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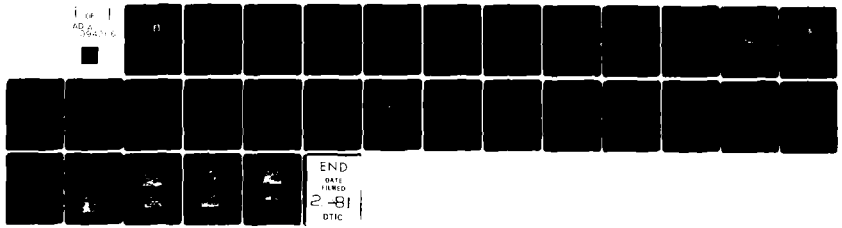

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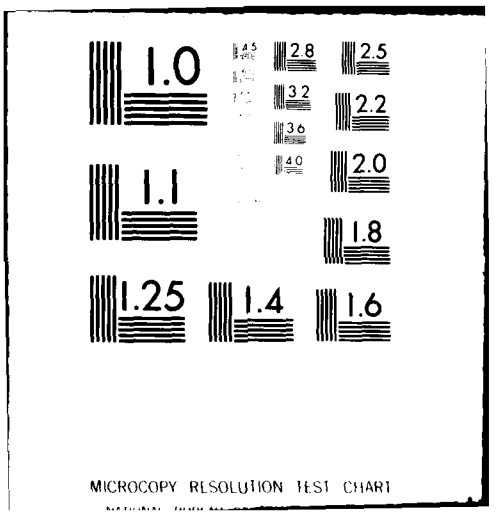
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(Selected Articles)

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CONTROLLING THE GROWTH OF A SINGLE ATOMIC LAYER- THE SUCCESSFUL DEVELOPMENT OF CHINA'S FIRST MOLECULAR BEAM EPITAXIAL DEVICE

by Han Daxing

From Vapor Phase Epitaxy to Molecular Beam Epitaxy

Epitaxial growth is a very important step in the process of the semiconductor device technique. To control the high frequency of transistors or integrated circuits it is only necessary to have a monocrystalline silicon layer of several microns (1 micron=10^{-6} meters). Yet, how can such a thin monocrystalline piece be cut? Furthermore, how can it give rise to the string of processes of washing, diffusion, photoetching, evaporation, pressure welding and testing? Therefore, people have thought of an ingenious method of using the epitaxial growth technique to resolve this problem. Epitaxial growth in the silicon plane technique uses a piece of relatively thick, very low resistance monocrystal as the lining and on it is placed an artificial one layer thin relatively high resistance monocrystal. Afterwards, all of the necessary parts are made on this thin layer. In the semiconductor industry, gas phase epitaxy and liquid phase

epitaxy are commonly used techniques.

Following the continuous raising of technology, epitaxial layers are becoming neater, more perfect and thinner. People's plans and requirements have no limits and the question is whether they can attain to several tens of angstroms (1 angstrom= 10^{-10} meters) and even attain a several angstrom thick epitaxial layer. Can they accurately control the growth and mixture processes? If they can realize these types of "atomic level" processes and make various ideal super thin structural devices their performance would certainly be excellent. Unfortunately, conventional epitaxial technology is powerless. In 1969, the Bayer Laboratory of the United States first manufactured a new circuit and called it the molecular beam epitaxial technique (MBE). This improved and raised the vacuum evaporation method and finally realized the ideal of depositing the atoms one by one on the lining. In the last 10 years, molecular beam epitaxy has become a dynamic new field of technology. The United States, England and France are all offering these products for sale. In 1974, China's technicians began research and design and in 1979 they successfully developed China's first molecular beam epitaxial device.

