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From Space To Medicine

The REAL Stuff!

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Lt. COL David G. Simons (MC) USAF

"Outside, the sun was a brilliant blue-white ball suspended in a dark sky, an eye-searing globe of intensely hot gas 100 million miles away. It was strange to see it thus, hanging in blackness by itself, not lighting the sky around it as it seems to do from earth." (p. 138) —David Simons, M.D.

Remember the old adage, *"If they can send a man to the moon, then why can't they find a treatment for my aching back (or other condition)?"* The saying implies, among other things, that space exploration and other high technology scientific endeavors are woefully distant from everyday concerns like chronic pain. Stated differently, most of us would be very surprised to learn that a favorite doctor or researcher had been an astronaut during his/her early career. Well, prepare to be surprised!

If you are a medical professional or an individual with fibromyalgia, you are probably already familiar with the extraordinary work accomplished by Janet Travell, M.D., and David Simons, M.D., in the study of chronic myofascial pain due to trigger points. These pioneering physicians opened doors to the diagnosis and treatment of chronic pain that will never be forgotten. Their *Trigger Point Manual* is required reading for any medical professional involved in the field of musculoskeletal pain. What you may not know, however, is that for 32 hours during 1957, Dr. David Simons traveled 102,000 feet to the edge of space and was the *first* person to see with his own eyes the curvature of the earth—and a few other amazing things! We thought you'd like to hear a little bit more of the story.

Dave Simons, or Lt. Colonel David Simons (MC) USAF, as he was to be known later in his career, came from a family of medical people in Lancaster, Pennsylvania. His father and uncles were doctors and a dentist. While attending Jefferson Medical School as an Army private, young Simons was also part of the wartime Army Specialist Training Program, studying Morse code to become a licensed amateur radio operator alongside a heavy course load of medical classes. He also avidly pursued a lifelong interest in astronomy and cosmology.

Simons then joined the Air Force as a medical officer and was assigned to the Aeromedical Labo-

PHOTO AT LEFT: Self-portrait of David Simons, M.D., in the gondola of the ManHigh II balloon at 19 miles altitude on August 19, 1957. Photo courtesy of David Simons, M.D.

PHOTO AT RIGHT: Dr. Simons sitting in the replica of the ManHigh capsule made specifically for the Cuyuna Range Historical Museum, accompanied by his wife, Carol McMakin, who also gave a medical lecture while in Crosby, MN. (August 2007).

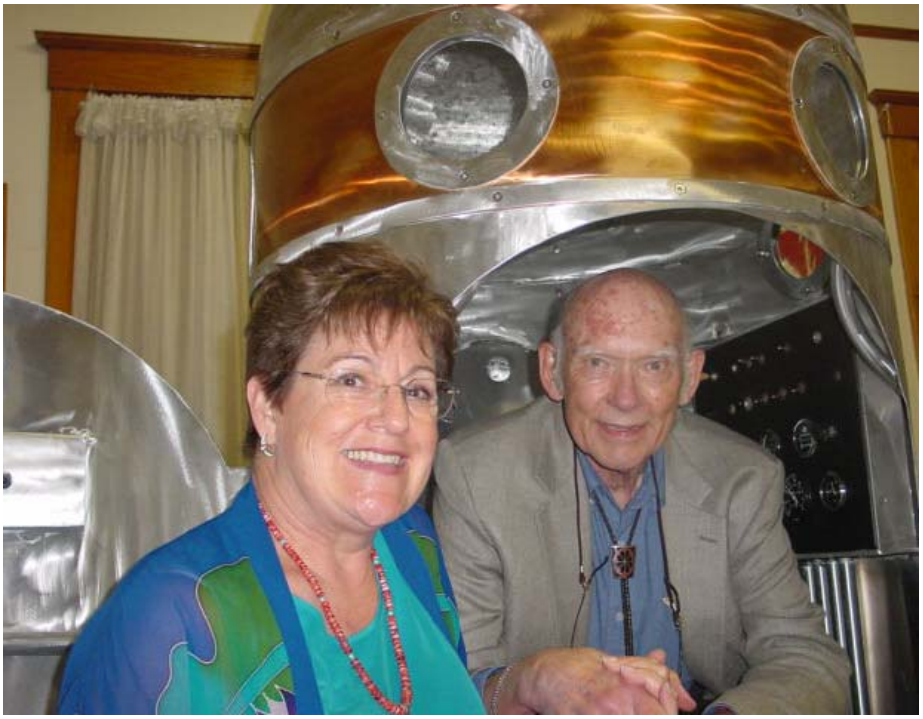

Photo courtesy of David Simons, M.D.

