

SCIENCE
AND YOU

by Todd Whitcombe,



Bone structure dictates
how tall humans can be

I think it was Abraham Lincoln who said “My legs are just long enough to reach the ground.” He was a rather tall gentleman for his time and had come up with this response to the perennial question of “Just how tall are you?”

Height and size are interesting questions. Why are we the size that we are? I don't mean for specific individuals but rather why are humans about five to six feet tall and not 20 or two feet tall or even two inches? Is it possible to produce a genetically altered generation of really tall humans and thus, dominate the NBA? Would it be worth it?

The question of size in the animal kingdom is dominated by the relationship between surface or cross-sectional area and volume. Area increases according to a square law while volume increases as the cube. That is, doubling the dimensions of a one centimetre cube produces a new cube with 2 cm sides. The cross-sectional area goes up by a factor of 4 (2 cm x 2 cm) but the volume increases by a factor of 8 (2 cm x 2 cm x 2 cm). This puts certain limitations on the size that an animal can be if it is constructed out of the material we have at hand — meat, bones, sinew, and such.

The reason is that bone can only carry so much load per area. At some point, the size increase in the bone will not compensate for the extra weight. The baby in “Honey, I Blew Up the Baby” would break its thigh bone the first time it took a step! Giants, such as those featured in film, cartoons, and literature, simply would not be practical — at least, not without a major redesign of the skeleton or the materials involved. Similar arguments apply to the muscle tissue as well, since the muscle power is related to area or thickness but the weight that a muscle must move is related to the volume.

Why are we not two inches tall? The complexity of the human body would not and could not be accommodated in a person two inches tall. The number of neural connections in the brain alone would not be sufficient. But it would be interesting to be that size or smaller since in the world of the very tiny, gravity is not the big enemy that it is for us.

For a tiny creature, such as an ant, one might think that a fall from 10 feet should seem like a fall from a 1,000 feet for us. But these little creatures routinely walk away from these tremendous drops and not just to go someplace else to die!

The reason is the surface area-volume ratio. Mass is directly proportional to volume. The terminal velocity that a falling object reaches is related to this mass but also to the surface area. This is why a crumpled up ball of paper drops much faster than an unfolded sheet. Same mass, different surface area.

With ants, their surface area to mass ratio allows them to “float” to the ground and land with an impact that is about the same as you or I jumping from the same height. Not something I would do every day but certainly not a life threatening jump.

We are the size we are to accommodate the complexities of our minds and not overburden the structure of our bones. Still, I think that I could stand to lose a few pounds!

THE NEW
ADVENTURE

by Tom Blakely



Only *you* can determine
when it's best to retire

Dear Tom: Retirement can be mine for the taking in less than a year and I have been looking forward to it. But some of my retired friends tell me I would be making a mistake to retire if I don't have to.

I am a woman, 57, and have taught school for 30 years and am now a school principal. My husband operates his own business and I have no need to earn money.

Why do some of my retired friends tell me it would be a mistake to retire? — Need to Know

You say “some of your friends” say it would be a mistake to retire. That implies you have other friends who hold different views.

That's natural — because retirement is different for everyone. You can listen to both groups. But in the end you have to decide what retirement is going to be like for you.

First, you should ask yourself why you want to retire at 57 instead of 65. You have said you don't need to earn more money. But lots of people say that when they are rationalizing their desire to retire.

Some of the reasons why people elect to retire before it is necessary are what many psychologists call “retirement fantasies.”

Among those fantasies are being able to sleep late. But many find their body clocks won't let them do it.

Another fantasy is having time to do all the things they didn't have time to do while they were working. But few people ever get around to doing those things.

Some people want to retire because they are bored by doing the same thing day after day and year after year. But in retirement they can get bored by doing nothing day after day and year after year.

A lot of people want to retire before it is necessary because they feel they have climbed to the top of the hill and now it is time to “coast.” But in retirement, some of these coasters discover the only way to coast is to go downhill.

Some career women elect to retire before it is necessary because they want to fulfill themselves in the traditional homemaker role that they feel they neglected while they pursued their career.

When you have sorted out your real reason for wanting to walk away from a successful career before you need to, consider these realities of retirement:

The status you have enjoyed all your working life will vanish—unless you replace it by other activities.

The motivation you had while working was created by the responsibilities of the job. Retirement will reduce your motivation. If you are going to be motivated, you will have to motivate yourself.

The power you had to shape the lives of hundreds of students will no longer exist. If the shaping of young lives gave purpose and meaning to your life for 30 years, you are likely to feel diminished as a contributing member of society.

The main reason you give in your letter for wanting to retire before it is necessary is that you don't need the money. It is hard to believe that the only reason you have worked so long and so successfully was only for the money. You surely must also have earned satisfaction, respect and a specific identity.

Keeping these “benefits” in retirement can turn out to be harder than earning them in the first place.

