BIOSCOPE: A NOVEL APPARATUS FOR THE INVESTIGATION OF LIVING MATTER

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ABSTRACT: Results of experiments obtained with the use of a new type of apparatus, the bioscope, are presented. The main components of the bioscope are a light source, a sensor, and a photodetector, disposed in a light-attenuated case. The apparatus principle of operation is based on the estimation of the level of light reflected by the sensor, a glass plate covered with opaque material. It was found that the intensity of the reflected light increases if a biological object (e.g., human palm, laboratory animal, apple) was disposed at distances of 1–10 cm from the bioscope sensor. The light intensity did not change in the presence of nonbiological or nonliving objects which have environmental temperature. The sensitivity of the bioscope to physiological states was also demonstrated in experiments with mental influence on biological functions.

The development of modern scientific notions on principles of biological functions was essentially determined by the development of various instrumental methods of their state assessment and measurement. The instrumentation used at present in medical-biological investigations serves mostly to register and measure the physical-chemical characteristics of the living system. However, changes possibly induced in biological systems when investigating certain parapsychological phenomena (e.g., mental influences, distant healing correction) may often remain beyond limits of sensitivity of the standard apparatus.

Investigations carried out using high-voltage high-frequency methods showed the sensibility of Kirlian luminescence to the change of the physiological state of biological objects (Dakin, 1975; Korotkov, 1995). Data obtained with these methods suggest an ability of biological systems to influence physical characteristics of gas discharge that arises around the investigated object under high-impulse voltage, such as its spatial form, intensity, and luminescence spectrum. This was clearly shown in the registration of the phantom leaf effect, when it is possible to visualize the total geometrical shape of a leaf even after a part of the leaf was mechanically removed (Choudhury, Kejariwal, & Chattopadhyay, 1979).

We hypothesize that, even in the absence of the discharge voltage, biological systems are capable of influencing physical characteristics of their surrounding environment. We may thus suppose that the effect of a high-impulse voltage consists mainly of production of ionized gas, the

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presence of which makes it comparatively simple to visualize such influences. Such interpretation of the mechanism of Kirlian imaging means that for detection of expected influences, we may, in principle, use another, more convenient object as a sensor. If this is the case, then selection of an appropriate object (sensor), a physical parameter characterizing its state, and development of an effective method of its measurement are of crucial importance; this applies particularly to the case when the sensor is located in an immediate vicinity from the biological object.

Our investigations led to the development of a novel apparatus, the bioscope, which fulfills these requirements (Sargsyan & Ter-Grigoryan, 2001, 2002; Sargsyan, Ter-Grigoryan, & Zhamkochyan, 2000). In this article, we present some results of experiments carried out with this device.

**METHOD**

The construction of the bioscope (see Figure 1A) consists of the following: a light-emitting source (i.e., an electrical bulb \( L \)), a photodetector \( F \), and a sensor (i.e., a glass plate) covered on the outer side with an opaque material. The light emitted from the source \( L \) is partially reflected by the glass plate’s lower surface and partially refracted by the plate, which is then reflected by the glass plate’s upper surfaces and falls upon the photodetector \( F \). A portion of the light passes through the glass plate and is mostly absorbed by the covering material; the residual light reflected by the covering material also falls upon the photodetector. The photodetector measures the total intensity of incoming light. The partition isolates the photodetector \( F \) from the light source \( L \) and from the light reflected by the glass plate’s lower surface. The light source, sensor, and photodetector are completely isolated from external light by a metallic case.

To ensure the stability of the light emitted by the source, we used a temperature-controlled power supply unit. A differential amplifier with a band-pass up to 20 Hz was used to increase immunity to noise. The standard method of subtraction of the steady component from the photodetector signal was used in the registration of reflected light intensity. The difference signal was amplified (by a factor of ~500 times) and fed to an analog-to-digital (A/D) converter, and the digitized data were stored in a PC. The value of the steady component was adjusted such that all changes of signal amplitude could be completely visualized on the PC’s monitor.
Figure 1: The general setup of the hardware for carrying out experiments. A illustrates the diagram of measuring operation: 1 = glass plate, 2 cm width; 2 = covering material (thick black cardboard); 3 = partition; 4 = metallic case; 5 = rack for the investigated object, L = ordinary incandescent lamp (radiation spectrum 400–3000 nm, intensity maximum at 1000 nm); F = photodetector (vacuum photodiode, spectral sensitivity 200–600 nm, sensitivity maximum at 350–450 nm); PC = recording computer. B shows the photodetector noise level at the light source switched off. C shows the background registration of the reflected light intensity.
The level of intrinsic noise of the apparatus did not exceed 0.008 mV. A 16-bit A/D converter with the conversion time of 0.6 ms and quantization step of 0.25 mV was used. The program package was developed for that purpose, and the processing speed of the PC made it possible to register the current value of the intensity of the light entering the photodetector with sampling step of 25 ms. The series of reflected light intensity measurements was smoothed, using the moving average method with the sample step of 25 ms and averaging time of 2.5 s (i.e., with sliding window length 100 samples). The averaged values of the registered signal were displayed every 25 ms. The stability level of the background signal can be estimated by Figure 1B, which shows the recording of the photodetector indication at the inactive radiation source.