How to Maintain Cleanliness on the Monocrystal Surface

The foundation of the molecular beam epitaxial technique is the super high vacuum technique. The highest attained

vacuum of the conventional vacuum plating which uses an evaporation stage is about 10^{-6} torr and the highest attained vacuum demanded by molecular beam epitaxy is greater than 10^{-10} torr. Why is it necessary to have such high vacuums? Illustrating with an example, under usual circumstances, each cubic centimeter of the surrounding air contains 10^{19} gas molecules and these molecules are continually moving and bumping into each other. Each molecule has an average movement of 0.1 microns before it bumps into another molecule, which makes it very crowded. Following the raising of the vacuum, molecule density decreases and the chance for molecules to hit each other is less. Reaching 10^{-10} torr, in each cubic centimeter there only remain 10^{6} molecules and each molecule can go an average of 1,000 kilometers before hitting another molecule. Therefore, we know that in a super high vacuum chamber gas particles cannot hit into each other. The reason why a super vacuum environment is so important is that it is needed to guarantee cleanliness on the crystal's surface.

The maintenance of the cleanliness of a specimen's surface does not sound difficult but it is actually not easy to carry out. For example, in the air, within a few seconds the surface of a new silicon monocrystal will grow a 30-40 angstrom thick layer of silicon dioxide. This is the result of the action of oxygen molecules in the air and the molecules on the silicon

surface. If it is in a 10^{-6} torr vacuum chamber, on the surface of a clean monocrystal, in only 2-3 seconds, a layer of gas molecules can be spread out. When in a vacuum environment of 10^{-10} torr, it is not that easy to spread out a layer of molecules on a monocrystal and one must be patient and wait at least 9 hours. Therefore, to maintain the cleanliness of the monocrystal surface or perhaps we should say maintain an ideal crystalline surface, only if the vacuum reaches 10^{-10} torr can the environment be considered clean. In this type of clean environment, people can possibly then realize the "atomic level" process and the required element atoms can be spread on the lining layer by layer.

China's first molecular beam epitaxial device used an oilless super high vacuum system. It was composed of a gas absorption pump, a magnetic ion pump and a titanium sublimation pump. Its highest attained vacuum reached 5×10^{-10} torr and when operating, the vacuum (arsenic steam background) reached 10^{-8} torr. This satisfied the requirements for molecular beam epitaxial growth.

Spreading on Atoms Layer by Layer

Let us look at how molecular beam epitaxial growth is carried out in an arsenic gallium crystal.

When arsenic and gallium are combined to make a mixed element phosphorous and divided and put into molecular beam

furnaces, the temperature of these furnaces can be precisely controlled. When heated in a vacuum, these "source" materials become vaporized, and it has been explained previously that these gas molecules do not hit each other in a super high vacuum environment. They are sprayed out from a small opening in the furnace and form a molecular beam. The further use of shutter modulation causes the molecular beam to be able to intermittently spurt towards the lining.

After polishing, the washed arsenic gallium compound monocrystal lining is arranged on the frame. To cause the monocrystal surface to be truly clean it is often necessary to use the ion stripping technique in a vacuum environment to eliminate the dirt layer on the surface.

At present, to have a completely clean environment, completely clean monocrystalline lining and a controllable molecular beam source, it is only necessary that you have sufficient experience and skill and then the atoms can be placed down layer by layer on the arsenic gallium compound monocrystalline lining. People used electron diffraction to study the process of arsenic gallium compound molecular beam epitaxial growth and consider that it is actually a growth of one layer of atoms on a layer of atoms.

Ample Scope for Its Abilities

There are usually installed various analytical instruments

on the molecular beam epitaxial device so as to carry out analysis in the growth process. The analytical instruments installed on China's first molecular beam epitaxial device were a tetrapolarograph, a high energy electron diffractometer, an Esser electron energy spectograph and an argon ion gun. The tetrapolarograph is used to monitor the remaining gases in the vacuum system and the strength of the molecular beam flow; the high energy electron diffractometer is used to analyze the surface structure; the Esser electron energy spectograph is used to analyze the surface components; the argon ion gun is used to make thin layer stripping.

Being so complex, which uses does the precision device have? During the last ten years it was practically proven that molecular beam epitaxial technology is the study of surface physics, the development of powerful semiconductor devices with accurate complex structures and also the providing of methods for the investigations of new materials, new devices and new effects.

Surface physics is at present a very active field of research. For some molecular beam epitaxial devices, people were able to control the growth of a super thin monocrystal on a clean surface and used various analytical instruments to study the structure, components, electron state and surface absorption and precipitation in the growth process. When the Bayer Laboratory used molecular beam epitaxy to study arsenic

gallium surface growth dynamics, the experimentally measured data and theoretical calculations were the same.

