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LABORATORY FOR RADIOELECTRONIC STUDIES OF BIOLOGICAL OBJECTS

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[Article by B. Konovalov, Izvestiya science commentator]

[Abstract] The article reports on the work of a special laboratory for radio-electronic methods of studying biological objects, which has been created at the USSR Academy of Sciences' Institute of Radio Engineering and Electronics (IRE). This research direction was initiated by Academician Yu. V. Gulyayev. The head of the laboratory is Doctor of Physical-Mathematical Sciences E. E. Godik. Research reportedly is being done in seven areas: electrical fields, magnetic fields, radiothermal radiation of internal organs, infrared radiation from the surface of the body, optical chemiluminescence of humans, acoustic signals, and chemical composition of the environment directly surrounding humans.

The author of the article visited the laboratory, which occupies the first floor of an old building in the center of Moscow. Godik first showed him a cage-like structure in which an electromagnetic system compensates for the effect of the Earth's magnetic field, so that magnetic fields emanating from humans can be recorded. Godik explained that non-contact magnetograms can provide more valuable information than electrocardiograms, for example. The physicists reportedly are working on this in collaboration with the All-Union Cardiology Center. The laboratory also has a chamber which screens out external radio emissions. In this chamber, a radiometer can record heat emission from deep within the body and measure internal body temperatures in seconds. It is said to be also possible to record detailed information in the superhigh-frequency radio range, so that the distribution of temperatures throughout the body can be determined.

The laboratory has a chamber with highly sensitive electrical-field sensors. They can, for example, record the 'seismicity' of the rib cage when one breathes. Heartbeat also affects the rib cage, and in this chamber it is possible to record cardiograms by non-contact methods. The sensors also can record the movement of muscles, which is said to open up possibilities for remote monitoring of the emotional state of humans.

Another facility is a darkroom in which chemiluminescence of the human body is recorded. Its instruments are capable of recording individual photons.

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The intensity and distribution of luminescence along the body are said to depend on its condition, and this can serve as a diagnostic tool for detecting tumors and determining the degree of burns, for example. The laboratory also has laser instruments for measuring chemical compounds in the air directly surrounding the body in amounts as small as 10 molecules per cubic centimeter.

The laboratory has developed an infrared television process which is likened to time-lapse photography. It is claimed that for the first time in the world, dynamic processes occurring in the cerebral cortex of animals have been made visible in real time, without opening the skull. Studies have been made of how these processes are affected by various types of stimuli: visual, auditory, and drugs. These studies are being done with scientists of the USSR Academy of Sciences' Institute of Higher Nervous Activity and Neuro-physiology.

It is noted that most of the laboratory's associates are recent graduates of the Moscow Physical-Technical Institute. Work reportedly is under way on creating a research chamber in which all the different technologies can be combined in unique isolation from the external environment.

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