

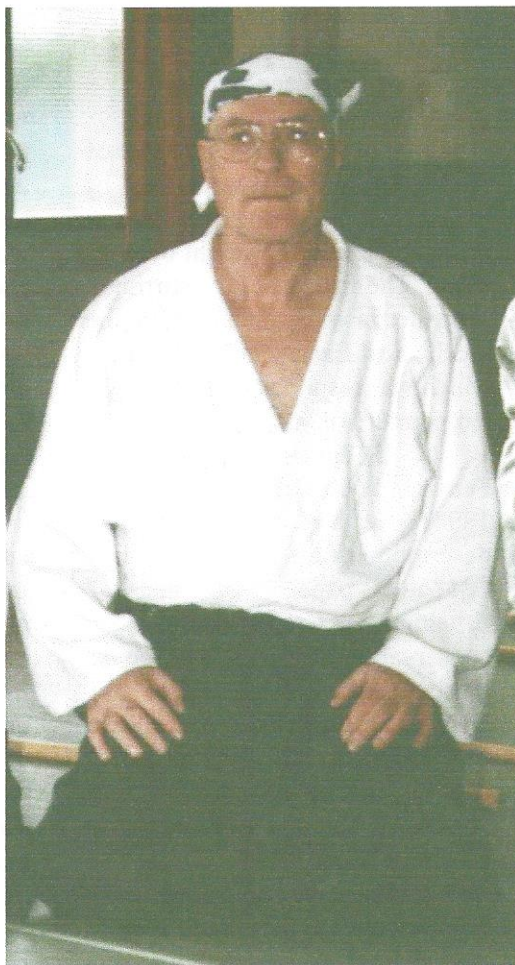
## Energy in Aikido from a physicist's point of view

In the Japanese characters of AI-KI-DO - KI stands for the meaning of Energy. Approaching the character of KI we are philosophical confronted with a notion playing in different colours. This is quite so due to the favour of Japanese thinking. Japanese people like such characters, playing in different colours. This shall be verified by the figure, giving the Kanji Character of KI and different meanings of this KI after Katsuaki Tanahashi \*.

Although some notions have similar or equal meanings a lot of different significances are to be noticed. This is also a way of Western Philosophy to declare certain strange and new ideas by the way of handling the notions like a chewing gum. Of course also idle talk plays a certain role to declare simple things by cryptic tittle-tattle. At least one can ask, why philosophical texts always are written so unintelligible.

For our use we pick out of the mass of meanings the one we need: Energy, which means exactly in this context Live Energy. Philosophical we are with this word already on a battle field of different meanings, struggling and mixed with another. Often are words like Force, Spirit, Spiritual Forces or Atmosphere used to characterise certain activities or feelings. So having no international valid system of notions the reader is sometimes in a (willingly?) helpless situation, being in doubt about what an author is speaking or writing at all. In a much better position on the other hand is science, because after fixing the notions everybody knows about what he or she is speaking.

Unfortunately only scientists held on to the agreed use of notions. Just the word Energy enjoys an enlarged popularity to day. So one speaks for example often from "criminal energy". This is already ineradicable. The basic idea may be the conception of a



specific potential energy (a well defined notion in physics), which solely will be discharged into crime. Even from people which intend to prove their (sound) intelligence by having understood at school at mathematics and physics (so to speak subjects for insane brains) only "fried potatoes", the word energy is popular. What shall one think about a sentence

like: "Here in this room is such a negative energy"! One expects evidently created a "positive" energy by a process like spin turning in the quantum theory of elementary particles. Just so? But what about the energy balance? Who supplies or carries off the needed energy? This people don't take care about the later on to be explained by any energy law. And this although everybody knows that one can drive a car only with gasoline supply, that means with preceding energy supply.

And there like also alternative practitioners to use the description of "flowing energy" along some body paths (meridians). Each physicist feels himself alarmed. What flows? And what flows can be measured! Enough. We leave the field of general an non-precise use of talking.

Physical determination of Energy is defined by the Historical Development of the Conception of Energy. Today Energy in Physics is a well defined quantity. One is able to detect energy transformations and measure them with well defined measuring units.