The historical material in this article was obtained from the autobiographical book, *Man High*, by David G. Simons and Don A. Schanche (New York: Doubleday & Co., Inc.,1960) and from Dr. Simons himself. Additional information may be obtained from the History Channel's production: *To The Edge of Space: Project Man High* (8/15/99) available on videotape.

ratory at Wright Field in Dayton, Ohio. As he described it, he "dropped quite by chance into the right place at the right time..." As under project director, Simons traveled to White Sands, New Mexico, to launch animals in captured World War II German V-rockets beyond the earth's atmosphere. That first research group included just himself, the instrumentation shop, and two monkeys. In 1949, the monkeys successfully flew an unheard of 36 miles into space in a rocket. Unfortunately, the experimental parachutes failed, and the nose cone plummeted into the White Sands desert. The monkeys functioned normally during weightless flight and were still fully anesthetized at impact. Later on, as director of the Space Biology Branch of the Aeromedical Laboratory, Simons initiated a study that sent hundreds of other animals by balloon to altitudes above 120,000 feet to study cosmic radion hazards above 99% of earth's atmosphere..

Today, this may sound like pretty commonplace stuff, but in the late 1940's, only a small handful of forward-looking scientists were curious about the possibilities inherent in space exploration and manned space travel—or even believed it was possible. Many others just laughed. For Simons, the next step was oversight of a very practical research project designed to confirm the uncertain theory that cosmic radiation at 100,000 feet is hazardous to man. Cosmic radiation consists of highly charged nuclear particles that constantly fly throughout outer space. Animal studies had appeared very promising, but what about humans? How would they fare in space over even a 24-hour period? There were a great number of unknowns in space besides cosmic radiation, yet there was also an obvious benefit to space travel. It would make possible observation of the universe without the interference of the earth's atmosphere. Weather forecasting could improve immeasurably if the planet's surface could be observed from far above. Much also could be learned about how man's mind and body reacted to the hostile, lonely, zero-gravity environment of space travel. At that time, very little data was available which could accurately predict how man would respond.

With incredible courage and steadfast confidence in the skilled scientists and engineers who helped to plan his voyage and design his spacecraft, Dr. David Simons agreed to undertake a manned flight to the edge of space. However, his voyage was not to be in a German or American-made rocket but in a tiny gondola-capsule attached to a high altitude balloon which would travel 20 miles into the sky! The project was aptly christened "ManHigh."

The ManHigh balloons were designed by Winzen Research, Inc., a small company in Minneapolis, Minnesota, which was already a pioneer in the crafting of high altitude balloons. Those built for ManHigh were 200 feet in diameter and had a capacity of three million cubic feet of helium. They were made of polyethylene, a .002-inch-thick, extremely fragile plastic that had to be handled with extreme care. When one of them was fully inflated, Simons compared its size to a 30-story building. Only nylon load tapes held it to its capsule.

