

OLD AND NEW INFORMATION ABOUT ELECTROSHOCK

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THE ORIGIN OF THE IDEA OF ELECTROSHOCK

The idea of inducing convulsions with electric current for therapeutic purposes in man instead of using convulsing drugs was the logical, I might say unavoidable, result of the study of changes in nervous structures following experimental epileptiform convulsions in animals. The idea of curing diseases with electric discharge upon the head is not original with me; it arose in ancient times. Dr. Debenedetti, keen scholar of the history of medicine, wrote to me some time ago that I must not take it ill of him, but I could not claim having invented electroshock therapy, because a distinguished colleague who specialized in therapeutics had already used electric discharges upon the head.

Scribonio Largo wrote a treatise on therapeutics entitled "Compositionis medicamentorum" (43-48 A.D.) in which he tells of the treatment of headache by the use of a live torpedo-fish applied to the sufferer's head. The voltage of the discharge of the torpedo-fish is 25 to 30 volts according to zoologists, so these applications probably did not produce the convulsions that are considered to be the essential element of ECT. Nevertheless, the principle was asserted. Further research has shown that the peculiar properties of this fish had already been written about more than 300 years earlier by Aristotle (384-323 B.C.), but he did not point out any therapeutic application. Pliny the Elder (23-79 A.D.), probably after Largo, spoke of the advantageous effect not only on the head, but also says "it eases labor whenever it is brought where a woman is lying-in" (Book 32X).

These and other ancient authors stress the peculiarity that the torpedo-fish has of

destroying movement and feeling. Thus, for instance, Galen (201 A.D) refers to a statement that it heals headaches (*Proprieta' dei semplici XI*) and "the torpedo-fish has such stupefying power that, being touched with the spear by the fisherman, and the quality passing from the stick up to the hand, it suddenly renders him stupefied and asleep," quoting Pliny's note: "The torpedo-fish, although touched at a distance by means of pole or staff, puts any strong arm and any quick foot to sleep."

Having accomplished our duty toward these illustrious predecessors, I must now go on to say how I arrived at the administration of ECT. It is always unpleasant to have to justify oneself. Yet in this case it must be done to avoid a situation in which it might be said that Cerletti had nothing to do with the invention of electroshock. In my monograph of 1940, I set forth the history of the first use of electroshock and recorded the names of all those who took part in or were present at the first tests. This monograph was in Italian, which is not read abroad, and in recent years I have received letters asking me to give an explanation of the double name "Cerletti-Bini" which is used in association with electroshock, particularly in the English literature. In answering these letters I have simply referred to the original monograph, but since it was not widely circulated, I concluded that I should now answer the recurring question publicly, once and for all.

Part of the confusion appears to have arisen because of the use in America of a brief report of a demonstration I gave at the Rome Medical Academy in 1938. This was the only report available to Kalinowsky, who was in Rome at the time of the first experiments and who went to the United States in 1939. He used it in his bibliographies. In this demonstration I had used ECT on patients with Dr. Bini's assistance, and I also entrusted to him the task of furnishing the Academy with certain specifications about the electrical apparatus. As a

¹Dr. Cerletti presented this manuscript to Dr. Paul Lemkau during the latter's visit to him in June, 1949, with a request that it be published in an American journal, since Italian journals are so rarely read in this country.

consequence, I placed his name before mine in the title. As time has passed, this has given a mistaken impression as to the actual facts of the case. The later and more complete reports could not be read abroad because of the blocking of circulation of literature due to the War.

The problem appears even more acute just now because of the appearance of a book by two English authors, Russell Brain and Strauss, entitled "Recent Progress in Neurology and Psychiatry." Even in the Italian translation of this work, by Dr. Ascenzi, electroshock is designated as a Bini-Cerletti discovery. I hasten to point out that this error is not to be ascribed to any fault on the part of Dr. Bini, who has been embarrassed by the general misuse of his name in this connection, but whose relations with me in the matter have been straightforward and fair in every instance.

Coming now to the history, or better the story of ECT, it may be divided into 3 periods:

- I. A *preparatory* period, during which the idea was maturing whence the invention later sprang.
- II. The period of the actual *invention* itself.
- III. The period of this invention's *applications* in the scientific field, and in the field of clinical practice.

