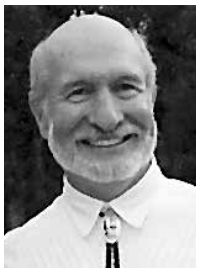
# Bones to Fluids: A Path to Understanding Wholeness



*Thomas Walker*

Thomas Walker is a Certified Advanced Rolfer®, Rolf Movement® Practitioner and faculty member of the Rolf Institute® of Structural Integration. Thomas began his studies of structural integration (SI) in the mid-1980s, followed closely with cranial-sacral in the early 1990s and biodynamics in the mid-1990s. Over the past 30 years, Thomas has studied these and related subjects while maintaining a successful SI practice in Steamboat Springs, Colorado. Thomas offers continuing education classes on integrating the fluid body and biodynamics into the practice of structural integration. For more information go to: www.explorationsinwholeness.com.

*Additional note: Although the author is a current faculty member of the Rolf Institute, the ideas expressed in this article are in no way meant to be construed as held by the Rolf Institute. They are the author's original perspectives intended to promote discussion and further exploration.*

## Abstract

*The fluid body is introduced as a valuable concept for structural integration practitioners. Based primarily on osteopathic and biodynamic foundations, the historical evolution of this concept, and the basic importance of presence—to change our perceptions and allow us to work directly with the fluid body—are described. Enhancing our touch skills by developing a continuum of contact will help us develop tools to work in partnership with the inherent healing function of the body and improve our work as structural integrators. An earlier version of this article was originally published in the June 2013 issue of* Structural Integration: The Journal of the Rolf Institute of Structural Integration *(Volume 41, Issue 1). It has been notably edited to better address the wider IASI community and to include current progression of these ideas.*

We all started as a drop of water and developed in utero in a fluid environment. (The human egg is 99% fluid and 1% genetic material.) This fluid environment still makes up most of the adult body. According to current scientific research, the "typical" healthy mammalian cell contains 70% water, 18% protein, 5% phospholipids, and 1% inorganic ions (Wang et al., 1999, and see Endnote). Yet, when we touch our clients, we primarily relate to the solid pieces: the bones, muscles, fascia, etc., which make up the 30% we refer to as tissue. There are a vast number of textbooks written about the 30%. We study, memorize, and often describe the changes we see in our clients referencing only the 30%. We are missing much in not learning to actively address the 70%, the *fluid body*. In this introduction to the fluid body I will discuss the importance of direct interaction with this often-overlooked aspect of our being, and the potential of this interaction to greatly enhance our goals for structural integration (SI).

While grounded in the paradigm of structural integration, this introduction to the fluid body is based on foundations from osteopathy, embryology, my own experience, and related biodynamic concepts of wholeness and health, as I currently understand them and successfully incorporate them in my private practice. My intent is to offer a body of knowledge to consider which can be incorporated into your daily practice.

As SI practitioners, we generally believe that changes in the structure occur from the outside inward, through our intention and our focused, vectorized touch. Our knowledge of anatomy and biomechanics directs our intentions. We want the fascial interfaces to become more slippery. We want the dried-out scar tissue to become more pliable and soft. We want dense places to soften and release. We look for continuity within the structure. We work to achieve integration, which is commonly understood to mean combining one thing with another to create a whole. With this understanding, it must be that that wholeness is our goal in the end.

We do three things within the framework of structural integration: hydrate, differentiate-de-rotate, and integrate. The first, hydration, is what we feel when tissues change. We feel the tissue soften, relax, and become "gushier." We have been taught that by pushing on the 30% we allow more

ease, spaciousness, and organization to appear in the tissues. There have been different explanations as to why this happens, such as pressure, heat, or piezoelectricity. Whatever the cause, as the tissues take on a more fluid quality, differentiation and de-rotation become more easily coaxed from the tissues and at times changes seem to happen spontaneously. We then describe movements as becoming more fluid and the body as being more integrated.

Below, I will describe the development of the cranial concept by Dr. William Sutherland, DO, and how this can inform our work as SI practitioners. We will gain insight into how the fluids can be directly contacted to help make our fascial work more complete and easier for both client and practitioner. I will then offer some basic steps which can be used immediately in your practice to begin to allow a more comprehensive balancing of the fascia.