After recording of the control level of background intensity of the light reflected by the sensor, the investigated object was disposed on the rack that was previously placed at a distance from 1 to 10 cm from the bioscope sensor, and the character of change of the registered signal was assessed. We used apples, grapefruits, and laboratory animals (rats) as biological objects. Before the experiments, rats were subject to Nembutal anesthesia, using 50 mg/kg dosage. Similar experiments were carried out with participation of human subjects.

In Figure 1C, an example is shown of a prolonged background registration of the reflected light intensity. Using the mean value of the background level intensity ($I_{\text{back}}$), we can estimate what level the mean value of the registered signal ($I$) has to attain to allow for a conclusion that a change of the reflected light intensity really occurred. For that reason, the Studentized $t$ test was used,

$$t = \frac{|I_{\text{back}} - I|}{(S_{\text{back}}^2 / N_{\text{back}} + S^2 / N)^{1/2}},$$

where $S_{\text{back}}$, $S$, $N_{\text{back}}$, and $N$, respectively, denote root-mean-square deviations and numbers of measurements carried out for sections of recording to be compared. With 10-s measurement intervals, the number of data points collected was $N_{\text{back}} = N = 400$. After amplification, the maximum amplitude excursion for registered signal background oscillations did not exceed 20–60 mV. Even if, for root-mean-square deviations, one uses the value of the maximum excursion of oscillations of the background part of the curve (equal to 60mV) than at significance level $< .001$ (when $t = 3.3$), we obtain $|I_{\text{back}} - I| \leq 6$ mV. In this experiment, the deviation of signal from the mean level of background oscillations usually exceeded the maximum excursion of background oscillations 5–10 times, which provided the high level of reliability of observed effects. Taking this into account, we restricted ourselves to illustrations of single experiments, without statistical analysis of data for one-type
experiments, because our main objective was the consideration of principal capabilities of the developed apparatus.

During the development of the bioscope, photomultiplier tubes, vacuum, and semiconductor photocells were tested as the photodetector. Light-emitting diodes operating in different spectral domains, semiconductor lasers, and ordinary incandescent lamps were used as the light source. The impact angle of the light rays from the light source onto the glass plate varied from 40 to 60°. The diameter of the most illuminated part of the glass plate upper surface varied from 1 to 4 cm. For the opaque covering, thin opaque plastic materials and black cardboard with a thickness from 50 to 100 µm were used. In all mentioned modifications, the device proved to be operating.

Note also that, as the components used are of small size, the sensing part of the system can be built sufficiently compact. The general diagram in Figure 1A explains the principle of registration. In the caption for Figure 1A, the main construction parameters of the bioscope are given, with which the experimental results presented in this article were obtained.

RESULTS AND DISCUSSION

It was found that 10–100 s after the biological object was placed on the rack, which was previously fixed at a distance ranging from 1 to 10 cm from the bioscope sensor, a reliable change of intensity of the light, reflected by the sensor, of the radiation source was observed. In Figure 2 (A, B, C), examples are presented of such influences caused by an apple, a grapefruit, and a human palm, respectively. The magnitude of the effect differs for various biological objects. In the case of the human palm, the increase of the reflected light intensity may amount to 1–2% of the absolute value of control level of the registered signal. After the biological object is removed from the rack, the amplitude of the registered signal returns to the control level. If the distance from the biological object to sensor is increased, the time during which the effect occurs increases, and the change of reflected light intensity itself is diminished.