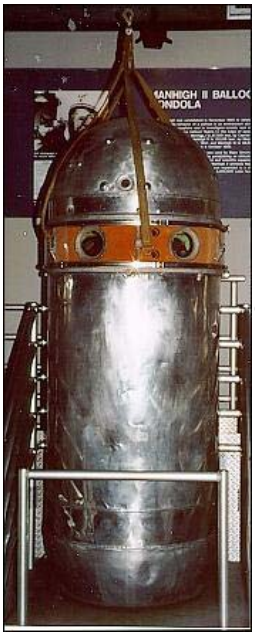

Photo: National Museum at Wright-Patterson Air Force Base

Replica of ManHigh capsule

The capsule was an aluminum alloy tube, eight feet high and three feet in diameter. It had pressure-stressed, cast aluminum domes at each end and six small portholes around the sides to observe atmosphere, stars, planets—and the earth. Inside was an aluminum frame to which was attached a nylon net which provided a seat for one person. There was just enough room left for a small array of scientific and life support equipment, including a telescope, a radio, medical testing equipment, a thermal suit, a parachute, cameras and film, photographic plates, a spot photometer, a chronometer, a tape recorder, food, and a rudimentary (by today's standards) but ingeniously effective air conditioning system crucial to help protect against the unshielded, burning heat of the sun. Dr. Simons recalled that when Dr. Johnson of the Bureau of Standards checked out the capsule, he calculated that "the total volume of equipment and man inside the three-by-eight foot capsule was roughly equivalent to a man with six packed suitcases inside a telephone booth."

Because of the capsule's electrical system, it was deemed too risky to use a pure oxygen atmosphere. The danger of fire from a stray spark was just too great. Instead, the capsule contained a mixture of oxygen, nitrogen, and helium (a lesson that NASA scientists unfortunately only relearned much later.)

As preparations were made for the space craft, Dr. Simons and a skilled test pilot by the name of

Joe Kittinger (chosen to make a shorter trial run to troubleshoot possible problems) were required to undergo rigorous training as well. They were issued tight-fitting, Air Force pressure suits which would protect them against stratospheric decompression in the event that the capsule sprang a leak during flight. There were also extremely challenging tests for claustrophobia, training time spent in simulated low-pressure chambers which reproduced atmospheric conditions that would be experienced at 100,000 feet, and parachute jumping. In addition, both men were required to fly sixteen hours in an open-basket free balloon to qualify for a Civil Aeronautics Administration balloonist's license. Simons got a kick out of the requirement for a driver's license to skirt the edges of space.

Of great concern was how the balloonists' vital signs (heart rate, respiration, body temperature, etc.) could be monitored from control centers on the earth's surface. Oversight of oxygen and carbon dioxide levels was also critical. The field of medical telemetry gained new importance in this emerging new frontier of space exploration.

With little experience with space travel, the bigger challenge was anticipating the dangers which *might* be waiting up there. Pilots had already observed a condition known as "breakaway phenomenon" at high altitude. Jet pilots found themselves feeling a sort of detached exhilaration—as if they had escaped all ties to earth and just wanted to keep on going in space and never return. What other unexpected emotional reactions could be predicted? An overwhelming sense of isolation or fear? Irritability when living conditions became acutely stressful because of severe muscle cramps, heat or the cold? What about over-confidence, mental deterioration due to fatigue, monotony, or even hallucinations? Could impaired mental abilities cause an balloonist or astronaut to make a fatal mistake in space?

When the day finally came for the launch of Simons' balloon, the weather was of concern with wind speed approaching marginal. The launch site was north of Minneapolis in Crosby, Minnesota, the site of old, deeply dug, open-pit iron mines. These mines provided steep canyons which gave the balloon protection from ground-wind problems during launch.

Full of eager anticipation, Dave Simons headed for space. Strapped to his arms and chest were photographic track plates provided by Dr. Herman Yagoda, one of the world's leading cosmic ray experts. The plates would allow Yagoda to identify and mark the precise locations where any cosmic particles entered Simons' body and enable him to monitor the effect of space radiation on Simons for a number of years to come.

The good news was that the ManHigh test pilot, Joe Kittinger, had returned safely to earth after his balloon trial. Of concern, however, was that the trip had been troubled by two significant operational problems with radio channel selectors and an incorrectly installed oxygen system valve. The ManHigh team quickly learned that even the smallest errors or oversights during space travel could be lethal. They worked hard to correct these and any other problems they could envision for Simons' flight.

