



## POWER IS ESSENTIAL FOR PROPULSION

IN BOTH TURBINES AND HUMANS

**MARKUS ZAPKE KNOWS ALL ABOUT POWER: "POWER IS ESSENTIAL FOR MOVEMENT," SAYS THE TURBINE ENGINEER. "IN THE WORLD OF ENGINEERING WE HAVE MACHINES BUT WE HUMANS NEED THE STRENGTH OF OUR MUSCLES."**

Mr Zapke, as a turbine engineer, power is at the heart of your profession. What does it mean to you? Power is essential for movement. It is needed to produce any form of propulsion. In the world of engineering

we have mechanical power but we humans need the strength of our muscles. You need that to remain in top form throughout the day. Kieser Training is great for that.

**What was the driving force that brought you to Kieser Training?**

I wanted my muscles to remain "in balance". My job is largely sedentary. Admittedly, I do walk around the workshop but that is not really physical work. In 2000, I started to build my own house. This combined with my

work meant that my body had to do twice as much. I wanted something to offset that load. Even after my first introductory session, I knew it was right for me and I have continued training ever since.

**Do you train regularly?**

In summer I cycle a lot and so I usually train twice a week. In winter, I train twice or three times a week. I don't feel right without regular training and exercise. If I train, I feel good and can keep going. I don't have to force myself to do it – quite the opposite. There are few concepts as convincing as Kieser Training. I like the fact that you only do what is essential. It's all about targeted training. I can look after my cardio training myself. I prefer to do that outside where it is more invigorating.

**You train with your son, right?**

Yes, he is now 17 and has been training for almost 3 years. At the start, I was the one who took him along but now he is often the driving force. He started at just the right age and has developed really well physically – even the instructors are amazed.

**Have your personal goals changed over time?**

Some 10 years ago, I bought a racing bike and since then I have had yet

another reason to continue Kieser Training. For cycling you need a really good level of physical fitness. In terms of muscles, the load is mainly on the legs but you also need the support of a strong torso. Kieser Training is excellent at providing the right foundation.

**What do you particularly like about training?**

Strength generates well-being, self-confidence, personal presence and a natural radiance. If you don't feel quite right, it helps you shed that feeling. Training is also an opportunity for contemplation – that applies equally to strength training and cycling. Sometimes I take problems home with me but strength training and exercise give me a break from my problems. I then sleep well and wake up refreshed.

**Read the full interview at:** [kieser-training.de](https://kieser-training.de) ■

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Age: 51  
Profession: Turbine engineer  
Centres: Potsdam and Berlin, customer since 2002



# OUR BONES ARE LIVING TISSUE

## THEY ADAPT TO MECHANICAL LOADS THROUGHOUT LIFE

**BONES PROVIDE SUPPORT AND ALLOW THE BODY TO MOVE. THEY STORE MINERALS AND ARE NECESSARY FOR THE PRODUCTION OF BLOOD CELLS. THEY ALSO PROTECT OUR ORGANS. IT MAKES SENSE, THEREFORE, THAT THEY ARE NOT A RIGID CONSTRUCT BUT CONTINUE TO FORM AND REFORM THROUGHOUT OUR LIFE.**

Our body has about 206 bones; each bone is made up of one-third collagen and two-thirds minerals. A bone is a well-perfused organ and contains several different types of living tissue. It is this tissue that largely determines a bone's mechanical properties. The tissue on the outer surface of a bone is known as *substantia corticalis*. On the shaft of tubular bones, this layer is very thick and so is also known as the *substantia compacta* or compact bone.

### **Its microarchitecture makes a bone hard and light**

The inner layer of tissue is called the

*substantia spongiosa*; it is a spongy network of fine trabeculae (cancellous bone) and is structured so that it can react to distortions. This microarchitecture ensures that the bone is both stable and light. On the outside, the bone is surrounded by a connective membrane called the periosteum. This membrane does not extend over the joint surfaces and here, the bone is covered with cartilage.