1. *The Preparatory Period*

The preparatory period includes a series of researches, in which I—first in Genoa and later in Rome—set out to provoke experimental epileptic fits in dogs. The problem was whether the sclerotic alterations of Ammon's horn (particularly of Sommer's sector), which are so frequent in the brains of epileptics, should be regarded as previous injuries which might be involved in the production of fits or were themselves consequences of repeated fits. I wished experimentally to provoke various types of series of convulsions in dogs, and to examine the brains from a histopathological standpoint, studying Ammon's horn particularly. It was already known to physiologists at that time that, in addition to injecting various toxic substances, convulsions in ani-

mals could be induced by applying a strong electric current across the head. But I wished to subject the brain to the direct action of the current as little as possible, in order to avoid adding anything to changes that would, by other possibility, remain definitely chargeable to the fit itself. Upon the advice of the physiologist Viale, I therefore adopted a mouth-rectum circuit rather than one across the head. Viale had already carried out experiments in America with this type of circuit in medicolegal researches upon death by lightning.

I arranged experiments of this kind in Genoa (1933), with the assistance of Professor Balduzzi, of his assistant, Dr. Lazzeri, and of Chiauzzi, an undergraduate. A 125-volt alternating current from the lighting plant was sent through a mouth-rectum circuit in dogs.

Having had some deaths with this method at first, I set out to determine what conditions were the most favorable for survival. I was able to establish that the dangerous factor was not so much the height of the *voltage* as the *duration* of the current's passage. In some cases, in fact, the 210-volt industrial plant took the place of the 125-volt lighting plant and no differences of any note were to be observed in results. By reducing the length of time of application to a minimum, the usual convulsion was obtained without any further trouble ensuing. I therefore replaced the knife-switch, which had proved insufficiently quick in response, with a button-switch; thus, with the aid of a metronome, fixing the length of time best suited for this purpose at from 0.1 to 0.5 second.

With this technique, I prepared a certain number of dogs in which fits had been induced at various frequencies and for various lengths of time and was on the point of the histological examination of their brains. Intent upon demonstrating the authentically epileptic nature of the convulsions, I got Chiauzzi to publish a minute description of these dogs' convulsive fits in the form of his graduation thesis (later published in *Pathologica*, 1934).

It was at this time that the Medical Faculty of Rome University called me to its chair of neuropsychiatry. As soon as I had

settled down in my new seat, I took up these experiments again with the assistance of young Dr. Bini (1936).

Most of the dogs were at first subjected to the same treatment adopted in Genoa, using the mouth-rectum circuit. Experiments with a circuit across the head were also made, but with the intention of controlling eventual alterations that might be ascribed to direct action of the current upon the brain. In the course of these researches Dr. Bini replaced the hand-switch with a clockwork switch like those used in X-ray apparatus. It was found that by lowering the voltage the convulsion was incomplete and only brief "absence" was induced. Confirmation was obtained that the discharge could easily be withstood if the time were very short (1 to 5 tenths of a second), and that the best voltage for obtaining fits is about 125. Various series of dogs were prepared in this way, and histological preparations of their brains were made.

II. *The Invention of the Electroshock*

In 1936, I had, in the Rome Clinic, adopted the Sakel method of treating schizophrenia by means of insulin coma. The following year I introduced the new method of inducing convulsions by the use of Cardiazol² (Meduna) and had my assistant, Longhi, undertake Cardiazol convulsion experiments upon dogs, paralleling those that were being made with the electric current.

It was natural that the idea should occur to me, and perhaps to others also, that electricity could be applied to men as a convulsive stimulus. Now the problem was different and simpler. Convulsions were to be induced with a therapeutic aim since the good clinical results obtained by Meduna's method were ascribed to them. For this the old transcranial method followed by physiologists was sufficient. But this idea then, and for a long time to come, appeared Utopian, because of the terror with which the notion of subjecting a man to high-tension currents was regarded. The spectre of the electric chair was in the minds of all and an imposing mass of medical literature enumerated the casualties, often fatal, ensuing upon electric

discharges across the human body. Nowadays, after 12 years of experience with electroshock, that terror may seem to have been exaggerated; but cases of death caused by low tensions (40 volts) had been described. Since, to obtain fits in dogs, tensions of around 125 volts were used, moreover with an alternating current—which was held to be more dangerous than direct—it seemed evident that these experiments were too near the danger zone to have any possibility of being applied to man. The fact is that no one at the clinic seriously thought of applying electric convulsions to *man*, even though experiments continued upon dogs, both with electricity and with Cardiazol. So, over a year went by.