Long period structures of molecular beam epitaxial growth with different material crystals are called "super lattice" structures. The period of most crystals is only several angstroms but these various multilayered structure crystals "manufactured" from molecular beam epitaxy have periods of several tens of angstrom and thus are called "super lattice." These types of super lattice structural devices have very special energy level structures and electronic qualities. It can be said that the molecular beam epitaxial technique is used to artificially "design" new crystals, and is a new device which has opened a path which has fascinated people.

Although the molecular beam epitaxial technique has still not reached the stage of being used industrially, yet it has already begun to show promise in developing new semiconductor devices. Because it is able to precisely control the thickness, component and mixture of the growth of a thin film, it can be used for making structurally complex, high performance devices. Generally, it can control the growth of a single atom layer in each second and can repeatedly grow an approximately 5 angstrom thin film. It has already been used in making multi-layered structured GaAs - $Al_xGa_{1-x}As$ lasers, variable capacity diodes, Schottky tubes and light wave guides and light coupler

devices. There are even people who are studying arsenic gallium molecular beam epitaxial plane technology.

China's first molecular beam epitaxial device has already been appraised and its major qualities have reached or approach those on the international level. Its emergence was welcomed by solid physics, semiconductor physics and semiconductor device scientific and technological workers.

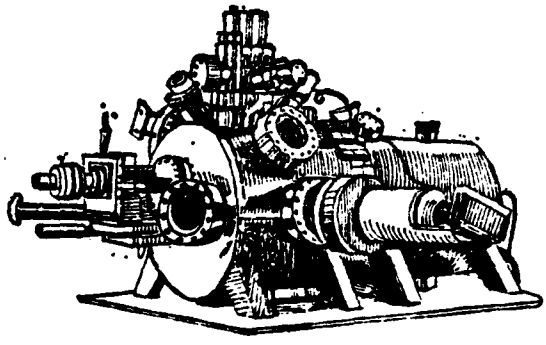

Chart 1 The Super High Vacuum Chamber Component in the Device

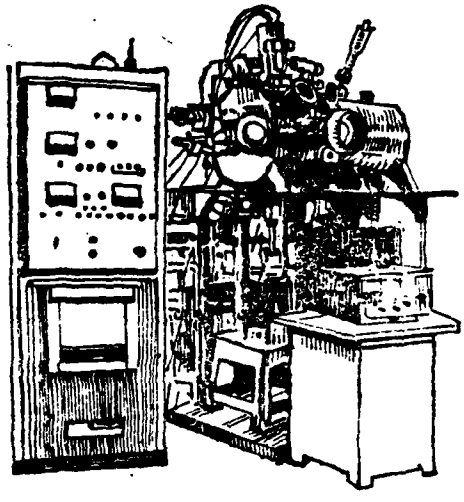

Chart 2 Schematic Diagram of China's First Molecular Beam Epitaxial Device

NEW PROBLEMS IN HUMAN BIOTICS - RESEARCH ON NON-VISUAL RECOGNITION OF PICTURES

by Zhou Wenbin

Spring always brings people new information. When the spring flowers are in full bloom and the birds sing and the butterflies dance in the scientific garden, a marvelous new seedling has already sprouted. The discovery of the function of non-visual recognition of writing and figures opened up a totally new field in human biotics.

A Stirring Meeting

On the morning of February 5th of this year a large number of people crowded into the Shanghai Science Meeting Hall and the news of the originally 60 person "Human Body Special Functions Scientific Discussion Meeting" spread like wild fire so that many more people came.

