “without correct balance, it is impossible to deliver a powerful technique.” Taken literally, that statement is disputable; one benefit of good training is to be able to deliver a powerful technique when not in a position of balance, and some techniques are more powerful when thrown from a position of imbalance—more on that later. The act of putting the body in motion necessarily involves horizontal forces, which, by definition, unbalance the body. One prominent karate instructor, in fact, has an entire training methodology that involves deliberately unbalancing the body and making use of gravity at the initiation of movements precisely in order to increase speed and power. What the karate-ka needs is stability through the motion—dynamic stability. A powerful technique, therefore, need not be initiated from a position of balance, but must be initiated from a position of stability.

Optimal stability is gained when the body is stationary and one’s base (stance) is firmly planted in a wide area on the floor. The parts of the body which are in motion (the torso, arms, and legs) should move in coordination with the motion of the center of gravity, which is normally kept inside the base area created by the feet. As the center of gravity moves toward the edges of the base area, balance weakens.



Stability improves as the center of gravity lowers. This is because the closer the center of gravity is to the ground, the greater the horizontal forces must be to move it. If the body’s center of gravity were on the ground, it would be much more difficult to move than if it were three feet above the ground. So, while lowering the center of gravity improves stability, it can be lowered too much, inhibiting mobility. Depending on the desired motion, movement is optimal when the center of gravity is at some height above the ground. To deliver power, one must give up some stability.

In karate, several factors influence stability: the angles of the ankles, knees, and hips; posture; foot contact with the floor; proper muscular tension around the joints and throughout the body (especially the *seika tanden*); weight distribution; and the proper timing and integration of all these factors during motion.

Kicking presents an interesting balance situation. Master Nakayama devotes four full pages to this topic in *Dynamic Karate*. He delivers excellent points on karate actions necessarily moving one’s center of gravity outside the base area (by definition, a position of imbalance), and those on the ability of a well-trained person to regain his balance if his center of gravity passes the edges of his base area. Any athlete is continuously putting his body in positions of imbalance and making subconscious micro-adjustments to compensate and regain balance throughout his movements. But when power delivery is considered, say in executing a front kick (*mae-geri*), Master Nakayama’s points might be reevaluated.

Of course, any lateral change in the center of gravity during front kick will negatively upset one’s balance and diminish power. The hips and torso should move in the direction of the kick, and the transfer of weight to the supporting leg should allow no lateral movement of the body.

(cont'd on p.6)

Technical Paper: Balance (cont'd from p.5)

However, when we consider the longitudinal vector in relation to center of gravity and base area (the support foot), we maximize power when kicking from a position of relative imbalance. Front kicking in longitudinal balance fails to make optimal use of one's momentum.

Balance, strictly speaking, is static; it is about standing in one place. It is a snapshot in time. It does not account for momentum, which is about movement, energy, speed, and power. Stability, on the other hand, is concerned with momentum. One can maintain stability even if his body is not, strictly speaking, in balance. This dynamic stability is partly what gives the front kick its power. Kicking is most powerful when one is longitudinally imbalanced—when one's center of gravity is not perched directly over the base of his support foot, but rather driven forward with the supporting leg. Any serious work kicking the heavy bag will make this fact immediately apparent.

A disadvantage to attaining this kind of maximum power is that it commits one fully to the direction of the kick, making it nearly impossible to change directions until balance is recovered. That kind of full commitment is certainly not out of the realm of true karate spirit (*ikken hissatsu*), but it must be

controlled and weighed against other factors such as stability, accuracy, and follow-up techniques.

Philippe Petit did not fall off the wire because physical structures prevented him from falling. The wire separated him from the abyss. His feet and legs held up his center of gravity. He controlled his horizontal motions so that they did not move his center of gravity outside of his base area. He was in balance, and the vertical forces were held at bay.

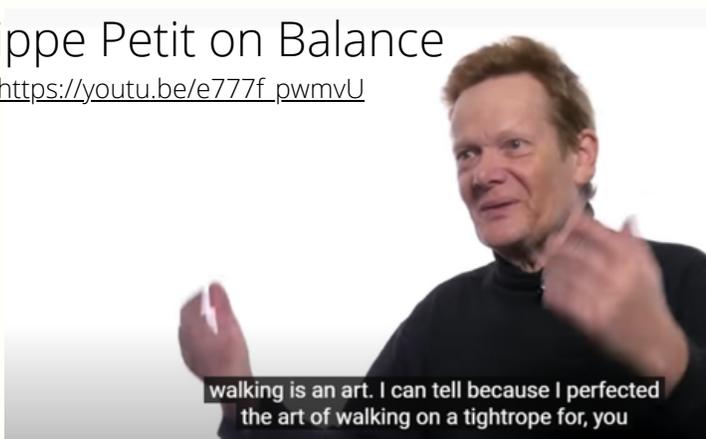
But Philippe was not trying to make power. He was making art. If he wanted ultimate physical power, he would have had to succumb to the downward vertical force. His towers swayed in the wind for almost three decades, but they stayed in balance. They fell 27 years later because they lost the physical structures holding them up. The buildings were engineered so that they could not lose balance, but like all man-made things, they could lose the structural supports that stabilize them.