In living systems, the stability of biological functions, energetic equilibrium, and continuous interaction with the environment is maintained by a variety of biochemical reactions. In all of these processes, the essential role is credited to electromagnetic interactions. Electromagnetic fields generated by biological systems and detectable in their environment are too weak and of too low frequencies, so they cannot affect the sensor in such a way that the intensity of the reflected change. We have also tested this directly, generating by physical means
Figure 2: Distant influence of different objects on bioscope indications. A = apple; B = grapefruit; C = human palm; D = aluminum plate, at environmental temperature; E = the same plate, heated up to 40°C. The distance of all objects from the sensor surface is 1 cm. In all figures, the deviation of the curve upward corresponds to increasing intensity of the light reflected by the sensor; arrows indicate moments of approaching and removing the investigated object in relation to the sensor.

Electromagnetic fields of much higher intensity (than are typical intensities of electromagnetic fields of living systems), but we have not seen any detectable influence on bioscope readings.

The temperature of investigated biological objects was equal or higher than the environmental temperature. Nonliving objects (metal, glass, plastic, etc.), having environmental temperature, do not influence the value of the registered signal (see Figure 2D). The control experiments showed that the identical but heated objects cause the decrease of the reflected light intensity (see Figure 2E). Thus the possibility of an influence of biological systems on the sensor by heat radiation is also excluded.

Due to processes of gaseous exchange and evaporations, the peculiar chemical “micro-atmosphere” is formed around biological objects. Thus we carried out control experiments in which an immediate contact of the objects with the surface of the sensor was avoided (see Figure 3A). In this case the lower part of the sensor was physically isolated from the environment. As it is obvious from Figure 3B, even after a hermetic isolation of the sensor’s outer side from the ambient atmospheric environment, a well-pronounced effect could be observed, if the human palm was placed at a distance of 2.5 cm from the surface.
Figure 3: Distant influence of the human palm on bioscope indications at the mechanical isolation of the sensor from an environment. A illustrates the diagram of the experiment: Labels 1–5, F, and L are the same as in Figure 1A, 6 = metallic tube closely fitting to the body (the diameter of the metallic tube was 4 cm, the wall thickness was 4 mm), 7 = the plate hermetically built in the tube and isolating the sensor from an environment. B shows the influence of the palm on the reflected light intensity; a partition 7 was used consisting of the aluminum foil with a thickness of 0.05 mm, coated from both sides by the thin layer of a polyethylene. C shows the same as in B, but a tin plate with a thickness of 0.1 mm was used for partition 7. D shows a control registration of the palm influence on the reflected light intensity at the absence of the partition 7. In all cases the distance from the palm to the sensor surface was 2.5 cm. The brackets represent the time interval of the influence. The scale in A and B is the same as in D.
of the sensor. The magnitude of the influence decreased somewhat when thicker and denser materials were used for encapsulation of the sensor (see Figure 3C). In Figure 3D, for comparison, analogous data are presented at the absence of the isolating partition.

The observed effects were reliable and replicable. The results underscore the ability of biological systems to exert distant influence on optical characteristics of the reflecting surface of the bioscope sensor, even through a thin metallic plate.

The extraordinary anomalous nature of such influence is demonstrated by the following phenomenon. It was found that, after being in close proximity to the biological objects for a few minutes, some materials (paper, wood, glass), which at first did not cause any effect, temporarily acquired the possibility to change the intensity of the reflected sensor light (see Figure 4).

Figure 4: The effect of temporary "biologization" of lifeless objects: 1 = control registration of the influence of the piece of a heavyweight paper; 2 = the influence of the same paper after 2 min between human palms. The brackets represent registration time intervals. The distance from the heavyweight paper to the sensor in both cases was 2 cm. In the control registration, the paper was brought to the sensor by means of pincers.

Here the direction of the change of the reflected light intensity is the same as for biological objects. The effect is observed even if the palms did not touch the paper and were located at a distance of 4–5 mm. from it. The time during which these changes entirely disappear may reach 15–30 min. For metallic materials, no effect of temporary 'biologization' has been revealed; therefore in these experiments the paper was brought near to the sensor by means of metallic pincers.