At about ten o'clock, the contingency of young people participating in the "Human Body Special Functions Scientific Discussion Meeting" publicly carried out an exhibition of ear and armpit recognition of characters. When observing, chosen

representatives of the masses took a brief note in the closed kraft paper bag or film cassette and sent it before the exhibitors; each person selected one and placed it under their ear or armpit to be recognized. The first to recognize it was Wang Qiang, a female student from Peking's No. 110 Middle School. She wrote the character "sheng" on a white sheet of paper and noted that the character was red. The supervisors then opened up the cassette to prove that she was correct. People who watched their wrist watches noticed that 3 minutes had elapsed. During the fourth minute, Wang Qiang's eleven year old younger sister, Wang Bin, wrote the character "guo" on a white sheet of paper and noted that it was red. After the supervisors opened up the film cassette as proof, it was shown that she was correct. Following this, an eleven year old child from Wuhan, Xie Chaohui, took 7 minutes to recognize a figure of a person without hands and the picture he drew was basically the same when compared to the original. There was the mother of two children, a twenty-five year old woman from Binan County in Heilongjiang Province, Mu Fengjin, who was given a folded circular test sample which she placed under her wrist watch close to her wrist. In less than four minutes, she wrote the six numbers "288650" on another piece of white paper. The supervisor then announced that the results were accurate. After an enthusiastic round of applause, someone suggested that the two sisters Wang Qiang and Wang Bin exhibit "remote sensing":

a brief note was placed under Wang Qiang's armpit and Wang Bin who was separated one meter from her sister recognized it. After two minutes, the two sisters both raised their hands at the same time and said that they each recognized it. They each wrote a blue colored character "hua." After the supervisors opened the sample, all of the observers were dumbfounded and said it was incredible.

During the whole course of the exhibition, sitting in the first row, was Professor Wu Xueyu, head of the Ear, Nose and Throat Hospital of Shanghai's First Academy of Medical Sciences, who saw all of this very clearly. This type of special functioning of the human body astonished this old professor. In the afternoon, he braved the cold and wind and rode his bicycle to the Jianguo Hotel and personally carried out tests on Tang Yu from Sichuan, Jiang Yan, Wang Qiang and Wang Bin from Peking and Xie Chaohui from Wuhan. Tang Yu recognized a succession of five samples with total accuracy and the accuracy rate of the other children was also very high. Professor Wu was very excited and said to those comrades present: "In my lifetime I have examined the ears of several thousand people but I never imagined that ears could recognize characters. After personal testing I am convinced and I 'capitulate'. Our attitude should be to accept the facts and then proceed to study them. For example, this complex question of recognizing characters with the ears can perhaps not be studied to completion in our

generation yet it still should be studied and if studies are not completed in this generation then they can be further carried out in the next."

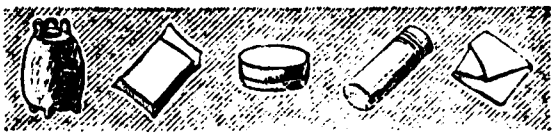

Chart 1 Methods Used to Test Samples in Various Types of Enclosures

Still More Miraculous Facts

On the morning of January 29th of this year, Luo Dongsu, a scientific research member at a certain airforce medical institute and Han Xiaohua, a reporter for the New China News Agency, took the two sisters Wang Qiang and Wang Bin on a special express train from Peking to Shanghai to prepare for their participation in the "Human Body Special Functions Scientific Discussion Meeting". At this time, Luo and Han designed a new test plan wherein they used a piece of cardboard with one side black and the other side yellow. On the yellow side were written the two characters "quan xi" and then used a scissors to cut along a diagonal line to make four pieces. Each two pieces were piled together so that the yellow side

faced inside and the black side faced outside. They were placed in a closed bag and given to Wang Qiang to recognize. After 11 minutes and 54 seconds, she not only accurately recognized the two characters "quan xi" but also described how the cardboard was piled and placed in the bag. Following this, Wang Qiang again went through a similar test and accurately recognized the cut up characters on the sample. The third sample was the two characters "nuan huo" which were cut up into 6 pieces. These 6 pieces were placed in the bag in a disorganized manner. After 6 minutes and 15 seconds, Wang Bin accurately described the way in which the pieces were placed and what the characters were. According to what Wang Bin said, when she was in the process of recognizing this cut up sample, she began by arranging one character in her brain from several cut up pieces and then suddenly put together the pieces and there appeared a whole word.