Bones evolve from embryonic connective and cartilage tissue. During childhood and adolescence this tissue gradually becomes hard bone. The growth of bones continues until we are adults and have reached our maximum height. The way growth occurs depends upon the type of bone. For example, with tubular bones, such as the femur, the increase in

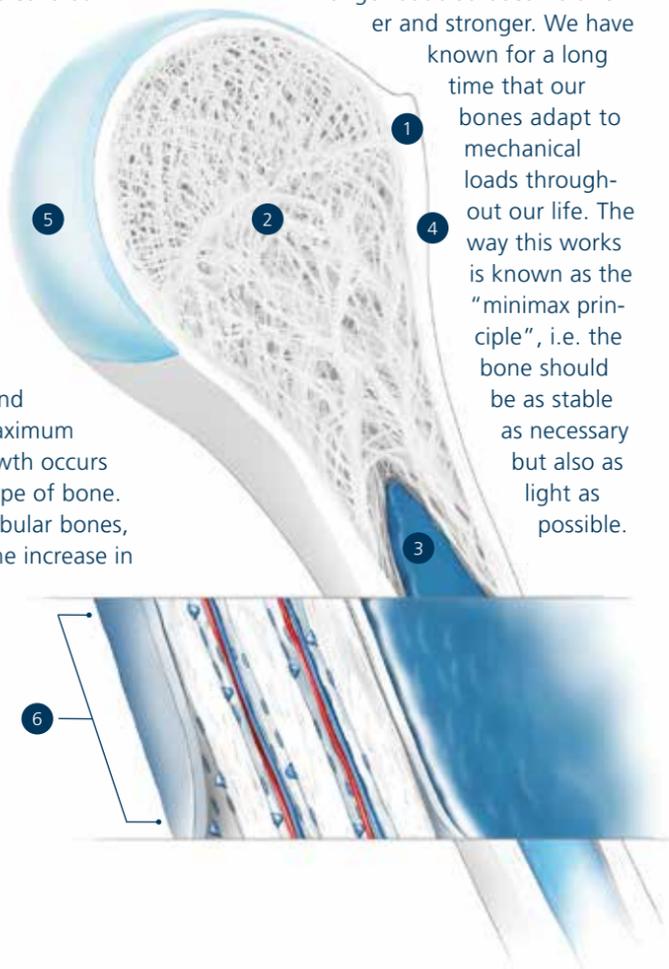
length occurs in the area of the epiphyseal plate. This is a gap between the shaft and the ends of a bone. The plate disappears once we have stopped growing and hard bone tissue forms.

### **During our life bones reform**

Of course, bones not only become longer but also become thicker and stronger. We have

known for a long time that our bones adapt to mechanical loads throughout our life. The way this works is known as the "minimax principle", i.e. the bone should be as stable as necessary but also as light as possible.

The cells that form bones are generally known as "osteoblasts". In contrast, the "osteoclasts" are responsible for the reverse process known as resorption. As with muscles, the balance between the rate of formation and resorption decides whether bones are formed or broken down. ■



- 1) *substantia corticalis*
- 2) *substantia spongiosa*
- 3) bone marrow cavity
- 4) periosteum

- 5) joint cartilage
- 6) Haversian canal (contains osteoblasts, osteoclasts, blood vessels, and nerves)

*Ensures lightness and stability – the outer bone layer is smooth and hard whereas the inner layer is a spongy structure of fine trabeculae. This microarchitecture ensures that bones are both stable and light. The regular distortions that occur during strength training maintain bone substance; they make it stronger and more elastic. Humans grow with resistance – evolution knew that.*

# BONES NEED STRENGTH TRAINING!

## MECHANICAL LOADS KEEP BONES HEALTHY

**MECHANICAL LOADS AND MUSCLE STRENGTH PROMOTE BONE METABOLISM. THEY KEEP BONES HEALTHY AND PROTECT US FROM THE DISEASES ASSOCIATED WITH A PASSIVE MUSCULOSKELETAL SYSTEM.**

The greatest force acting regularly on bones is not gravity but muscle strength. When our muscles work hard, our bones, particularly the long

tubular bones, distort a very tiny amount. Tensile, compression, shear and bending forces are transferred to the bones via muscle insertions and origins and as a result, the inside of bones is subject to minute distortions. These in turn trigger stimuli that extend throughout the bone and activate a control loop.

