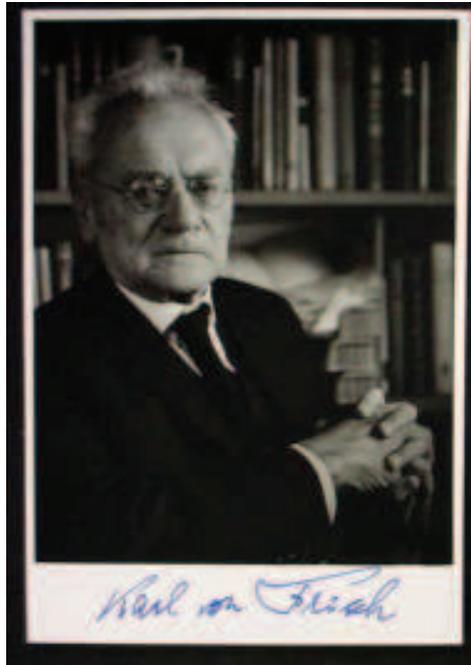


UNESCO Kalinga Prize Winner - 1958



Karl von Frisch (1886 - 1982)

[Born : 20th November, 1886 Vienna, Austria
Died : 12th June, 1982 Munich, West Germany]

Truly Amazing Bees

“Few animals are more amazing than honeybees. They live in an intricate society, with queens, guards, builders, cleaners, nurses, heating and cooling technicians, scouts, honey makers, pollen stampers and collectors of nectar, pollen, water, and resin (each worker bee goes through many different “jobs” during her lifetime). They build complex hives with beautiful honeycombs or perfect hexagons. They make flowering plants and honey-lovers thrive. They accomplish great feats of navigation. They see more colors and smell more scents than we do. They see the polarization pattern in the sky. And they communicate information in a symbolic language without match in the animal kingdom : the bee dance.”

— Karl von Frisch

Karl von Frisch (1886 - 1982)

German Zoologist & Nobel Laureate in Physiology or Medicine (1973).

Karl Ritter von Frisch (November 20, 1886 - June 12, 1982) was an Austrian ethologist who received the Nobel Prize in Physiology or Medicine in 1973 with Nikolaas Tinbergen and Konrad Lorenz.

He studied zoology with Richard von Hertwig whom he later succeeded as a professor of zoology at Munich, Germany. He studied the senses of bees, identified their mechanisms of communication and showed their sensitivity to ultraviolet and polarized light. In the center of his work were the study of the sensory perceptions of the honey-bee and the way of the communication of these animals among themselves. He was one of the first who translated the meaning of the waggle dance. This theory was disputed by other scientists and only recently was definitively proved (**see Nature Magazine Ref. - Nature 435, May 2005, pp 205-207**)

In 1973 he was awarded Nobel Prize in Physiology and Medicine for his achievements in comparative behavioral physiology and pioneering work in communication between insects. **He was also awarded UNESCO Kalinga Prize for Popularisation up Science for the year 1958.** g



Karl von Frisch

Born	: 20-Nov-1886
Birthplace	: Vienna, Austria
Died	: 12-June-1982
Location of death	: Munich, West Germany
Cause of death	: unspecified
Gender	: Male
Ethnicity	: White
Occupation	: Zoologist
Nationality	: Germany
Executive summary	: Researched bee communications

Student of Ethology. Von Frisch studied the behavior and communications of bees, determining that the “waggle dance” they perform indicate both the distance and direction to food sources, based on the position of the sun.

Father	: Anton von Frisch
Mother	: Marie Exner
University	: PhD. University of Vienna (1910)
Professor	: University of Rostock (1921-23)
Professor	: University of Breslau (1923-25)
Professor	: University of Munich (1925-WWII)
Professor	: University of Graz (1964-50)
Professor	: University of Munich (1950-58)
Nobel Prize for Medicine 1973	
	(with Konrad Lorenz and Nikolaas Tinbergen)

Frisch, Karl von (1887 - 1982)

Frisch, Karl von, 1887 - 1982 Austrian zoologist, b. Vienna, Austria. He studied zoology with Richard von Hertwig, whom he later succeeds as professor of zoology at Munich Univ. For his pioneering work in comparative behavioral physiology, particularly his studies of the complex communication between insects, von Frisch was awarded the 1973 Nobel Prize for Physiology or Medicine. In his early work he showed that fish and honeybees can see colors, fish can hear, and bees can distinguish dozens of closely related floral scents. In 1923 he described as a simple language the round and waggle dances of honeybees. He found that round dances mean that food is nearby and waggle dances mean that there is food at a distance. The straight component of the waggle dance points the way to the food, and the duration of the dance indicates the distance. In some cases bees orient themselves by the direction of the sun or, if the sky is overcast, by the polarization of light from patches of blue sky. An important implication of von Frisch's work is that behavioral continuity exists between animal communication and human language.