Nevertheless I, who had gone to such lengths in striving to preserve dogs from death when given electrically induced convulsions, had now come to the conviction that a discharge of electricity must prove equally harmless to a man if the duration of the current's passage were reduced to a minimum interval. Continually turning the problem over in my mind, I felt that I would sooner or later be able to solve it; so much so that in 1937, not being able to go to the Munsingen Congress, I allowed Bini to hint at these vague hopes, and I, myself, at the 1937 Milan Assembly concerning the therapeutics of schizophrenia, announced these hopes that I had been nourishing.

This inactivity in the face of so momentous a question greatly depressed me, so that I immediately jumped at the information, given me by my colleague, Professor Vanni, that "at the Rome slaughterhouse pigs are killed by electricity." As though to justify my passiveness and to settle my hopes by facing a real fact, I decided to see this electric slaughtering with my own eyes, and immediately went to the slaughterhouse.

There I was told that the application of a current across the pigs' heads had been in use for some years. The butchers took hold of the pigs near their ears with a large scissor-shaped pair of pincers. The pincers were connected to the lighting plant with wires, and terminated in two teathed disc-electrodes enclosing a sponge wet with water. As they were seized, the pigs fell on their sides and were soon taken by fits (con-

² American synonym, Metrazol.

vulsed). Then the butcher, taking advantage of the unconscious state of the animal, gave its neck a deep slash, thus bleeding it to death.

I at once saw that the fits were the same as those I had been producing in dogs, and that these pigs were not being "killed by electricity," but were bled to death during their epileptic coma.

Since a great number of pigs was available at the slaughterhouse for killing, I now set myself the exact opposite of my former experiments' aims; namely, no longer to make efforts to keep the convulsed animals alive, but rather to determine what the conditions must be for obtaining their death by an electric current. Having obtained authorization for experimenting from the director of the slaughterhouse, Professor Torti, I carried out tests, not only subjecting the pigs to the current for ever-increasing periods of time, but also applying the current in various ways: across the head, across the neck, and across the chest. Various durations (20, 30, 60 or more seconds) were tried. It turned out that the more serious results (prolonged apnea sometimes lasting many minutes and, exceptionally, death) appeared when the current crossed the chest; that this application was not mortal for durations of some tenths of a second; and, finally, that passage of the current across the head, even for long durations, did not have serious consequences. It was found that pigs, even when treated in this last way several times, "came to" gradually, after a fairly long interval (5 to 6 minutes), then started moving, next made various attempts to get shakily to their feet, and finally ran rapidly to mix with their mates in the pen.

These clear proofs, certain and oft repeated, caused all my doubts to vanish, and without more ado I gave instructions in the clinic to undertake, next day, the experiment upon man. Very likely, except for this fortuitous and fortunate circumstance of pigs' pseudo-electrical butchery, electroshock would not yet have been born.

A schizophrenic of about 40, whose condition was organically sound, was chosen for the first test. He expressed himself exclusively in an incomprehensible gibberish made up of odd neologisms, and, since his ar-

rival from Milan by train without a ticket, not a thing had been ascertainable about his identity.

Preparations for the experiment were carried out in an atmosphere of fearful silence bordering on disapproval in the presence of various assistants belonging to the clinic and some outside doctors.

As was our custom with dogs, Bini and I fixed the 2 electrodes, well wetted in salt solution, by an elastic band to the patient's temples. As a precaution, for our first test, we used a reduced tension (70 volts) with a duration of 0.2 second. Upon closing the circuit, there was a sudden jump of the patient on his bed with a very short tensing of all his muscles; then he immediately collapsed onto the bed without loss of consciousness. The patient presently started to sing at the top of his voice, then fell silent. It was evident from our long experience with dogs that the voltage had been held too low.

I, bearing in mind the observations with repeated applications of the day before upon pigs, made arrangements for a repetition of the test.

Someone got nervous and suggested whisperingly that the subject be allowed to rest; others advised a new application to be put off to the morrow. Our patient sat quietly in bed, looking about him. Then, of a sudden, hearing the low-toned conversation around him, he exclaimed—no longer in his incomprehensible jargon, but in so many clear words and in a solemn tone—"Not a second. Deadly!"