## History

### *Fluid body*

The evolution of the concept of the fluid body has its origins in the discoveries of William G. Sutherland, DO, who built on the foundations of "the father of osteopathy," Dr. A.T. Still. Dr. Sutherland spent fifty years patiently exploring the subtle movements within the body. At the end of his journey, his ability to interact directly with what has become known as the fluid body has contributed greatly to the understanding of healing and wholeness.

This knowledge can contribute to our SI paradigm. The fluid system is not only critical in the development of the embryo, but also in the organization, function, delivery of resources to, and the lifelong maintenance of our bodies.

> *Sickness is an effect caused by the stoppage of some supply of fluid or quality of life.*
>
> (Still, 1897, p. 310)

Dr. Sutherland began his discoveries leading to the cranial concept in 1899 while examining a temporal bone. Its beveled edges reminded him of fish gills and he surmised that the temporals must be part of a respiratory system. He also noticed that the bones of the cranium moved independently of each other and realized that abnormal relationships between the bones produced certain symptoms in his patients. When he manually organized the bones, these symptoms would disappear. He developed specific techniques that could be used to free the articulations via the sutures, allowing the bones to express very slight yet important movements. When these movements normalized, physiology of the whole body could be improved.

In the early 1930s he shifted his focus to the meninges (dura) and their bi-laminar in-foldings that form the tentoria and the falx and continue from the foramen magnum to the second sacral segment as the neural tube (Magoun, 1951). Collectively, he termed these dural in-foldings the *reciprocal tension membrane* (RTM). He described how its coiling and uncoiling motions determine the movements of the bones of the skull. Sutherland also noticed that the continuity of the RTM from cranium to sacrum resulted in whole-body responses to its movements.

Several years later, Sutherland shifted his focus to the fluctuations of the cerebral spinal fluid (CSF) driven by what he termed the *primary respiratory mechanism* (PRM). He described the CSF as circulating down and around the spinal cord in a rhythmically pulsatile and spiral fashion. Many practitioners have perceived this movement and refer to the pulsation as the *cranial rhythmic impulse* (CRI), which has a palpable rate of six to twelve cycles per minute.

Focus on the bones, the dura (RTM), and the CRI is the main approach employed by many osteopaths, of whom John Upledger is the most well-known, and by lay practitioners today. However, Sutherland moved on. He began to notice that there was a fluid fluctuation ascending and descending from the sacrum to the cranium at a tempo of about 2.5 cycles per minute. This movement was seemingly outside of, yet inclusive of, the anatomy and is palpable throughout the body.

In the final years of his life, Sutherland described the motion of the PRM as being generated by external forces. He sensed his patients being moved by an external, ubiquitous force that he called the *Breath of Life* (BoL) or *long tide*. Sutherland perceived the BoL as an incarnate process, inherent in every living being, as well as an encompassing field phenomenon. The BoL passes through the patient's body and the practitioner's hands undiminished, generating a sense of the whole fluid body and field breathing at a constant tempo of 50 seconds of inhale and 50 seconds of exhale. Because of this breath-like sensation, he called the tempo *primary respiration* (PR).

The long tide is not affected by the central nervous system or by external forces. It has been present in each of us since before the moment of our conception. It is an inherent rhythm. Sutherland compared the BoL to the cyclic sweeping of a lighthouse beam across the ocean, lighting it up, but not touching it. BoL sweeps through the patient stimulating the inherent healing forces already and always present in the fluids. From these revelations the concept of the fluid body emerged: The whole body perceived and contacted as a single unit of living substance.

Sutherland reasoned that the different polyrhythmic tempos he had been describing through the years were generated by the BoL as it passed through the various layers of the whole body. Thus the long tide (6 cycles per 10 minutes), the mid tide (2.5 cycles per minute), and the CRI (6–12 cycles per minute) are all expressions of the BoL.

Sutherland's studies began with bones, progressed to the dura and fascia, on to the CSF, and then to the entire fluid field. This progression is important to know for our own profession, since every day in our work we touch all the elements he described. As he deepened into his experiences he sensed the entire fluid nature of the body, its tempos, fluctuations, and qualities, as well as its responses to the pervading, animating force of the BoL. Sutherland perceived the fluids as the organizing and healing mechanism which enlivens the whole. By interacting with the fluids, profound healing can occur throughout the whole body simultaneously. He sensed a fluid continuum, containing no anatomy, from within the skin to outside the physical body. Sutherland's singular gift of insight about healing and health was born from years of patience and open perception.

