

JOSE DELGADO: A CASE STUDY

Science, Hubris, Nemesis and Redemption

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Long, long before men and women became scientists the Greek playwrights portrayed the justice meted out toward the overweening pride and ambition of their heroes by the Gods' wrath and retribution. Hubris invited nemesis and only rarely was there hope of redemption. Nothing Freud or the analysts added altered this dynamic as the following case study from the twentieth century illustrates.

The Case

Jose Manuel Rodriguez Delgado

(1915-2011)

This biography has an unusual provenance and was not something I might have anticipated writing. Born almost twenty years after Delgado at the beginning of the neuropsychopharmacology era I was not familiar with his pioneering work in physiology using electrode implants in animals and humans to modify emotion and behavior. It might have crossed my horizon during psychiatric training (1962 – 1967) at a time when his research began attracting international attention but I was too immersed in my own animal pharmacology studies to take serious note.

Jose emigrated from Spain to the USA in 1950 and spent 20 years in America before returning to Spain when controversy engulfed his career. Based on his pioneering work at Yale University he was among the small number of clinical and animal researchers who became founding members of the ACNP in 1961. Although we were fellow members for most of our careers our paths never crossed; neither of us served on any of the organization's committees or held office nor did he receive any of its awards.

In 2005 at the age of 90 Delgado was interviewed for the ACNP's Oral History Project (Series Editor Ban TA 2011) by Joel Braslow, a psychiatrist and historian but not a member of the organization. The interview is published in Volume 2 Neurophysiology, (Volume Editor Fink M). It is relatively brief and some rather vague answers suggest early cognitive impairment. Additional comments on Delgado's pioneer contributions are provided by the series editor in the Preface and by the volume editor in *Dramatis Personae*. Three of Delgado's key publications in English are cited in the references to the preface. (Delgado JMR 1952a, 1952b, 1955).

Jose Delgado died at the age of 96 just three months before December 2011 when the ACNP celebrated its fiftieth anniversary. It was not until nine months later that I received a request to write an obituary due to some reluctance among members better suited to the task, perhaps attributable to the still ongoing controversy about Delgado's life's work. I had two months to complete the task. (Blackwell B 2012). After a brief overview of existing information I felt convinced that the topic

deserved a more exhaustive analysis both because of the unusual perspective it offers from an historical view of science but also for an opportunity to offer a much maligned pioneer some belated redemption. This led to an extended biography published in my memoir (Blackwell B 2013) and reproduced here.

The Man of Science

Jose Delgado was born on August 8th in Ronda, a province of Malaga in Spain. His father was an ophthalmologist who Jose planned to emulate until he became entranced by the work and writings of Santiago Ramon y Cajal, often considered the “father of neuroscience”. Cahal was a Nobel Laureate in 1906 in Physiology and Medicine, together with Golgi, for work on the structure of the nervous system. Captivated by the mysteries of the nervous system Jose began working as a student in physiology under Juan Negri at the Madrid Medical School. On the first paper listed in his bibliography he is a second author to J.G. Valdecasas who worked with Servco Ochea in Negri’s lab on glycolysis of heart muscle. It was published in 1933 when Jose was a pretentious 18 years old!

Delgado must have formally become a medical student around the outbreak of the Spanish Civil War in 1936 between the elected Republican Government (loyalists) and the insurgents led by General Franco, supported by Nazi Germany and Italy. As the fascists gained control first Ochea and then Negri fled Spain whilst Delgado dropped out of his studies to join the Republican side as a medical corpsman. After the fascist victory in 1939 he spent five months in a concentration camp before returning to medical school to complete his M.D. in 1940, graduating *cum laude*. He then began work immediately as an instructor in physiology and in 1942 obtained his Doctor of Science, also *cum laude*.

Between 1942 and 1950 Jose resumed his animal research in physiology and received several awards; Countess of Maude's Prize (1944), Roel Prize (1945) and the Ramon y Cahal Prize awarded by the Spanish Government (1952). During this period he published 14 papers on his primate research in European Journals mostly in his native language. This work primarily involved selective brain ablation and electrical stimulation of various nuclei and regions with implanted electrodes.

At this time Joel was handicapped by difficulty obtaining primates for his research. In the OHP interview he tells of travelling to Africa to purchase animals. On the two week return journey he bonded to a gorilla and feeling unable to operate on his “new friend”, donated it to the local zoo! Later on, this period in Jose’s career would be characterized by his detractors as “under the fascist regime” implying guilt by association with fascist atrocities while ignoring his service as a corpsman on the Republican side, incarceration in concentration camp after the war and humanitarian treatment of his animal subjects.

In 1950 Delgado won a two year James Hudson Brown Scholarship to Yale University Medical School and joined the physiology department under John Fulton. Impressed with his work Fulton appointed him an Assistant Professor in the department (1953-1955), promoted him to Associate Professor (1955) and eventually to Full professor of both Physiology and Psychiatry in 1966 at the age of 51. Delgado flourished at Yale, described by a colleague as a “technological wizard” he invented a device he named the “stimoceiver”, a small implanted array of electrodes that permitted two way

communications with a fully mobile animal and allowed Delgado to stimulate different regions of the brain, producing changes in behavior and affect.