The situation was such, weighted as it was with responsibility, that this warning, explicit and unequivocal, shook the persons present to the extent that some began to insist upon suspension of the proceedings. Anxiety lest something that amounted to superstition should interfere with my decision urged me on to action. I had the electrodes reapplied, and a 110-volt discharge was sent through for 0.5 second. The immediate, very brief cramping of all the muscles was again seen; after a slight pause, the most typical epileptic fit began to take place. True it is that all had their hearts in their mouths and were truly oppressed during the tonic phase with apnea, ashy paleness, and cadaverous facial cyanosis—an apnea which,

if it be awe-inspiring in a spontaneous epileptic fit, now seemed painfully never-ending—until at the first deep, stertorous inhalation, and first clonic shudders, the blood ran more freely in the bystanders' veins as well; and, lastly, to the immense relief of all concerned, was witnessed a characteristic, gradual awakening "by steps." The patient sat up of his own accord, looked about him calmly with a vague smile, as though asking what was expected of him. I asked him: "What has been happening to you?" He answered, with no more gibberish: "I don't know; perhaps I have been asleep."

That is how the first epileptic fit experimentally induced in man through the electric stimulus took place. So electroshock was born; for such was the name I forthwith gave it.

III. *The Period of Application*

The period of the invention's applications, on this same patient and upon others, immediately followed. Everyone was quickly reassured as to the safety of the method.

Our schizophrenic went on getting better rapidly. Having entirely abandoned his jargon, he was able to supply all the data for his identification and anamnesis. He began to take an interest in his surroundings, and share in the life of his ward. After 11 complete ECTs and 3 incomplete ones (over about 2 months) he was discharged from the clinic in a "complete remission." It may be of interest to note that the patient said upon leaving that he was well satisfied because a very tiresome whistling in his ears that had troubled him for years had also disappeared.

Electroshock was extended to an ever-increasing number of patients with different disease pictures without difficulties arising. Needless to say, in the beginning I could not avoid feeling uneasy. I did not ignore the fact that unexpected—perhaps terrible—surprises might be encountered with the new method of treatment. I remembered the numerous casualties due to myxedema thyreopriva which, after some years, followed the brilliant operation of goitre ablation by Kocher and Reverdin. I had not forgotten the hopeless blindness brought about by

atoxil, after it had aroused so many hopes for the cure of sleeping sickness, or the incidents caused by blood transfusions before the discovery of blood groups, nor the disastrous paraplegias consequent to endorachidian injections of sulphonamides, etc.

In the case of ECT I was afraid that by repeating the applications in series I might "epileptize" patients. It was true that in dogs subjected to repeated epileptic convulsions I had never observed the occurrence of spontaneous convulsions, but then I was dealing with animals much different from man, and with healthy animals, not patients with illness of the nervous system. However, in time, through observing the absence of spontaneous epileptic fits in patients repeatedly shocked, this fear vanished.

Another alarm was aroused by the discovery, in 2 patients treated with ECT, of slight opacity of the crystalline lens. It was only after having had patients examined by ophthalmologists over a long period of time that we could ascertain that in those 2 cases the alterations of crystalline lens were due to a pre-existing process and had nothing to do with the passage of the electric discharge across the head.

While the first idea of using electric current to induce convulsions in man was born with the aim of improving a therapeutic method that was not free from serious difficulties, the Cardiazol method (Meduna), constant observation and study of epileptic fits under the convenient conditions offered by ECT readily demonstrated that the new method afforded a splendid opportunity for scientific research, both physiopathological and clinical.

Hence I undertook several series of researches, methodically separating and analysing the various phenomena that occur in epileptic fits, trying to clarify not only the mechanism but also the biological significance of the attack itself, and consequently the therapeutic mechanism of ECT, particularly in the two great types of disease that had been treated: manic-depressive psychosis and schizophrenia. The demonstration that followed of the diencephalic localization of the semeiotic constellation of epileptic fits, the new psychopathogenetic framing of these 2 diseases, and the interpreta-

tion of the meaning of fits under the name "terror-defense reaction," quickly gathered widespread acceptance.

I also began to investigate the problem of angiospasm in convulsive fits by measuring cerebro-spinal fluid pressure during ECT. These researches have been recently developed in an interesting study by Fazio and Doeb and in works by Marsan, Fuortes, and Di Fortunato. With Dr. Bini, I studied the histopathology of brains of animals subjected to different ECT applications. On the other hand, I distributed among the assistants of the clinic a wide series of researches from the standpoint of practice. These researches were published in the volume of 1940.

Bini had the task of studying the technical part and clinical manifestations of ECT, which he accomplished perfectly. His writings on the subject have definitely established the fundamental semeiotic data, so that the many authors who came later could not change anything and could add very little.