Currently, there are three major models of the cranial concept derived from Sutherland's perceptions. The terms soma, fluid body, and tidal body have evolved to describe these three models:

Biomechanical model → Soma → CRI (6 - 14 cycles per minute)

Functional model → Fluid body → mid tide (2.5 cycles per minute)

Biodynamic model →Tidal body → long tide/BoL (6 cycles per 10 minutes)

Fascia is in the soma category because it is an aspect of anatomy. Healthy fascia has a fluid quality. In this model, it is in the transition zone between soma and fluid body. Is fascia soma or fluid? These three models cannot be separated one from another; they are a continuum. The long tide is always present whether we have ever heard of it or not. The fluid body is always fluid with bits of mass in it; the soma is the stuff that allows us to function in the world.

> *A successful response from the cerebrospinal fluid . . . is an intensified interchange between all of the fluids of the body. . . . It is definitely evident that the reaction is systemic and includes the whole body even into the bones.*
> (Anne Wales, DO, quoted in Shea, 2012, p. 111)

By interacting with the fluids, profound healing can occur throughout the whole body simultaneously.

### *Biodynamics*

At about the same time Sutherland was progressing through his explorations, a German embryologist, Dr. Erich Blechschmidt, was developing a different model of human development than that generally accepted by conventional science. Pure genetics was the dominant model at the time, asserting that pre-formation of all living structures is carried only within the genes.

Blechschmidt was studying and describing a process called epigenetics. The epigenetic model states that an embryo develops through successive differentiations of an originally undifferentiated structure. His observations, based on the physics of moving water, showed that the movements of fluid (the protoplasm or "living water") in the embryo were directing embryonic development and that these fluid forces continued throughout life as the ongoing function of maintenance and regeneration of the human structure. In this, Blechschmidt's scientific work added additional support to Sutherland's perceptions.

Blechschmidt (2004) discovered that fluid movements were occurring when there were no structures to generate them. His studies of the progression of these movements showed that in order to have movement, some force must be present to cause it. He determined that forces are acting upon and within the fluids themselves. Further explorations showed that there are submicroscopic movements in the fluids, very much like the more metaphoric BoL perceived by the early osteopaths. Blechschmidt used the term *biodynamic* to refer

to the forces in the fluids that cause order and organization to occur.

Blechschmidt determined that it is the flow of protoplasm that produces the differentiations we see in the embryo, and that genes, though necessary, are not the cause of body formation. Genes are a mechanism by which the information in the fluid fields is manifest into physicality. Genes are members of the orchestra, but not the conductor.

Blechschmidt described a process by which form is determined by fluid flow, which shapes the limiting membrane out of which comes the anatomical details. He described a model in which the interaction between the varying fluid flows within the embryo creates barriers and resistances that influence the genes to create structures. He coined the term *metabolic fields* to describe how these forces of growth compress, shear, stretch, and thus affect the metabolism of the cells and, in the end, direct their differentiation into the component structures of our bodies. Blechschmidt described how relative position influences shape, which determines the expression of the cell nucleus into the formation of embryonic structures. In his view, for the cell to shift from one stage to another, there must be some external force causing the differentiations.

> *Differentiations arise as functions of the whole organism whether it be one cell or many.*
> (Blechschmidt & Gasser, 2012, p. 4)

A biodynamic approach to embryology is an exploration of the movements occurring throughout the fluids, which shape, resource, and sustain the whole person. Blechschmidt's scientific descriptions offer a more verifiable confirmation of the same phenomena and perceptions the early osteopaths often described with deistic metaphors. Most importantly, both imply that slow-tempo movements perceived in the fluids are expressions of wholeness that act to shape, differentiate, and organize the pieces of the body. They also state that these embryonic fluid movements are present throughout life.

To work with the fluid body is to engage an expression of wholeness with its ability to organize, shape, sustain, and resource the physical body. By learning to work directly with the fluid body, we can learn to experience wholeness as a palpable sensation instead of a concept. I once heard a meaningful metaphor about the relationship between genes, fluid, and the Breath of Life in a class taught by Jaap van der Waal, MD, PhD.:

> *Genes are like the clay that forms a piece of pottery. Clay by itself cannot form into shapes; it requires the hands of the artist. And the hands of the artist cannot act without the mind of the artist. Clay represents the genes; the hands represent the fluid forces; and the artist's mind represents the Breath of Life – the deific plan or the master mechanic often alluded to by Still.*

## Interacting With the Fluid Body

The fluid body is a huge topic with many dimensions. The concept of the fluid body is a teaching tool that is both limiting and descriptive, as most models are. It is limiting because the labels soma, fluid body, and tidal body imply that they are distinctly separate compartments. It is descriptive because it is experienced as a continuum of fluid systems. I describe this continuum perceptually as progressing from solid and condensed structures, to dense, honey-like fluidity, to water, to unbounded spaciousness and unlimited connection.