In addition to engineering and long-term health concerns, the trip upward was fraught with natural dangers as well. In his 1960 book, Simons described balloon ascent this way:

> *"At about 30,000 feet [the balloon] would hit a 90-mile-an-hour jet stream and race speedily eastward until it rose to 35,000 feet where the winds would change sharply and the bitter-cold stratospheric temperature would plunge nearly 100 degrees below zero.*
>
> *This was one of the most dangerous levels through which the balloon had to pass. Often the winds at the junction of the troposphere and stratosphere sheer off in sharp layers, like speeding cars running northward under an overpass and westward across it. If the polyethylene balloon, frozen to brittleness by the tropospheric cold, passed suddenly from a fast westward wind into an equally fast opposing wind, it would splinter like a broken light bulb."* *(p. 81)*

What was quite unnerving to recall as Simons' flight took off was that Kittinger's balloon had nearly turned upside down while entering the jet stream. Then, when it began to straighten up again, the capsule had been yanked so hard that it threatened to break off the balloon. Simons hoped for a smoother ride! At first, he got his wish. After a smooth 20-mile ascent and only a manageable problem with the calibration of his altimeter to be concerned about, he welcomed the unprecedented view:

> *"The color samples, provided by Dr. Stakutis of the Air Force Cambridge Research*

Center, included every perceived shade of color man can reproduce in pigment. But not one of them could match the strange blue-purple color my eyes beheld now at the atmosphere's outermost edge.

Where the atmosphere merged with the colorless blackness of space, the sky was so heavily saturated with this blue-purple color that it was inescapable, yet its intensity was so low that it was hard to comprehend, like a musical note which is beautifully vibrant but so high that it lies almost beyond the ear's ability to hear, leaving you certain of its brilliance but unsure whether you actually heard it or dreamed of its beauty.

...Below me was the warmly lit earth with clouds hugging close to its surface, and far away in every direction was its rim of atmosphere, etched against a dark sky like the moon's rim in the night. I could see 400 miles in every direction and gaze upon a half-million square miles of earth below.

Along the horizon a faint curve told me that the earth is a globe. But instead of making the planet seem smaller, my twenty-mile-high vantage point powerfully emphasized its incomprehensible enormity. I felt puny and humbled by the realization that although I could look 400 miles in any direction, I was only barely able to perceive the roundness of our planet. *(pp. 136-137)*

It wasn't too long before Dr. Simons was to witness firsthand a more wicked side of Mother Nature (does she have power in outer space, too?) At nightfall, a large, violent storm front laden with thunder and menacing streaks of lightening moved in from the west and moved slowly directly below him, cutting him off from the ground far below and also blocking his balloon's access to the earth's infrared radiation which warmed its helium and helped it to maintain its altitude. As they waited for the storm to pass through, Simons and the ground crew had no particular worries about safety as long as the balloon could be kept at a high enough altitude for a little while longer. Thunderheads were not thought to ascend any higher than 50,000 feet anyway, which was far lower than Simons was now riding. Exhausted from a long, hot day in cramped quarters, he was able to close his eyes and doze off for a little while.

He was awakened not long after by the gondola's plummeting and spinning. It was quickly apparent that his spacecraft had drifted downward and that thunderheads from the storm now towered around him at about 68,000-70,000 feet, a whole lot higher than where they were thought to exist! Although Simons was amazed to witness this phenomenon (and was the first man to ever do so), he was also horrified because the long antenna attached to his gondola was trailing menacingly within lightening range, and he was "plunging God knows how fast into a storm that could destroy the balloon." To save himself, it was necessary to drop a huge 100-pound load of main batteries for him to propel the balloon upward. The move would be a huge shock to the balloon, whose skin was quite brittle at this altitude. Although the capsule lurched as the weight fell away, the balloon held, and he began to ascend upward towards space again!

Battling increasing exhaustion and heat stress and functioning with levels of carbon dioxide running a bit too high, Simons was nevertheless largely unaware of the physical toll that these stresses had placed on him, and he continued on with his photography, his observations with the telescope, and his capsule checklist recordings.

After the storm had finally moved away, he began making a careful descent back to the earth by releasing gas from the balloon a little at a time via a valve switch. With only a little trouble with the tropopause of the atmosphere, he soon landed in the farmland near Aberdeen, South Dakota. Although eager for fresh air and freedom from his oppressively hot pressure suit, he later confessed to an initial longing to return to the blackness of space. However, after experiencing the "warm sun, the smell of freshly harvested flax, the feel of soft loam beneath [his] feet. . . nostalgia for the stratosphere left..." As he crawled out of his space capsule, he saw a wonderful sight:

"Less than 100 yards away, bent across the neck of an old field horse, came a farmer in faded blue overalls. Astride the horse with him was a youngster, his son.