After returning from Shanghai to Peking, on March 11th and 12th, Luo Dongsu further cut up the characters "shan", "ren", "xie", "xin hua", "dong" and "jiu" into several pieces, put them in a bag and gave them to Wang Qiang and Wang Bin to recognize. They discriminated and recognized them accurately. The longest time used was 18 minutes and 30 seconds and the shortest time used was only 18 seconds.

These facts really bewildered and amazed people. Yet, even more miraculous facts were placed before the people.

On the afternoon of February 8th, the related scientific and technological, educational and news representatives participating in the "Human Body Special Functions Scientific Discussion Meeting" found a 10 kilogram, radioisotope-storage lead can, placed the sample in the can and tightly sealed it. They let the testees use their hands to touch the lead can so as to recognize the writing or figures inside.

The first testee was Huang Hongwu from Anhui Province. After one minute, he recognized the character in the lead can as "zhang" and indicated that the script was red.

Next, He Xiaoqin and Hu Lian from Anhui Province, Mu Fengjin from Heilongjiang Province, Yu Ruihua from Hebei Province and Xiong Jie from Hubei Province were successively given the test of recognizing characters by touching the lead can and all accurately recognized the characters in the lead can.

On the evening of the same day, they found a 20 kilogram lead can and tested Mu Fengjin and Yu Ruihua. Mu Fengjin's sample was a piece of transparent plastic and a common piece of paper with characters written on it. She was blindfolded with a quilt and used her hands to touch the can. After 25 seconds, she said that there was a transparent plastic piece standing upright in the can and a piece with writing on it which was lying flat on the bottom of the can. Yu Ruihua's sample was a person drawn in red and blue and an apple. After 50 minutes, she said there was an impression but it wasn't

steady. When someone turned off the light in the room, after only one second, she said she recognized it. On a piece of paper she drew an exact duplicate of the sample of a person and an apple, only the apple was missing its base.

Chart 2 Lead Can Test

The Specific and the General

For the latest report on "recognizing characters with the ear" see the March 11, 1978 issue of the "Sichuan Daily." Because of many chance opportunities, people discovered Tang Yu, a twelve year old elementary student from the Jianli brigade of the Tuanjie commune in Sichuan Province's Dazu County who possessed the ability to recognize characters by using his ear. This was tested and verified by comrades from the commune and county science party committees, the county culture and education bureau, the Jiangjin Prefecture party

committee and news units.

After this matter was made public, there was a series of chain reactions in the whole country. Guangdong, Anhui, Peking, Hebei, Heilongjiang, Hunan, Guangxi, Guizhou, Shandong, Shanxi, Henan, Shenxi and Jiangxi all reported the discovery of children and youths who possessed this type of special function. At present, among those who have been verified to possess this type of function there are males and females, children ranging in age from several years to ten odd years old, youths that are twenty odd years old and even middle aged people in their fifties.

This endless stream of facts brings forth a question for scientific workers: is non-visual *recognition of characters* a rare peculiar function or is it a common physiological phenomenon?

To answer this question, teachers at Peking University carried out an interesting investigation. Beginning from November of last year, they found 40 unscreened sons and daughters of workers around the age of 10 to carry out the test. Among them, 36 were girls and 14 were boys (sic). At the beginning they used pictures with characters on them and placed them in the ear of the testee to be recognized. Later, it was discovered that when the testees were left in a dark room to touch the photos or pictures it was even easier to measure this type of special response function. By taking

the method of using the hand in a cloth sheath to touch the pictures as one of the basic testing methods, they used a 50 centimeter square deep colored thick cloth woven into a muff and the two ends passed through in a cloth belt so as to be convenient for ligation. The picture was placed in the cloth bag and the two hands of the testee were inserted separately from the two ends into the bag. Using the cloth bag, the muff was tied on the back of the hands and the two hands of the testee rubbed the picture in the muff. Another basic testing method was to place the paper or pictures with characters in a black plastic box with a diameter of 3 to 5 centimeters. After turning the cover they also used sealing wax to seal it and it was held in the hand or placed on the body of the testee to be recognized. After over a month of guidance and testing, the results were that 16 out of the 40 children were discovered to possess special reaction functions, which is 40%. Among them, 14 were girls and 2 were boys. In the tests, they also discovered that the level of the children's special reaction functions can gradually be raised after going through testing. Based on the results of this type of testing, the testers considered that the number of young children who possessed this type of reaction function was not small and that this type of function had a fixed level of universality. They also reckoned that the ability of non-visual recognition of images is possibly a type of latent physiological functioning

state and it is only that at present many people have still not been discovered.