By learning to work directly with the fluid body, we can learn to experience wholeness as a palpable sensation instead of a concept.

The fluid body is a living continuum and not part of a sequence of events. It responds simultaneously throughout its entirety. It is not as if it begins one place and ends up somewhere else. The whole breathes and fluctuates as it directs its therapeutic forces toward specific goals. It seems to recognize the priorities of the body in any given moment. Although there are thousands of fluid compartments in the body, the fluid body is a whole without boundaries or compartments. Ideally, when there is balance in the fluid body, there is one single response encompassing all the fluids of the body, intracellular and extracellular in all its aspects. Fluctuations occur in every drop of fluid in the whole body in every moment. Sutherland talked about fluid motions by saying that "every drop knows the tide" (DynamicPotency, 2013, para. 20). When one perceives the fluid body, it feels as if there is a single, albeit large, drop that is being breathed. This can be hard to grasp because our conventional medical model is built around parts: the 30% we refer to as anatomy and physiology.

Sensing the dura, the RTM, and the fluid body requires the practitioner to sense and recognize qualities and tissues beyond the physical contact of the fingertips. As we aspire to perceive more than the pieces, more than the bones and tissues, we must learn to acknowledge and then disregard our conscious perception of what is superficial and allow ourselves to sense more deeply. Sutherland taught that the fluid body could not be contacted in the way one works with the tissues. The dura can't be contacted by pressing harder or deeper. It doesn't respond effectively to direct contact and it cannot be pushed as though it is separate from the whole self.

> *Go around the problem; get the system sufficiently resilient so that it is able to change, and it will change. It doesn't have to be forced. It's that forcing that you have to avoid at all costs.*
>
> (Rolf, 1978, p. 83)

The fluid body is highly sensitive. If approached from a spacious perspective and a neutral state of mind, one can observe the powerful reorganizations that happen for one's clients. This healing is generated by the function of the inherent health of the client's system and supported by the practitioner's presence. I have come to call the process of changing oneself, to allow perception of the subtleties of Wholeness, *Inclusive Attention*.

Inclusive Attention means holding a neutral state of mind, having no preference to outcome, while actively engaged in unbiased listening to your client's system, with a detached awareness of self, client, and the immediate physical surroundings. This kind of presence provides us a wide perspective while staying "out of the way" of the intelligence of the inherent healing carried in the fluids.

In order to relate to the movements of wholeness in the fluid body, you cannot think of yourself as separate. Perceiving wholeness demands that you change yourself. Dr. James Jealous, DO, has said, "wholeness doesn't appear, you disappear" (personal communication, n.d.). It is important to allow the dualities of giver-receiver, client-practitioner to fade into the background. Duality of any sort is antithetical to wholeness since, by definition, there are no dualities in wholeness. To synchronize with wholeness in the fluids one needs to be present in one's own fluid body. Direct interaction with the fluids means that one is not working with anatomy but in collaboration with the 70% of physicality that has no anatomy. To do this you need to experience yourself as a fully three-dimensional fluid being. You need to begin to perceive your body as more diffuse, becoming more aware of the spaces between your particles and experiencing your own fluid system.

To contact the fluid body one needs to shift not only one's perceptual focus through presence, but also one's sensing skills from palpating and seeking dysfunction to active listening for wholeness and ease (fluidity). Our preferences and biases as practitioners as well as our intentions and focus will diminish our ability to sense with expansive perception and hear the story of the body. It is important to internally shift from a doing mode to a simultaneous sensing-listening-being mode. In addition, there is the need to continually disregard the boundaries and duality within yourself and your client by sensing the entirety of the whole therapeutic field with neutral, simple inclusive awareness.

In learning to work with the fluid body, it is important to develop more sensitive hands and a much broader spectrum of contact. It is impossible to experience and support the depth of the fluid body's healing and organizing effects without doing so. Broadening contact skills also allows one to experience wholeness as a palpable phenomenon. It is much more than an intellectual, or perhaps to some, an entertaining concept. In my own experience, it has allowed many opportunities to truly "listen to" my clients' systems. I have found that from this perspective it is much easier to sense and instantly respond to the client's natural pace of change. It is also easier to feel the continuity throughout the fascia and fluids of the body, thereby influencing balance and coherence in a much broader area with much less effort. Choosing to listen for ease and choosing the perceptions of spaciousness and hydration are both an expansion on the fascial skills SI practitioners already have.