It was the scientist Harold Frost, who in 1987 first described this process –

known as the "Mechanostat Theory". The degree of bone deformation constitutes a control variable that should be kept constant. A control mechanism – the mechanostat – records the actual deformation and then compares it with the desired value.

Provided that the load stimulus is sufficiently high, this micro-deformation exceeds the desired value. That stimulates the bone metabolism. The osteoblasts are activated and work hard to build up bone mass. The bones lay down mineral salts and this increases the stability of the spongy trabeculae. In addition, there is a thickening of the outer layer of tubular bones and the insertion points of tendons and joints.

In contrast, if the micro-deformation fails to reach the desired value, the osteoclasts come into play and bone mass is decreased. In addition, it produces a negative change in the geometry. In other words, if we fail to use our muscles enough, our bones will lack the required mechanical load. This represents a risk factor for premature bone loss. To maintain bone health and prevent bone disease, it is important to do regular strength training.

### **Negative training: positive impact on bones**

Kieser Training not only trains the muscles but also the bones. As a result, the bones remain healthy, are better able to withstand external influences and are more resistant to bone diseases.

An interesting fact is that the negative phase of a muscle exercise produces the highest level of bone deformation and so is more effective at strengthening bones. In terms of training, that means that you should try and actively slow down the weight during the negative phase, i.e. as you lower it.

This produces the maximum muscle strength. So why not try semi-negative or negative exercises? Our staff will be pleased to introduce you to the methods. In addition, at [kieser-training.de](http://kieser-training.de), you can read how to do semi-negative exercises on the B1 or negative chin-ups and dips on the K Tower. Experience how to activate your bone metabolism in daily life. ■



# TRAINING KEEPS THE GENES YOUNG

## EPIGENETICS IN SPORT

**WHEREAS SOME PEOPLE SEEM TO REMAIN YOUNG FOREVER, OTHERS AGE PREMATURELY DESPITE SEEMINGLY SIMILAR LIVING CONDITIONS. WE LIKE TO PUT THE BLAME ON THE POWER OF OUR GENES, AS THIS QUIETLY ALLOWS US TO AVOID PERSONAL RESPONSIBILITY. HOWEVER, ARE OUR GENES REALLY ALL-POWERFUL?**

At the end of the 20th and beginning of the 21st centuries, more than 1,000 scientists from 40 countries decoded the human genome, i.e. the totality of genes that in humans is about 25,000. The genome can be likened to the ABC of humans and consists of a text comprising three billion characters.

### All power to the genes then?

"It was thought that by decoding the genome, we had solved the mystery of our genetic make-up. It was hoped that our personal DNA codes would explain why we are who we are," says Professor Dr Wilhelm Bloch, Head of the Department for Molecular and Cellular Sport Medicine at the Institute for Circulation Research at the German Sport University in Cologne.

"Individual differences in performance, health and the effects of physical activity were seen as the result of so-called genetic polymorphisms, i.e. small changes in the genetic code," says Bloch. To continue the ABC metaphor, this means that changes to individual letters in the human ABC changes

words slightly and so changes sentences, i.e. the functioning of the genes."

However, this explanation has proved unsatisfactory as genetic polymorphisms are only responsible for about 5% of individual differences. Identical twins are a classic example of the fact that genes are not all-powerful. "In most cases, their genetic codes are almost identical. In early life, the twin's genotype and phenotype, i.e. the genetic constitution and its detectable expression, are very similar but as they get older the individuality of each twin increases. They start to diverge. In other words, it is possible to influence the genotype."

### Genes are not everything

Epigenetics provide a key to understanding the difference between the human genotype and phenotype. It is an area of research that seeks to explain the relationship between our genetic constitution and actual performance and adaptability together with the related changes.