Bini also attempted to make the application of shock safe and comfortable. In 1940 in the Italian electrotechnic shop of engineer Arcioni (Milan), he prepared an apparatus which could be safely and easily handled. Since it derived from the primitive and rudimentary one that had been used in the first experiments, he very kindly offered the patent rights to me. But I considered it unnecessary to associate the invention with the equipment and refused the offer, pointing out not only that I had not had a hand in the bringing forth of the new apparatus, but also that it would not be easy to patent a piece of equipment essentially made up of a voltmeter, a transformer, a clockwork switch and the headband with electrodes to transmit the current, all according to methods already established and known. Bini had added to the equipment an apparatus designed to determine, by the use of weak continuous current, the resistance offered by the head-circuit alone. This novelty aroused criticisms from electrologists, so that at the Copenhagen Congress (1939) I recognized that this resistance measurement could not be carried out in a constant, strictly accurate way. However, the apparatus could be used

to check for inappropriate application of the electrodes and also for short circuits in the equipment.

As a matter of fact, as soon as the elementary data about the method became known, all sorts of equipment appeared in Italy, France, Germany, England, and elsewhere. The equipment has become simpler and simpler, being restricted to the voltmeter and to the devices already known for fractionating the time of application of the current in tenths of seconds. The simplification reached its maximum in the technique adopted by one of my assistants, Prof. Felici in Tripoli. In the *Sanitary Bulletin of Tripolitania* (January, 1944) he reports that, having no equipment at his disposal, and having learned in the Rome clinic that "an excess of voltage, besides doing the patient no harm (the safety limit being high) was on the contrary to be preferred . . ." he applied ECT fixing the 2 electrodes to the head and switching the current quickly by hand (about 2/10 of a second). The voltage on the line in Tripoli varied between 125 and 150 volts.

So, as it was performed in Genoa in the first experiments upon dogs, ECT was now applied to man without special equipment. This means that the invention of ECT does not consist, as many have believed and still believe, in a special instrument. It would be unfair, however, not to recognize that Bini's elegant and comfortable apparatus has contributed to the rapid spread of the method. It has allowed research studies of which Bini himself, in collaboration with the cardiologist, V. Puddu, contributed the first example in a beautiful paper entitled "Upon the Physiopathology of Cardiovascular and Respiratory Systems in ECT." This work was done on dogs and was documented with remarkably clear graphs (1940).

Recent Advances in Italy

It is impossible in this short paper to give even a brief account of the multifarious developments that the application of the method has had in the scientific and theoretical field and in practice. Volumes on ECT full of new data and developing important theoretical deductions have been published in va-

rious languages. Here, however, only some of the most interesting ideas that have emerged from this wide research movement may be quoted, particularly taking into consideration the contribution of Italians, which seem to be particularly original, as well as researches carried on outside the neuropsychiatric field.

It is on less strictly scientific grounds that research is included on ways in which electric current passes across the head. This is largely a question of electrotechnique. Prof. Bollea and engineer Manfredi have found that the cerebrospinal fluid is of paramount importance in the distribution of current in the encephalic mass, an increase in density being found in the periventricular zone. Thus it becomes clear why ECT culminates in the epileptic fit, the phenomenology of which derives from a stimulus of the diencephalic neurovegetative system particularly.

The humoral factor in the mechanism of the therapeutic action of electroshock has been studied by Boussinet and Jacob (1945). They found improvement in mental patients, particularly dysthymic ones, when plasma and serum of previously shocked patients were intravenously injected. Using the pig as the experimental animal (having rejected rabbits and sheep after trial) I tried various "biological tests" for making comparisons between the brain of a normal animal and one that had been repeatedly shocked. Ideally, such studies should be by direct biochemical analyses but I had neither the assistants nor the money for this. Suspensions of cerebral material that had been "shocked" were prepared in phenolic water in the same way as in the preparation of antirabies vaccine from rabbits' brains. These suspensions were injected intramuscularly into 36 patients with dysthymic psychoses. Remarkable changes were obtained in the field of neurovegetative functions of sleep, vasomotor stability, sweating, general nutritional condition, and in many cases there was marked improvement in affect and in the state of anxiety. Puca has injected the cerebrospinal fluid of "shocked" patients into other patients and reports good results, particularly in dysthymic psychoses.