Tugging off my helmet and the sweat-soaked nylon liner beneath it, I called: 'Hello! How are you today?' I could think of nothing more dramatic to say.

'Howdy,' called the farmer in taciturn voice as he and the boy slid from the bare-backed horse. 'Grab the reins, boy.' He turned to his son.

The youngster held the horse's head down to keep him from shying at the sound and sight of an approaching helicopter. . .

'Look,' cried the boy excitedly. 'There's a helicopter. I always wanted to see one of them.'

The space capsule which had just returned from thirty-two hours and three minutes at the ceiling of the world lay unnoticed at his feet." (pp. 189-190)

Lt. Colonel David G. Simons and test pilot Captain Joe Kittinger collected and brought back a phenomenal amount of valuable data and observations during their respective ManHigh flights. At first, the details of their expeditions remained largely ignored by the scientific community and the general public. Ironically, it was only after the successful launch a few weeks later of Russia' *Sputnik I* satellite "shock[ed] the scientific pants off America," that sufficient funds were suddenly made available to Simons and his team to analyze all of the ManHigh data and enable a third balloon flight by First Lieutenant Clifton McClure.

So why did Dave Simons, Joe Kittinger, and Clifton McClure engage in such daring experiments and endure such challenging conditions? In his autobiographical account of the ManHigh project, Simons wrote:

"Why do we set such difficult goals? Or more to the point, why did three of us risk our necks to learn the far less exotic things we gathered from ManHigh? The answer, quite simply, is that the very act of taking these risks meant that we were taking a short step forward toward the next difficult step and the next one after that to the seemingly impossible." (pp. 261-262)

August 17-20, 2007, marked the 50th anniversary of Simons' ManHigh flight and the advent of the Space Age. Celebrations took place in Crosby, Minnesota, to celebrate a special moment in the history of mankind. In his keynote address, Dr. Simons reminded the audience that: "The most important thing is the message, not the messenger."

While at Crosby, Simons and two current colleagues, NASA astronaut Duane Graveline, M.D., and Brookhaven National Laboratory Medical Scientist, Marcelo Vasquez, M.D., gave three talks concerning the current status of our understanding of the cosmic radiation hazards of space flight. Among their key points were that cosmic radiation is so hazardous that it will require cave dwelling on the moon for stays beyond a few weeks. It is also absolutely prohibitive for manned exploration of Mars.

Following his distinguished career with the Air Force, Lt. Colonel Simons (MC) went on to work for the Veterans Administration where he conducted research as a specialist in Physical Medicine and Rehabilitation. It was during this time that he met Dr. Janet Travell, one of the leading pioneers in the diagnosis and treatment of myofascial pain due to trigger points. Travell was also White House physician during the Kennedy and Johnson administrations. The two collaborated on the 1983 definitive book, *The Trigger Point Manual* which won them international recognition and respect. A second edition was published in 1999, after Travell's death in 1997.

Since then, Simons has remained extremely active in research and clinical education. In 2001, along with Siegfried Mense, Prof Dr med., he co-authored an outstanding text entitled, *Muscle Pain: Understanding Its Nature, Diagnosis, and Treatment.* He described it as speaking primarily to academicians much as the trigger point manuals spoke primarily to clinicians.

Just a few weeks ago, the Tufts Orofacial Dental Society presented him an award for his pioneering of our understanding of myofascial trigger points. Dr. Simons also gave two medical presentations and a research symposium.

Whether in the field of space exploration or the field of medical research, Dr. David G. Simons has been a man of great courage, conviction, and curiousity when it comes to the unknown. The obstacles he has encountered in both fields are simply seen as challenges to overcome. He is an inspiration and a delight, and we in the fibromyalgia community are very fortunate to know him!

Special thanks to Dr. Simons for his assistance with background for this article!