"Epigenetic modulation is what lies between an egg cell and an adult human," explains

Bloch. "It allows genes to be turned on and off for varying lengths of time – in certain circumstances for several generations. Admittedly, the number of genes switched off is slightly higher than the number switched on. That

changes us as we get older. The impact of these modulations is the subject of current research."

### Lifestyle influences our genes

This epigenetic modulation is triggered by our personal lifestyle and this has an enormous influence on gene activity. Bloch cites alcohol as one of the strongest epigenetic modulators. Diet and physical activity also play a crucial role. Admittedly, we do not yet understand the precise relationship between physical activity and epigenetic modulation. "However, we do have a series of examples indicating that training triggers epigenetic modulations in both the muscle and the brain and these may go hand in hand with changes in the performance of the tissue in these organs," stresses Bloch.

### Training switches genes on or off

For example, a specific inflammatory gene may be activated in the course of our life. The good news is that we know from research that training can switch this gene to silent. "The immune system of those who train remains at a younger stage," says Bloch.

Vice versa, other genes switch to silent as we get older, e.g. the genes that suppress the development of tumours. A study of a group of breast cancer patients showed that exercise can activate these so-called tumour-suppressor genes and this in turn had a positive effect on survival rates. Scientists even think that people who are physically more active throughout their lives have a lower risk of breast cancer.

### Every single training session counts

What is amazing is that a single training stimulus can have a major impact. "In one of our studies, we were able to show that a single training stimulus activates our natural killer cells, i.e. it strengthens the body's own tumour defences," says Bloch. Basically, physical activity has an effect on our system of epigenetic modulation and so improves our immune and defence mechanisms.

Training has a positive effect on our basic genetic make-up

Similarly, the gene for the nerve growth factor BDNF (brain derived neurotrophic factor), is, as Bloch explains, activated by training. BDNF promotes the plasticity of the brain and its regenerative capacity. The welcome consequence for us is that the brain remains "young".

### Genes are just our foundation

Research has clearly shown that there is an interaction between genetic make-up and our lifestyle. Bloch sums it up succinctly: "If you start life with good genes, you will not reap the rewards if you adopt a poor lifestyle. The reverse is also true. If you start with a poor genetic make-up, you can influence your genes in a positive way by adopting an appropriate lifestyle. This means that in epigenetic terms, we either age quickly or we remain young." The solution is in our hands. So, carry on training! ■