I also found that the hypodermic injection of "shocked" brain protected rabbits to some

extent from death after intracerebral injection of the "fixed" virus of rabies. Spolverini found that such treatment also protected monkeys to some extent from a very virulent strain of poliomyelitis virus. Accornero repeated the rabies work on rabbits in a large experiment that confirmed the earlier results though an unfortunate epidemic of pasteurellosis in his animals interfered. In the course of this work, it was found that the peculiar properties of "shocked" brain suspensions in water grow fainter with the passage of time and disappear altogether in about 2 months. Research is proceeding to find methods to preserve the property through different methods of preparation. I have called the substance that is presumably formed in the brain after repeated applications of ECT "acrogonine." Many investigators have reported to me that they have observed little or no results in such experiments. My own work continues to support the fact that behavioral changes follow the injection of acrogonines. Two conditions appear to me to be possibly responsible for the failures to obtain changes: (1) that too many shocks are given the pig or (2) that the water suspension of brain tissue had been kept more than 50 days. Longhi has repeated my experiments with the "virus fixe" of rabies and obtained the same results; controls died after 8 days, the acrogonine-treated animals after 40.

Longhi and Martinotti have found that acrogonine injected into the periventricular gray substance (hypothalamic zone) of dogs by Demole's technique has a soporific effect. These workers have prepared dogs with a hollow sound into the third ventricle (Sacchi and Adami's technique) and are continuing the research. Fiume has showed that tuberculin reaction increases after shock, anergic cases becoming positive in 2 instances. He considers this evidence of an increased defense reaction in the organism.

Bini in 1942 suggested the repetition of ECT many times a day for certain patients, naming the method "annihilation." This results in severe amnesic reactions that appear to have a good influence in obsessive states, psychogenic depressions and even in some paranoid cases. "Clustering" of treatments, shocking daily for 3 or 4 days followed by

a 3-day rest, is less intense but sometimes effectual. The method of annihilation has made possible studies of amnesia and of hallucinations, delirium, and moria occurring during the treatment, relating them to the personality factors in the patients (Bini and Bazzi, Polimanti). Flescher and Virgili have made systematic researches on amnesia and showed that spontaneous memory is more damaged than that of learned, didactic material and that automatic memory is still less disturbed. Depressed and aged patients show disturbances earlier than young or excited patients. The "annihilation syndrome" has been compared by Cerquetelli and Catalano with the psychopathology following prefrontal leukotomy. They indicate close parallelism with the advantage of reversibility in the case of shock.

These authors have also used shock successfully to stop the symptoms of demerol mania quickly, following Martinotti who used it with success in other forms of toxicomania. Broggi and others have also used ECT in progressive paralysis with at least temporary success. Ruggeri has used ECT in Parkinsonism and DeCrisis in disseminated sclerosis, observing attenuation of hypertension.

Electroshock has also been applied in certain general physical illnesses though all have a constitutional "nervous" background. Recovery has been frequently reported in asthma, and Catalano and Cerquetelli, with Tommasi, have had success in psoriasis, prurigo, and alopecia areata. Manciola, after having observed improvement in ozena in a schizophrenic patient treated with shock,

found similar improvement after acrogonine injection and is pursuing the research with histological controls.

Two other ideas both of which have perhaps as much relation to poetry as to science must be mentioned. The first is simply that the word "shock" does not have the same meaning in neuropsychiatry as in general pathology. It is worth noting that many of our therapeutic methods such as prolonged sleep, narcoanalysis, insulin coma, epileptic coma, electronarcosis, etc., have in common the factor of the induction of a state of unconsciousness.

The second idea has to do with the patient's fear of therapy, which leads some to want to stop it. On being asked the reason, they reply: "I don't know, I am afraid." "Afraid of what?" "I don't know, I have fear." "But were you worried, did you feel pain?" "No, but I have fear." There must be a vague recollection—organic memory—of the first "terror-defense" reaction. I believe that name "terror-defense" expresses the biological significance of epileptic fits. The terror phase, although taking place during unconsciousness, leaves specific biochemical and psychological changes in the organism that later emerge generically into the conscious sphere. This, too, was expressed long ago by Padre Dante:

"Qual e colui che somniando vede,
E dopo il sogno la passione impressa
Rimane, e l'altro alla mente non riede. . . ."
(Para. XXXIII, 58-61)

(As he who while dreaming sees,
And after the dream is over,
The emotion remains while the picture has
faded away. . . .)