Engaging the fluid body is a simple concept, but. in practice, it isn't easy to do! It isn't easy because the ability to stay in a neutral frame of mind with unbiased contact and presence is continually interrupted by our mind's impatience. Learning to work with Wholeness in this way is in part an exercise of mindfulness. What makes presence so valuable, while in contact with another, is that presence allows safety for the client and immediate

feedback for the practitioner. Our client's body reflects our level of presence in each moment by the wholeness its system is able to express to our perception.

## Getting Started

The concepts presented here have their roots in my biodynamic training and personal practice. Biodynamics can inform our work as SI practitioners, but cannot replace it. They are not the same work. Don't abandon what you already know how to do.

Dr. Sutherland's progression from bones to membranes to fluids demonstrates a continual acquisition of perceptual and contact skills that build upon each other. Many people learn about biodynamics then jump from the soma to the tidal body (or energetics), never recognizing there is a middle phase. Sutherland spent nearly 50 years developing the skills to perceive the entirety of the fluid body. We don't need to take that long, but we will benefit from learning the skills needed to interact with the intermediate phase, the fluid body. As structural integrators we already have a good start because fascia is the phase between the solids and the fluids. Fascia is primarily fluid with the mass needed for us to function.

By deepening our explorations and contact with the highly fluidic fascia we can learn to incorporate the necessary skills for interacting with the fluid body in our fascial work. We are also carrying on the inquiry of Dr. Rolf in exploring ways to advance our work. As we continue to develop these skills, the fluid body's expressions will begin to come more prominently into our awareness. In our desire to be more effective in our work (now!), we often lack the patience to deepen our skills. We then miss valuable steps and subtleties with which we can more completely understand the processes of wholeness and its function in health and healing. By bringing fluid awareness into all of our contacts, we will gradually begin to experience the Wholeness expressed by the fluid body.

Fluid likes to take up space. So I need to shift myself to become more spacious to synchronize with this quality. From spaciousness, I feel and look for the spaces and ease in the tissue. Fluids like to spread, and space likes more space so I cannot relate to spaciousness from a narrow perspective. It's impossible to relate to the fluid body and its inherent qualities from a pushing, "I know" contact. However, it is still necessary to know how and when to shift to a pushing contact, varying pressure depending on tissue density, developing a *continuum of contact*.

Wholeness expresses itself as balance. Balance infers ease. From a place of ease in yourself, listen. Seek ease in the soma. Look for the ease in the tight tissue. Our usual method of working with dense tissue is to force it to relax. Learn to explore and follow the ease and you will have doubled your skills.

In focusing on the details of the movement, you will have lost your Inclusive Attention and your ability to sense the client's whole system. You will end up tracking your own interference reflected in your client.

It is my experience that many practitioners venture into the fluid realm by chance and engage it in the usual ways we have learned to work with the fascia. When this happens, the fluids often change and express a pattern that is frequently sensed as a repeated swirling and spiraling sensation. The practitioner may then misinterpret this sensation as an "unwinding" phenomenon, and may actively exaggerate the motion with the intention of helping to unwind a trauma. In actuality, the client's system may just be squirming to get away from direct contact. If you begin to sense the fluids and then get curious and shift to a more focused doing or directing attitude, the fluid patterns will also shift in response to your intent and input, just as the smooth surface of a pond shifts when a breeze ruffles the surface. In focusing on the details of the movement, you will have lost your Inclusive Attention and your ability to sense the client's whole system. You will end up tracking your own interference reflected in your client.

As you develop the sensitivity in your hands to perceive subtle and significant shifts in the fascia, you will begin to correlate what shifted in you to allow your perceptions to change. This awareness is the same from bones to fluid body to tidal body. It just requires continual attention to and refinement of presence and your willingness to change what you assume about the body.

*So many therapists are striking at the pattern of disease instead of supporting the pattern of health . . . [Y]ou are not practitioners curing disease; you are practitioners invoking health.*

(Rolf, 1978, p. 202)

## Conclusion

Structural integration is a powerful point of view. It is not defined by its techniques, but by its vision. The value of fascial manipulation to improve the function in our clients has a strong track record. Throughout its history many have been continually exploring ways to enhance our work.