Karl von Frisch - Autobiography

I was born on 20 November 1886 in Vienna, the son of university professor Anton Ritter von Frisch and his wife Marie, née Exner. I studied at a grammar school and later at the University of Vienna in the Faculty of Medicine. After the first exams, I switched to the Faculty of Philosophy and studied Zoology in Munich and Vienna. I received my doctorate from the University of Vienna in 1910. In the same year I became assistant to Richard Hertwig at the Zoological Institute at the University of Munich. There I gained my University Teaching Certificate in Zoology and Comparative Anatomy.

In 1921, I went to the University of Rostock as Professor and Director at the Zoology Faculty; in 1923, I moved to Breslau and in 1925, I succeeded my former teacher Richard Hertwig in Munich. With support from the Rockefeller Foundation, I oversaw the building of a new Zoological Institute with the best facilities available. After the destruction of the latter during the Second World War, I went to Graz in 1946, but returned to Munich in 1950 after the Institute had been reopened. I have been a Professor Emeritus since 1958, and have continued

my scientific studies. Of my published papers the following are the most important :

- Der Farben und Formensinn der Bienen : Zoologische Jahrbücher (Physiologie) 35, 1-188 (1914-15). (The bee's sense of colour and shape).
- Über den Geruchssinn der Bienen und seine blütenbiologische Bedeutung : zoologische Jahrbücher (Physiologie) 37, 1-238 (1919). (The bee's sense of smell and its significance during blooming.)
- Über die "Sprache" der Bienen. Eine tierpsychologische untersuchung: Zoologischer Jahrbücher (Physiologie) 40, 1-186 (1923). (Bee's 'language' - an examination of animal psychology.)
- Untersuchung über den Sitz des Gehörsinnes bei der Elritze: Zeitschrift für vergleichende Physiologie 17, 686-801 (1932), with R. Stetter. (Examination into the position of the sense of hearing in the minnow.)

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- Über den Geschmacksinn der Bienen: Zeitschrift für vergleichende Physiologie 21, 1-156 (1934). (The bee's sense of taste.)
 - Über einen Schreckstoff der Fischhaut und seine biologische Bedeutung: Zeitschrift für vergleichende Physiologie 29, 46-145 (1941). (On the repellent substance on fish skin and its biological significance.)
 - Die Tänze der Bienen : Österreichische Zoologische Zeitschrift 1, 1-48 (1946). (The bee's dances.)
 - Die Polarisation des Himmelslichtes als orientierender Faktor bei den Tänzen der Bienen : Experientia (Basel) 5, 142-148 (1949). (The polarisation of skylight as a means of orientation during the bee's dances.)
 - Die Sonne als Kompaß im Leben der Bienen : Experientia (Basel) 6, 210-221 (1950). (The sun as compass in the life of bees.)
 - Tanzsprache und Orientierung der Bienen, Springer verlag Berlin-Heidelberg-New York (1965). (The Dance Language and Orientation of Bees, Harvard University Press, 1967).
- From Nobel Lectures, Physiology or Medicine 1971-1980, Editor Jan Lindsten, World Scientific Publishing Co. Singapore, 1992.
- This autobiography/biography was written at the time of the award and later published in the book series Les Prix Nobel/Nobel Lectures. The information is sometimes updated with an addendum submitted by the Laureate. To cite this document, always state the source as shown above.

Karl von Frisch died on June 12, 1982. ☞

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ADAM SMITH (1723 - 90)
Scotish Ecnomist

Karl von Frisch - Biography

[Bon Nov. 20, 1886, Vienna, Austria
Died June 12, 1982, Munich, West Germany.]



Zoologist whose studies of communication among bees added significantly to the knowledge of the chemical and visual sensors of insects. He shared the 1973 Nobel Prize for Physiology or Medicine with animal behaviourists Konrad Lorenz and Nikolaas Tinbergen.