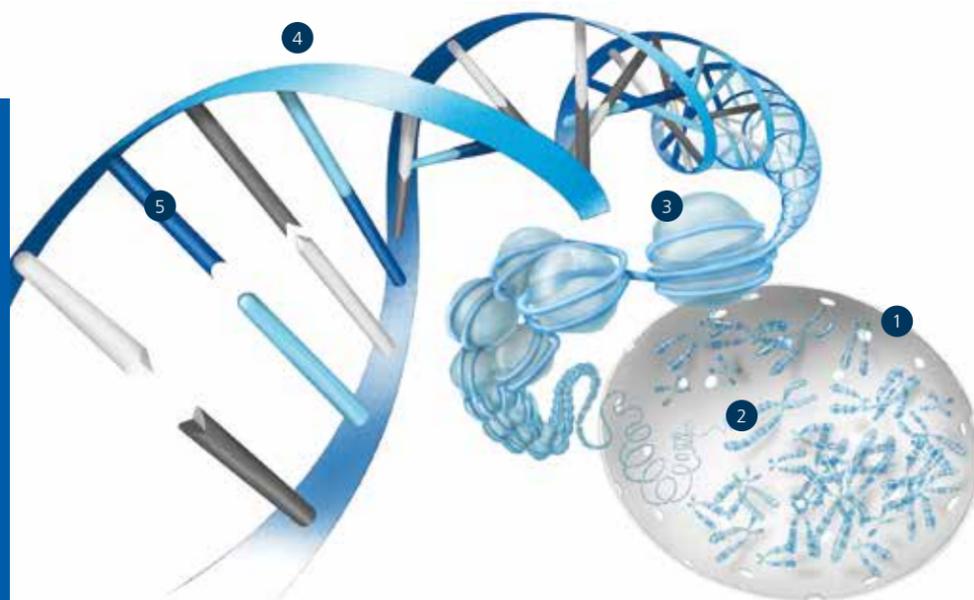


## DNA: genetic code carrier

Each cell nucleus contains 23 pairs of chromosomes. Each chromosome consists of a long thread of deoxyribonucleic acid (DNA) whose structure can be likened to a twisted ladder. It contains our individual genetic code: our genetic information. Each strand of this double helix is made up of sugar and phosphate groups, the "rungs" from two of the four possible bases. They form the letters of our individual genetic ABC, i.e. our DNA code. Their sequencing contains the instructions for the production of proteins, e.g. muscle proteins.

The DNA thread is two metres long. It has to be packed into a microscopically minute cell nucleus and so is packaged in an extremely compact form and wound like thread onto a reel (nucleosome). If a gene is activated, the DNA is unwound, copied and translated into a protein. If the packaging is too tight, the DNA cannot be unwound and so the gene remains silent. This in turn may have a positive or negative effect.

Chemical processes determine how our DNA is packaged and how tightly; it is precisely here that our lifestyle can exert an influence. That, in principle, is epigenetics.