In the experiments on narcotized rats, a decrease in the level of the registered signal was observed after an injection of a lethal dose of Nembutal (see Figure 5). We can thus surmise that the bioscope indi-
Figure 5: Influence of the Nembutal lethal dose applied to a narcotized rat on the registered signal level. 1 = injection of the Nembutal lethal dose; 2 = stopping of the respiration. The distance from the rat’s back is 3 cm. Little arrows indicate the beginning and end of the registration.

cation directly represents the relative level of the investigated object’s biological activity, and from the amplitude of deviation from the control level, one may assess the investigated object’s functional state. Figure 6 shows the character change of bioscope signals from the narcotized rat as a result of an extrasensory individual’s mental concentration on the animal. After 1.5–2 min from the beginning of the mental concentration, aimed at the normalization of the functional state of the animal, a decrease of the registered signal level was observed, followed by prolonged damped oscillations when the mental concentration stopped. Note the influence of mental effects one may register from

Figure 6: Registration of the mental influence on the narcotized rat. Registration in the region of the rat’s head, at a distance 1 cm from the rat’s head to the bioscope sensor. Mental influence was exerted from a distance of 5–6 m from the rat. The brackets indicate the time interval of the mental influence. Arrows indicate the beginning and end of the registration.
practically every person. One may also use other biological systems as the object of influence.

Figure 7A presents data obtained during distant healing correction of a patient’s state. The bioscope sensor may be placed near any part of the body; in this case it was located 4 cm from the patient’s palm for his and the experimenter’s convenience. The sharp decrease of the registered signal was observed during the distant healing influence. After correction, the signal level was increased in a wavelike fashion. After 2 hr, the bioscope indication, registered from the same region of the palm, exceeded the initial level of signal before the healing séance by a factor of 1.5 (see Figure 7B), which may serve as a criterion for effectiveness of the performed correction.

The developed apparatus clearly demonstrates the ability of living systems to exert distant influence on the environmental objects, as evidenced by the fact that bioscope indications change if one places the biological object near the sensor. At the same time, the effect of temporary “biologization” also shows that in the immediate proximity to biological systems, prolonged changes are formed at some materials, which may be then recognized by means of the bioscope. Of course, the character of observed effects casts doubt on the possibility of simple explanation of discovered phenomena. However, the relative clearness of processes, which take place in the reflection of light by the sensor, allows us to rely on the revelation of mechanisms being the basis of observed effects and on the determination of physical nature of the channel of interaction, by means of which the biological system exerts such influences.

The biological object is a complex system, and investigations with living systems can hardly contribute to a substantial understanding of the physical processes that take place on the sensor-reflecting surface. The experiments in this study showed that the directions of the change of the reflected light intensity caused by biological systems and heated nonliving objects are always opposite. Nevertheless, the influences of warm objects exist, and one should first obtain a better understanding of the physical nature of processes taking place on the reflecting surface of the sensor under influence of thermal radiation.

Despite the lack of complete understanding of mechanisms underlying the change of the light reflected by sensor, the high reliability and reproducibility of observed effects suggest that the bioscope may be a useful instrument for investigating parapsychological phenomena. The obtained data are particularly convincing by virtue of the bioscope’s simplicity in design. The last series of experiments point out the possibility of using the developed apparatus as a device for training and enhancing faculties to correct patients’ physiological state by means of distant healing.
Figure 7: Distant healing correction of the patient's state: A represents registration of the process of distant healing séance; B represents 2 hr after medicinal séance; registration at a distance of 4 cm from the patient's palm. The brackets indicate the time interval of the healing correction. Arrows indicate the beginning and the end of the registration.
The following question is also of interest: If the living system is capable of influencing the physical state of objects in its environment from a distance, what then is the role of such influences in the process of vital functions of the biological system itself?

The physiological significance of signals registered by the bioscope was already shown in earlier published works (Sargsyan & Ter-Grigoryan, 2002). In particular, it turned out that the mechanical compressing of the narcotized animal pad led to the essential change of the character of signals of the bioscope, placed at a distance of 2 cm above the animal. Besides, under sound-induced stress in a human subject, a pronounced change of amplitude-frequency responses of registered signals was observed (registration at the distance of 6 cm from the palm). Of course, only future investigation on the comparison of the bioscope signals’ amplitude-frequency responses with the biological systems state will reveal in what cases the bioscope use may turn out to be more effective compared with the commonly used apparatus. However, this possibility itself calls for the study of the common instrumental approach of both ordinary and anomalous appearances of biological functions.

In summary, the results obtained thus far have shown that the development of the bioscope has led to discovery of new phenomena and mechanisms that exist in the process of vital functions of biological systems. We hope that subsequent investigations will lead to the full comprehension of the main principles of their functioning.

REFERENCES


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