Frisch received a Ph.D. from the University of Munich in 1910. He was appointed director of the Zoological Institution of the University of Rostock in 1921, and in 1923 he accepted a similar position at the University of Breslau. In 1925 Frisch returned to the University of Munich, where he established the Zoological Institution. When this institution was destroyed during World War II, he joined the staff of the University of Graz in Austria, but he returned to Munich in 1950, remaining there until his retirement in 1958.

About 1910 Frisch initiated a study that proved fishes could distinguish colour and brightness differences. He also later proved that auditory acuity and sound-distinguishing ability in fishes is superior to that in humans.

Frisch is best known for his studies of bees, however. In 1919 he demonstrated that they can be trained to distinguish between various tastes and odours. He found that while their sense of smell is similar to that of humans, their sense of taste is not as highly developed. He also observed that it is not limited to the quality of sweetness. He found that bees communicate the distance and direction of a food supply to other members of the colony by two types of rhythmic movements or dances : circling and wagging. The circling dance indicates that food is within 75 m (about 250 feet) of the hive, while the wagging dance indicates a greater distance. In 1949 Frisch established that bees, through their perception of polarized light, use the Sun as a compass. He also found that they are capable of using this method of orientation when the Sun is not visible, apparently remembering patterns of polarization presented by the sky at different times of the day and the location of previously encountered landmarks.

Karl knight of freshness (20 November, 1886 in Vienna - 12 June 1982 in Munich) was long time professor for Zoology in Munich and is considered as one of the most important German-speaking behavior researchers. In the center of his work the study of the sensory perceptions of the

honey bee and the way of the communication of these animals was located among themselves. For his achievements he was honoured in 1973 together with Konrad Lorenz and Nikolaas Tinbergen with the Nobel Prize for Physiology or Medicine. With the honor "his discoveries were appreciated for the

organization and release by individual and social behavior patterns”.

Life :

Karl von Frisch studied Medicine in Vienna and Munich first and only later turned to natural sciences and obtained a doctorate in 1910. In the same year he joined as an assistant to zoo-logical Institute of the University of Munich, where in 1912, he became private lecturer in Zoology and Comparative Anatomy. In 1919 he became Professor. In 1921, he became full professor for Zoology and director of Institute to the University of Rostock. In 1923, he followed a call after Breslau, returned then however in 1925 to the University of Munich, where he took over the line of the zoo-logical institute. After destruction of the zoo-logical institute in the Second World War he went in 1946 to the Karl Franzens university Graz, until he returned in 1950 to reopening residents of Munich of the institute there. In addition, in 1958 he was Emeritus Professor and continued in the future his scientific research.

In 1962 he received the Balzan Prize for biology.

Karl von Frisch married Margarete, geb. Mohr; his son, Dr. Otto von Frisch, was director of the national nature-historical museum Braunschweig from 1977-1995 and Praesentator of the 1970er-Fernsehserie of “Paradiese of the animals”.

Research Results :

Karl von Frisch examined the smell and sense of taste of the western honey bee. He found out that bees can differentiate between different flowering plants at the smell. Their sensitivity for the geschmacksrichtung is sweetly less high surprisingly then with humans.

Karl von Frisch was the son of a University Professor Anton von Frisch. He displayed at early interest in animals, which his family encouraged. His uncle, Sigmund, Exner, the leading authority on insect vision at the time, channeled Frisch’s earliest Professional endeavors in to a study of vision in honeybees.

The vision of the bees for forms is human seeing strongly to support, it is however by a high temporal resolving power particularly good able to notice movements. Their color seeing differs from

that of humans, since their eye cannot notice the color red, on the other hand however had color sensory cells for the basic colours yellow, blue and ultraviolet. Several blooms, which appear to humans in the same yellow, can appear differently colored for bees because of the different ultraviolet portion.

The investigations are important over the sense of orientation of the bees. Karl von Frisch found out that bees can keep exact directions, whereby they can use the sun as compass even if her are not visible. Owing to the special structure of the bee eye they are able to notice polarized light. From scattered light in the blue sky results there a characteristic sample of partly polarized light not visible for humans, which is dependent on the conditions of the sun. Each place at the sky exhibits a certain percentage of the polarization of the light and a certain oscillation level of the polarization. Only if one piece of blue sky is visible, the bee at the there visible sample can, even if the sun is covered by clouds, which recognize exact position of the sun and orient themselves to it. The bee had besides an internal clock knows it from a trip in the morning the direction of a fodder place, finds it its direction on the basis the position of the sun also in the afternoon, by considering the movement of the sun correcting.