As Master Nakayama states, one can recover from a loss of balance so long as the stabilizing physical structures are in place, but it is harder to recover from a loss of stability. That's the purpose of sweeping techniques—to destabilize. The karate-ka can, at times, lose balance in a controlled manner, but he must maintain dynamic stability.

In terms of stability, a karate-ka must think about the entire panoply of forces. He can afford and even intentionally engage moments of imbalance in delivering a technique, but he must be more careful about his stability. A bear is entirely stable and in balance when he is on four legs. But he rises up on two legs when he fights. His balance is at risk, but his stability becomes dynamic, and his agility and power increase significantly. Discovering the limits of those realities in human movement is what makes karate so compelling—scientifically and artfully.

Philippe Petit on Balance

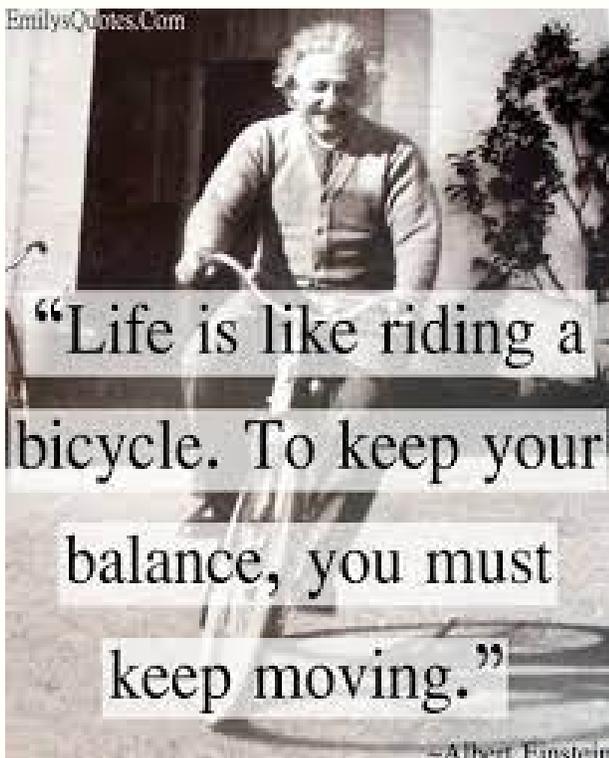
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News & Updates

Yaguchi Shihan Resigns from ISKF

In May of 2022, Yaguchi Shihan submitted his resignation from the ISKF and announced his return to the JKA. Mr. Yaguchi was a founding member of the ISKF in 1977 and was instrumental in the formation and development of the organization for 45 years. He leaves his role as Technical Advisor in the ISKF and has formally returned to his roots in the JKA, where he will take on the position of Technical Director. Born in Japan in 1932, Mr. Yaguchi began his karate life in the early 1950s and is one of the highest-ranking living karate-ka in the world today. He was sent to the USA in the early '70s, starting out in Los Angeles, and soon arrived in Denver where he built a very strong dojo and eventually formed the Mountain States Region of the ISKF. After the ISKF split from the JKA in 2007, Mr. Yaguchi remained as Chief Instructor of the ISKF Mountain States Region until his retirement in 2017. He is widely considered to be among the all-time great Shotokan Karate instructors and remains one of the most sought-after instructors in the world. Now American citizens, Mr. and Mrs. Yaguchi reside in Lakewood, Colorado.



Dojo News

Shotokan Karate of Vail has expanded its dojo, taking on the former space and students of Mr. James Lee in Eagle, Colorado.

ISKF Albuquerque closed its dojo after Mr. Caesar Morales retired and moved to Tucson, AZ. ISKF Mountain States is seeking a new instructor in Albuquerque.

Sensei Gary Swain retired from full-time teaching at his Lone Tree Dojo at the end of 2021. Membership numbers at the Lone Tree Dojo have always been among the highest in the Mountain States Region, thanks to Mr. Swain's hard work and determination. The dojo is now being run by Sensei Tatsuun Ryu.

ISKF Colorado Springs is now being run by Ms. Monica Silva after Sensei Suzi Wong retired and moved to Tennessee. The dojo has also moved to a new location. Information can be found at www.iskfoc.com.

Sensei Marius Lehene has started a new dojo in Fort Collins.

Look for more news and updates in our next newsletter!

"There is no such thing as motivation in my world. I am not motivated to do what I do. As an artist, I am driven, I am compelled, I am thrust forward by a force so rooted inside me, so convincing, that it seems futile to try to explain it. Although it has a name: passion."

- Philippe Petit