Preliminary Investigations Into "Miraculous Functions"

This type of special reaction function in the human body has greatly attracted the interests of many scientific workers. From April and May of last year, a certain air force medical science institute, Anhui Normal University and Hubei Chinese Medicine Academy began systematic investigation and testing work. Afterwards, Peking University, Wuhan University, Peking Normal Academy and the Jiamusi Medical Academy also had some comrades who went into this field of research. In each locality, they carried out long term tests and discovered facts of universal significance.

Firstly, the places on the human body where recognition of characters is possible are generally the ear, armpit and fingers, yet some children have these types of functions in other places such as in the curve of the armpit, the back, the bottom of the feet, the top of the head, the tip of the nose and the arms. When recognizing characters in these different places, the images that appear in the brain are not overlapping. There was one time that a science worker gave Mu Fengjin five tests. She simultaneously placed the examples on the top of her head and on her wrist and accurately recognized each one by one. According to what Xie Chaohui from

Wuhan said, there are "two color televisions" in his brain and this "television fluorescent screen" was in his forehead and taking the center line as the boundary, the top was the hair and the bottom was the eyebrows. After the sample was squeezed in the ear there could appear an image in his forehead. When the sample was squeezed in the left ear, then a picture appeared on the left side of the forehead and when the sample was squeezed in the right ear, a picture appeared on the right side. The two did not coincide.

Secondly, when recognizing the first image, generally the speed is slower. Later, the speed is faster and it appears that in this type of function there exists the need for an "activation" process. Many testees showed that when an image began to appear in their brain it was often hazy and only gradually became clearer. Moreover, when this type of image appeared in the brain, it was always in one flash and then it was gone. After a little while it could again repeatedly appear. Xie Chaohui said that during this process, if the sample was a character, then there first appeared in his forehead the seeming image of a character and one by one they passed. Finally, one stopped and that was the character he needed to recognize. For example, for the character "tong 同 " there first appeared the characters "guo 国 ", "tuan 团 ", "yuan 元 " and "hui 回 " and then finally the character "tong 同 ". If the sample squeezed into the ear was a picture, then one point at a time appeared

just like isotopic scanning. For example, for the picture of a basket, he was able to draw out a string of pictures as shown in chart 3. If at one time he discerns many images, for example characters, he can often make the character he wants to recognize appear directly in his forehead and like movie subtitles one appears connected to the other. If there are several lines of characters, after the end of one line of characters there is a pause, then there is the second line and finally the whole picture appears. When a peculiar signal appears, there is a "beep, beep, beep" sound like a bicycle horn inside the ear, the forehead is like the glimmering of a car's red light and the image is shown very quickly. If there are few characters, then they are shown once and if there are many characters, they are still shown sequentially yet the speed is very fast. If it is a picture, it is not shown one spot at a time but just once.

Chart 3 The Process of an Image Being Shown in the Brain

Thirdly, the recognized image can be sealed in a paper bag, plastic container, glass bottle, iron box, lead box or even in a lead can. Up until now, people have still not discovered a type of sealed bag to "shield" the characters. From this it can be seen that the image carrier is possibly a type of special substance that is still yet unrecognized. Luo Dongsu had determined acupuncture points for the human body and drew a volt-ampere characteristic curve. He compared these curves with the characteristic curves of diodes and discovered that they have amazing similarities. Among them, the tunnel type curve and the tunnel diode were the same and the tunnel diode is a receiving microwave and submillimeter signal component used in radar. Within it, the body effect type curve was the same as the body effect diode. The body effect diode which is a small power solid microwave oscillator or Doppler radar launching tube possesses the ability to launch microwave signals. This discovery seems to explain that the human body also has the ability to launch or receive microwaves. Luo Dongsu called the receiving electromagnetic wave signal system the "seventh receptor." At the same time, when he used lithium fluoride pieces for testing, he discovered that X rays and gamma rays were produced and the dosage was within several milliroentgen. Yet, here there is encountered another question: why is the sample in the lead can also able to be recognized? When X and gamma rays are non-visually recognized what function

after all is arising? What relation does it have with the electromagnetic waves of radio communication wave bands? This indeed requires further investigation.