Realizations over found fodder places can be passed on from bee to bee. For this a special dance as communication medium, which arises in two forms, serves. A round dance serves as information that the fodder place (without indication of direction) is in the closer periphery of the bienenstocks, approximately in the distance of 50 to 100 meters. Through close contact of the bees thereby also information about the kind will hand over to the source of food (bloom smell). For information about more distant sources of food however the Schwaenzeltanz is used. The dancing bee on the perpendicularly hanging honeycomb in the bienenstock moves a piece straightforward, runs back then in the semi-circle to the starting point, runs out the same distance again straight and describes then a semi-circle to the other side, on which the dance begins again from the front. On the straight distance the bee with the abdomen implements schwaenzelnde movements. The direction, in which the straight distance will go

Glossary on Kalinga Prize Laureates

through, contains the information about the direction of the source of fodder. The angle, which the straight distance forms to senkrechten, indicates exactly the angle, which the indicated flight direction with the conditions of the sun forms. The distance of the source of fodder is communicated to the straight distance per time unit by the speed of the dance, thus by the number of the runs. The other bees take up the information, by keeping close contact during the dance to the dancing bee and reconstructing their movements. They receive information about the kind of bloom which can be found also about the sense of smell. Also in such a way received direction codes are converted with a trip at later time of day position of the sun changed by the bee depending upon. Orientation works in all other respects so well that the bees find a source of fodder with the help of the Schwaenzeltanzes if they must fly a detour because of an obstacle, about a mountain lying between them.

Karl von Frisch in all other respects found out that bees can notice the direction of the magnetic field of the earth. They use this ability, by always aligning the building of their honeycombs in the dark bienenstock in the same direction to the magnetic field.

Karl von Frisch was obvious much to bring the results of his research also to the laymen. Thus developed the books "dance language and orientation of the bees" and - with newer research results - "from the life of the bees".

Literature :

As his most important work Karl von Frisch regarded :

- The colors and sense of form of the bees : Zoo-logical yearbooks (physiology) 35, 1-188, (1914-15)
- Over the sense of smell of the bees and its bloom-biological meaning : Zoo-logical yearbooks (physiology) 37, 1-238 (1919)
- Over the "language" of the bees. A animal-psychological investigation : Zoo-logical yearbooks (physiology) 40, 1-186 (1923)
- Investigation on the seat of the sense of hearing with the Elritze : Magazine for comparative physiology 17, 686-801 (1932)

- Over the sense of taste of the bees : Magazine for comparative physiology 21, 1-156 (1934)
- You and the life - a modern biology for everyone (1936)
- Over frightening off the fischhaut and its biological meaning : Magazine for comparative physiology 29, 46-145 (1941)
- The dances of the bees : Austrian zoo-logical magazine 1,1 -48 (1946)
- The polarization of the sky light as orienting factor with the dances of the bees : Experientia (Basel) 5, 142-148 (1949)
- The sun as compass in the life of the bees : Experientia (Basel) 6, 210-221 (1950)
- Dance language and orientation of the bees, Springer publishing house Berlin-Heidelberg-New York (1965)
- From the life of the bees, Springer publishing house Berlin-Heidelberg-New York (9th edition 1977), ISBN 3-540-08212-3.

Karl knight of freshly medal :

The 'Karl knight of freshly medal' is a Science Prize of the German zoo-logical society (DZG). The Prize is lent in the 2-jaehrigen rotation at scientists, whose work is characterised by outstanding zoo-logical achievements, which represent an integration of the realizations of several biological single disciplines. It is the most important prize of the Zoology in Germany and is endowed with 10.000 euro.

External links and references :

- Karl Von Frisch, Dancing Bees : An Account of the Life and Senses of the Honey Bee.
- Dance and communication of honeybees (<http://www.polarization.com/bees/bees.html>)
- The flight paths of honeybees recruited by the waggle dance, Nature 435, May 2005, pp.205-207.
- Karl von Frisch, Decoding the Language of the Bee, Nobel Lecture, December 12, 1973 (<http://nobelprize.org/medicine/laureates/1973/frisch-lecture.html>)