

BEEONICS

Beeonics im Wärmeschrank



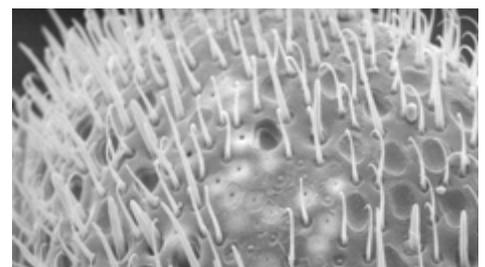
Controlled atmosphere: Even the beehive is 100% AtmoSAFE

Memmert has become rather enamoured with the honey bee. Consequently, for this reason and indeed many other reasons, we are supporting the Hobos project. This exciting project aims to bring this wonderful creature, which is irreplaceable to our planet, closer to both schoolchildren and students throughout the world.

Each and every bee in this project will be born in a HPP Memmert constant climate chamber. And in an exclusive interview with **AtmoSAFE**, Professor **Jürgen Tautz** of the **BEEgroup**, Julius-Maximilian University of Würzburg, Germany, spoke about beeonics in **laboratory equipment**.

AtmoSAFE: Professor Tautz, you give lectures on beeonics to developers and industrial managers worldwide. What lies behind this witty play on words?

Jürgen Tautz: The term bionics has existed for quite a while and it describes the efforts to transfer the richness of invention in nature into technical innovations. Beeonics specifically demonstrates the range of applications that this fascinating system of the **honey bee** has in store for people.



The probes of the honey bee have precise temperature

fascinating system of the **honey bee** has in store for people. I am referring specifically to their anatomy, behaviour and social structure. You only have to think of a honeycomb where the bee encloses a great deal of space with as little building material as possible, yet creates a honeycomb structure that is incredibly stable. Put simply, you can stand on a honeycomb and it won't break - a perfect principle, one on which many compound materials are based. A second example lies in the way in which bees generate heat. Specifically of interest to the technical heat insulation of buildings is how this is spread through the honeycomb by the method in which the bees insulate their beehive by storing honey supplies in the outer part of the honeycomb.

sensors with a precision of 0.02 °
C

AtmoSAFE: Every **heating oven** must also have insulation to enable the temperature in the chamber to be regulated as **precisely** as possible whilst also keeping energy consumption low. When we first met you, we were surprised by your words that a beehive is also an AtmoSAFE.

Jürgen Tautz: Well I was referring there to the promise in your mission statement that all Memmert **appliances** are 100% **AtmoSAFE**. Naturally, I believe that it is the **honey bee** that can control the **atmosphere** so **precisely**. (he says laughing)

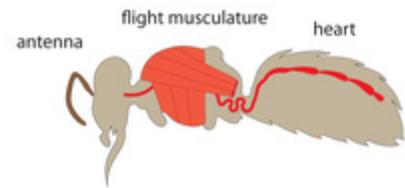
AtmoSAFE: We would be delighted to share the title 100% **AtmoSAFE** with the bees if you can explain to us more precisely what similarities you are referring to here.

Jürgen Tautz: Conditions in a **heating oven** closely reflect the **atmosphere** in a beehive. Honey bees also provide **controlled atmosphere**. They can precisely regulate the temperature in the nest and in individual brood cells, down to 0.1 °C. This means that their "sisters" are equipped with different capabilities for their later tasks in the bee community. This is why we need to incubate the young bees, which we particularly want to observe, in a **heating oven** that ensures the same precision and sensitivity in its temperature regulation.

AtmoSAFE: 0.1 °C? That is an incredible concept. While the **heating oven** has **temperature sensors** made of platinum for its measurements, how on earth does the bee measure the temperature?

Jürgen Tautz: Bees also have **temperature sensors** and their antennae are covered with 20,000 sensory cells, some of which are capable of measuring temperature differences down to a precision of 0.02 °C.

The antennae of the honey bee have precise temperature sensors with an accuracy of 0.02 °C. If we consider the anatomy of the honey bee, we can also find another application for beeonics. The heater bees are responsible for heating up the brood cells in the beehive. These heat up in their chest areas to a temperature of almost 44 °C, while the backs of their bodies remain cooler. This control of the distribution of body temperature takes place via the heat exchange in the blood vessels, which is arranged in a horseshoe-shape between the front and rear parts of the body.



Surprisingly laboratory equipment and honey bee have a lot in common

AtmoSAFE: In almost all Memmert appliances, heating coils are arranged around the chamber along the same principles.

Jürgen Tautz: Precisely – and through the horseshoe-shaped arrangement, the surface for heat exchange is enlarged, both in the bee and in the **heating oven**. This is a highly efficient procedure that also saves time. In addition, the bee utilises the so-called counter flow principle, which very efficiently maintains a large temperature difference in a uniquely straightforward manner.

AtmoSAFE: Professor Tautz. We thank you for this fascinating adventure into the world of beeonics.

You can find further information regarding the **BEEgroup** and the Hobos project at www.beegroup.de and www.hobos.de.

Autor: Memmert GmbH + Co.KG

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