Fourthly, when there is this type of function in the human body, it can not only recognize open and flat writing and pictures but can also recognize pictures that are folded, wrinkled or even cut up. At the same time, it can also recognize three-dimensional substances. This is also to say that it can "open up" the folded pictures and modern technology is too inferior to bear comparison to this. On January 2nd of this year, several comrades from Peking Normal Academy carried out this type of experiment: they used fine copper wire to weld and make the character "ri" and afterwards rolled it up, wrapped it in white paper, put it in a small cardboard box and gave it to Wang Bin to recognize. After one minute, she said it "was twisted metal wire" but did not reform the original character of "ri." To be able to "open up" and see the character it seems it is necessary to have a certain lining (such as paper) as a "background."

Fifth, this type of special function still exists in the phenomena of "sensing" and "remote sensing." So-called "sensing" is when a sample is placed on a person's body and another person comes in contact with this person and then this person can recognize pictures. So-called "remote sensing" is when a sample is placed on a person's body and another person stays

a fixed distance from this person and then this person can recognize pictures. Four comrades from the Peking Normal Academy carried out an interesting experiment on "remote sensing." On January 10th of this year, they let Wang Bin recognize the five characters "ni ren shi wo ma." Wang Bin disliked the paper being so big, so before giving it to her, the tester cut the paper in half. The characters "ni ren shi" on one half were given to Wang Bin as a test and the other half with the two characters "wo ma" were placed in a paper basket 3 meters away from Wang Bin. In 23 minutes, Wang Bin recognized the 3 characters "ni ren shi" and she said that on the reverse side there were two characters but that she could not see them clearly. Soon afterwards, she said that the two characters were "wo ma."

Sixth, from many experiments it was observed that there existed a fixed relation between recognition speed and recognition accuracy. When recognition was difficult the rate of mistakes was high even to the point of non-recognition. Furthermore, the strength of this type of function was also closely related to body health and whether morale was high or low. As for the relation with visible light, tests showed that visible light was not necessary. For example, Mu Fengjin from Heilongjiang Province not only recognized characters in the dark but there they were even more distinct.

The non-visual recognition of images is indeed an important new discovery in human biotics. It is a scientific research field which opens vast vistas. Starting from here, it is possible to open up a new door in human biotics and open up a gap in the investigation of the profound mysteries of human biotic phenomena. Without a doubt, research on this type of special function in the human body will greatly influence biology, physics, bionics and medicine and will also have great practical value.

Should not those people who aspire to investigate the profound mysteries of biotics courageously throw themselves into this research work?

Research on Special Functions of the Human Body

Photo 1 Wu Xueyu (on the right), Head of the Ear, Nose and

Throat Hospital of Shanghai's No. 1 Medical Academy, personally carries out a test on young children with special functions. Here is is examining whether or not the sealed pocket is translucent.

Photo 2 Professor Wang Chufu of the Department of Radios in Peking University presents a report at the "Human Body Special Functions Scientific Discussion Meeting."

Photo 3 Luo Dongsu, a research member at a certain air force medical institute, examining the volt-ampere characteristics of Wang Bin's ear.

Photo 4 Wang Bin using her ear to recognize a sample in a plastic cassette container.

Photo 5 Tang Yu (from Sichuan) and Jiang Yan (from Peking) exhibiting the use of hands and ears to recognize characters.

Photo 6 Yu Ruihua from Hebei Province using her hand to recognize a sample placed in a 10 kilogram lead can. Behind her are (from the left): Hu Lian, Mu Fengjin and Xiong Jie. All of them can recognize samples in lead cans.

Photo 7 Tang Yu's test sample and recognition results.

(Pictures taken by Zheng Jiasheng and He Qifu)

[Note]: Other photos in the text taken by Han Xiaohua.