But as it is the case also with other physical quantities - and this one may see as a deficit - a physicist is not able to declare what Energy "is" in a philosophical sense. For deepening the understanding we follow a best know popular German writer of items in science, Hoimar v. Dithfurt \*\*. He wrote: "It is strange, but what Energy is, nobody knows right. Even from the physicist one cannot get a real satisfactory information.



The famous English Astrophysicist Sir Arthur Eddington said in those days, that he and his colleagues spoke with the use of the notion Energy from "something" without the least knowledge of what it deals with.

Eddington measured 1919 at first the gravitational light aberration by the sun, which comes out as a result of Einsteins Theory of General Relativity with 1,75''. The Conception of Energy at those times was well settled among physicists. In so far is this cited

opinion something disturbing, if one does not know that Eddington was always irritated by blatherskites. But he developed against this an inimitable method to unmask them. A reporter started an interview with him with the sentence: " Sir Eddington; some people say that there are only three persons in the whole world who understand the Theory of Relativity". After this a long interruption arose. Eddington did not answer.

So the reporter annoyed asked if something is not in order. Eddington says: "Oh, I am thinking about who may be the third. The word Energy comes from the ancient Greek language and means there "effect". The to days most current definition of Energy is the working ability. Energy is one of the most important conception in Physics. Energy appears in numerous manifestations. There is for example a mechanical Energy, a kinetic Energy, a potential Energy, a heat Energy, an electromagnetic Energy, an atomic Energy , a nuclear Energy and so on.

A most important rule in Physics is the so called Energy Law, a fundamental natural law. It says: At no physical system Energy can produced from nowhere nor annihilated. It can only be transformed from one form into another. But in the 19th century even under the physicists this conception was not quite clear. But the Energy

Law was also formulated in this century. Three men are to be mentioned with the formulation of the above mentioned Energy Law:

1. Julius Rober Mayer, (1814 - 1878), who first perceived that heat is a form of Energy like mechanical work. He calculated \*\*\* by an ingenial consideration the Mechanical Heat Equivalent by  $1\text{kcal} = 4,1868\text{Ws}$ . Mayer was a ships doctor. But because he was not a Physicist, Mayers importance was for a long time unappreciated.

2. James Prescott Joule, (1818 - 1889) verified the value of the Mechanical Heat Equivalent by experiment. A stirring apparatus was driven by a falling weight over a string. The friction of the stirring propeller in water transformed the mechanical Energy into heat Energy, which was responsible for the rise of temperature of water.

3. Herrman Ludwig Ferdinand von Helmholtz, (1821 - 1894) gave the comprehensive description of the Energy Law in 1847 in his paper: "Über die Erhaltung der Kraft (over the conservation of forces)", which he presented at a session of the Deutsche Physikalische Gesellschaft \*\*\*\*. Remarkable of the title of this paper is, that he was speaking from "forces", where the meaning was precisely "Energy". Today in physics one distinguish exactly between these both notions. Elsewhere these both notions are mixed in a curious way. Some texts (of amateurs) are therefore often by this reason unintelligible, because the notions get mixed up and so it is not quite clear about what the author is speaking at all.

The Energy Sources for Aikido practising But where comes the energy from we use to practice Aikido? Animals and human beings have to eat. The nourishment they take gives them energy. It is to distribute into three chief ingredients: Carbohydrates, fats and

proteins All of these ingredients are "reduced" in the chemical factory of our body with the participation of oxygen- which is bound in the lungs by the red blood corpuscles - with the aim to gain energy in the cells.

This process is complicated and needs the metabolic organs of the body, hormones, enzymes and the blood circulation to bring the refined substances into the cells of the body. The energy gain of the reduction process of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ , a simple carbohydrate which is transported in the blood) amounts to 17600 kJ/kg. Glucose is the substance processed out of higher molecular carbohydrates, which at least is responsible for the energy gain in the cells. From the different types of fats which the body converts to energy gain, only the triglycerid of the palmitinacid may be mentioned. The reduction of this substance allows an energy gain of 38900 kJ/kg. Proteins give an energy gain of 17200kJ/kg. Without entering into details of the complicated pertinent chemical processes and health relevant questions one can however state that fats have nearly a twofold energy gain as carbohydrates and proteins. In former days, when many activities of human beings require still a high bodily mobilisation, not without reason nourishment with a high part of fat has a high reputation.

By Karl-Friedrich Leisinger

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