Structural integration has deep roots in osteopathy. We have borrowed much from that profession and incorporated aspects, including cranial-sacral therapy, visceral manipulation, and nerve work, among others, into our whole-body approach to enhancing embodiment. We can learn much from Sutherland's progression from bones to fluids to further refine our whole-person philosophy, and we may find following his evolution of perception to be a good path to explore.

In structural integration we have limited cranial touch to the axial complex whereas the progression of Sutherland's studies taught that there is a seamless continuum between the anatomy and the fluids. He demonstrated that whole-body responses to this quality of touch offer comprehensive results. To learn this quality of work requires patience, both with the time it takes to grow our personal skills and with our ability to change within ourselves. However, the reward is a partnership with the body's unerring, inherent self-healing process to assist us in our work.

Increasing our spectrum of touch allows us to match our touch to our client's tissue quality and makes the work easier on practitioner and client alike. Continuing to develop our *broad spectrum of touch* allows us to work directly with the largest percentage of our client's system—the fluids—improving our ability to support embodiment and function.

My experience working with the fluid body has taught me how to more clearly understand integration and wholeness and how to engage its effects to rebalance the disorganization we often see and feel in our clients. As I've gained more perceptual skills and sensitivity, I've experienced the seemingly miraculous effect of how the health carried in the fluids can reorganize the anatomy. Now, in every session, I have the choice to relate to dysfunction, or to the expression of health in the whole body. I can also choose to relate to the health within the dysfunction. To shift from one approach to another, I have only to shift myself. If I only relate to the dysfunction, I am much less effective in reminding my client's "being" of wholeness. And from my experiences, I believe that wholeness is the pathway to health.

*Many thanks to Gale Loveitt and Heidi Hauge for their valuable help in editing.*

## Resources

Kern, M. (2001). *Wisdom in the body*. London: Thornsons.

## References

Blechschmidt, E. (2004). *The ontogenetic basis of human anatomy: A biodynamic approach to development.* Berkeley, CA: North Atlantic Books.

Blechschmidt, E., & Gasser, R. F. (2012). *Biokinetics and biodynamics of human differentiation: Principles and applications*. Berkeley, CA: North Atlantic Books.

DynamicPotency. (2013). Retrieved Dec. 23, 2013 from http://www.dynamicpotency.com/words-and-wisdom-osteopathic-quotes-2/2/

Feitus, R. (Ed.). (1978). *Ida Rolf talks about Rolfing and physical reality*. Bookslinger.

Jealous, J. (2001). *Emergence of originality* (2nd ed.). Farmington, ME: Biodynamic/ Sargent Publishing.

Magoun, H. (1951). *Osteopathy in the cranial field*. Kirksville, MO: the Journal Printing Co.

Rolf, I. P. (1977). *Rolfing: The integration of human structures*. Santa Monica, CA: Dennis-Landman.

Shea, J. J. (2012). *Biodynamic craniosacral therapy* (Vol. 4). Berkeley, CA: North Atlantic Books.

Still, A. T. (1899). *Philosophy of osteopathy*. Kirksville, MO: The Journal Printing Company.

Sutherland, W.G. (1967). *Contributions of thought: The collected writings of William Garner Sutherland*. A. Wales (Ed.). Kansas City, MO: Sutherland Cranial Teaching Foundation.

Wang, Z., Deurenberg, P., Wang, W., Pietrobelli, A., Baumgartner, R., & Heymsfield, S. (1999). Hydration of fat-free body mass: New physiological modeling approach. *American Journal of Physiology Endocrinology and Metabolism*, (276), E995-E1003.

## Endnote

The fluid body encompasses all aspects of bodily fluids including intracellular water and extracellular fluid (lymph, blood, CSF etc.) as well as the vapor field around the body created from exhalations and general excretions through the skin. It is still more than this.

> *The "typical" mammalian cell contains 70% water, 18% protein, 5% phospholipids, 1% inorganic ions . . . . In the present investigation, cellular hydration was thus assumed to be a mean of 0.70, representing a typical mammalian cell . . . . Extracellular fluid consists of water, protein, and minerals, with water accounting for ~94% of plasma and ~99% of interstitial fluid . . . Extracellular fluid is distributed into two main compartments, with about one-sixth as plasma in the intravascular space and the remaining five-sixths as interstitial fluid in the extravascular space . . .* (Wang et al, 1999)

Retrieved from http://ajpendo.physiology.org/content/276/6/E995