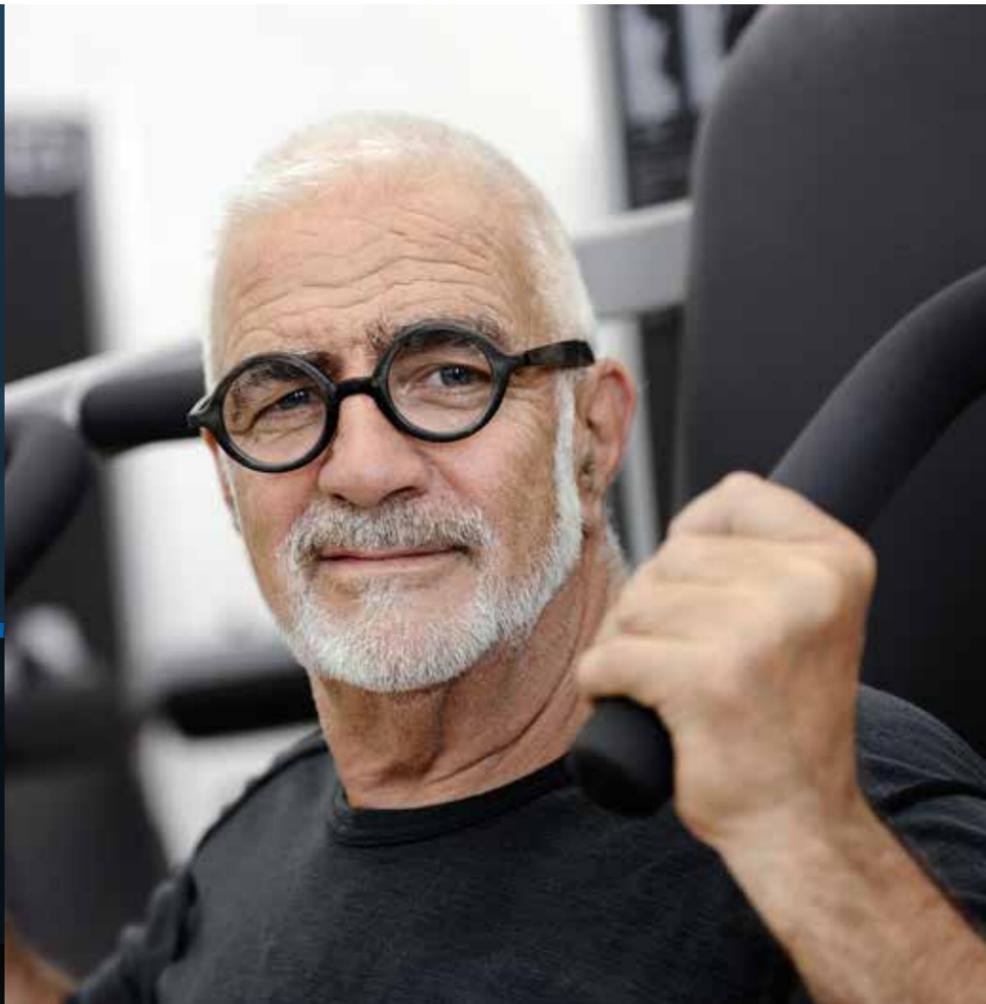


1) cell nucleus  
2) chromosome  
3) nucleosome

4) deoxyribonucleic acid (DNA)-double helix  
5) bases

## WERNER KIESER'S CORNER

NOT A LIGHTHOUSE – JUST A GLOWING BUNNY



Many people believe that humans – like all other animals – were created by a God. Others believe that all life was the result of evolution. However, there is one fact that should give both believers and non-believers alike food for thought. After an evolutionary history spanning some four billion years,

a member of the hominid species has come up with the idea of single-handedly creating new types of life – a living creature that is not the product of a more or less blind selection process. Scientists have created a fluorescent rabbit by injecting the gene from a fluorescent jellyfish into the embryo

of a white rabbit. I am not sure that many of my fellow citizens realise the explosive nature of this innovation. Of course, it is great if we can use genetic engineering to rid the world of incurable diseases but the ability to create living organisms, including humans, for

specific purposes simply opens Pandora's box. It is not for nothing that the scientist Yuval Noah Harari gives the final chapter of his book "Sapiens: A brief history of humankind" the title "The end of homo sapiens". An important book!

Werner Kieser

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## AUSTRALIA NEW LOCATIONS

### PYMBLE

Opened 11 July  
939 Pacific Highway  
Pymble, 2073, NSW  
[pymble@kieser.com.au](mailto:pymble@kieser.com.au)

### MALVERN

Opens in September  
1155 Malvern Road  
Malvern, VIC 3144  
[malvern@kieser.com.au](mailto:malvern@kieser.com.au)

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## THE FUTURE IS STRONG TOGETHER TRAINEE PROGRAMME AT KIESER TRAINING

### KIESER TRAINING OFFERS ITS STAFF A TRAINING PROGRAMME AS PREPARATION FOR MANAGEMENT POSITIONS IN ITS CENTRES

"The trainee programme arose from a lack of management staff," says Alexandra Schramm, one of those who developed the programme. "It allows us to retain good staff, nurture their strengths and develop their social and professional skills. It is also a fantastic opportunity for staff."

During the two-year training period, participants study Kieser Training in depth; they acquire new knowledge or expand their existing knowledge of staff management, marketing, sales, etc. In addition, the programme offers group sessions and seminars where trainees can improve their communication skills or reflect on how they see themselves and how others see them. Finally, the programme includes coaching tailored to individual needs.

In addition to completion of Kieser's own basic training, applicants must have at least one year's experience of Kieser Training. They must also complete a selection process. "We only take the best," says Schramm. "In the last few years, 26 trainees have started the programme and

### WOULD YOU LIKE TO WORK FOR KIESER TRAINING?

Would you like to show people how targeted training can improve their health and well-being? If so, apply now. Information on the work involved and current vacancies can be found at [kieser-training.com](http://kieser-training.com)

today 11 of them are working for us as Assistant Managers and 6 as Managers."

Jörn Bilkenroth was one of those who took part in the programme and

completed the first year as an Assistant Manager. "The programme is particularly attractive to those who have completed a dual course comprising both study and practical experience and are really keen to get into a management position," says the 45-year-old. "For me, it was a great experience. It had a really positive effect on my personal attitude."

Bilkenroth started out as a customer in 2000 when he came to Kieser Training with two prolapsed discs. Having got rid of his back pain by building up his muscles, he was so taken with Kieser Training that two years later he applied to become an instructor. He then completed the basic Kieser Training course and worked during his university studies in various centres and positions.

Today, the trained teacher, who has 14 years of experience on the training floor behind him, works in the Kieser Training Academy and passes on his knowledge to potential and actual members of staff – if necessary in Spanish. And that precisely is his thing! ■