Delgado's research was a sophisticated and less destructive continuation of Fulton's earlier work. In 1935 Fulton had reported on his experiments demonstrating a dramatic reduction in violent behavior by a chimpanzee following ablation of the pre-frontal cortex. This finding was credited with providing the impetus for the Portuguese psychiatrist Moniz to extend the work to humans by performing lobotomies on psychiatric patients, claiming excellent results for which he won the Nobel Prize in 1949.

With this background and working in Fulton's department Delgado expressed his wish to shun the crude ablation of brain pathways, replacing that with more discrete direct chemical and electrical stimulation of selected areas. Possibly encouraged by Moniz's fame and success Delgado extended his animal experiments into twenty five carefully chosen patients with chronic treatment refractory epilepsy and schizophrenia at a Rhode Island asylum and for whom there were no effective treatments available. His ground breaking paper describing the results was published in 1952. This appeared with the provocative title, "Technique of Intracranial Electrode Placement for Recording and Stimulation and its Possible Therapeutic Effects in Psychotic Patients" (Delgado 1952c)

1952 was the watershed year in neuroscience. At precisely that moment Chlorpromazine was being given to schizophrenic patients for the first time with success that would spawn the neuropsychopharmacology revolution. Delgado positioned himself between the burgeoning disapproval of mutilating surgical lobotomies and the belief that direct electrical or chemical stimulation of specific brain areas was scientifically and clinically superior to oral administration of drugs whose effects on the brain were inevitably mitigated by metabolism in the liver, obstruction by the blood-brain barrier and uncertain distribution throughout the brain.

Delgado was not entirely alone in these beliefs. His 1952 paper narrowly pre-empted publication of somewhat similar research in humans by Robert Heath, Chairman of Neurology and Psychiatry at Tulane University.

In a seventeen year period (1952-1969) Delgado produced 134 scientific publications on his research in cats, monkeys and patients, both psychotic and non-psychotic. This work included research on both physiological and chemical stimuli of specific regions in the central nervous system (Delgado JMR 1956). In 1959 he reported on cerebral excitability in the monkey after administration of iproniazid, an early MAO inhibitor antidepressant, (Delgado 1959a), and in the early days of the ACNP he published a review titled, "Neuropharmacology of Behavior", (Delgado 1966).

Nevertheless the bulk of Delgado's research concentrated on his special area of expertise in electrical stimulation. In the early days this tended to focus on discrete emotional and behavioral outcomes in individual animals and, more rarely and selectively, in humans. A retrospective review of Jose's pioneering work in *Scientific American*, (Hogan J 2005), comments, "Delgado limited his human research, however, because the therapeutic benefits of implants were unreliable; results varied widely

from patient to patient and could be unpredictable even in the same subject. In fact Delgado recalls turning away more patients than he treated.”

It was in the decade from 1960 to 1970 that several events occurred which ushered in the controversy that would end Jose Delgado’s career in America. After 1960 some of his research involved work on more global social behaviors sometimes in colonies of monkeys inviting speculation about mind control in human society. Two particular events in this time period encouraged Delgado to widen the scope of speculation about the possible societal and philosophical implications of his research.

In 1963, during a spell in his native country, Jose performed and filmed an experiment that would bring him international attention. After implanting his “stimoreceiver” in the caudate nucleus of a fighting bull at a Cordoba ranch Jose stood in the bullring. Waving a red cape and facing the charging animal he brought it to a sudden halt by pressing a handheld transmitter. Two years later, in 1965, the *New York Times* published a front page story, including a photograph with the headline, “*A Matador’s Radio Stops a Wired Bull*” by John A. Osmundsen. During an interview with the reporter Jose Delgado speculated about the implications of his research in changing human behavior and society. “...electrical brain stimulation does not simply evoke automatic responses but reactions that become integrated into social behavior according to the individual’s own personality or temperament”, Dr. Delgado said. A videotape of the bull experiment, narrated by Delgado himself is still available on U-tube today.

Sometime after 1965 Delgado received an invitation to contribute a book to be published in a series entitled “*World Perspectives*”. This was the forty first Volume in a series edited by Ruth Nanda Anshen. This remarkable woman lived to be 103, obtained her Ph.D. in philosophy under Alfred North Whitehead and was an author, editor and philosopher who established the “Seminars on the Nature of Man”, named after her at Columbia University. Her proclaimed wish as an editor was to be an “intellectual instigator” of new ideas. To this end she sought out and edited the works of many of the world’s leading scientists and thinkers encouraging them to speculate on the broader societal and philosophical implications of their own often narrow fields. The goal was to “extrapolate an idea in relation to life”. To this end she had edited the writings of individuals as diverse as Albert Einstein, Paul Tillich, Eric Fromm, Jonas Salk and Margaret Mead. For each of the many series she edited in her lifetime she selected an editorial board of the world’s leading thinkers.

For “*World Perspectives*” she chose twelve individuals. To better understand the company Jose Delgado was invited to join and the impact it may have had on his contribution I will briefly list them.

- Sir Kenneth Clark: one of the best known historians of his generation and writer, producer and presenter of the BBC TV series, “*Civilization*”.
- Richard Courant: An internationally acclaimed mathematician, a German Jew who fled Nazi Germany to become Professor at New York University and founder of the Courant Institute of Mathematics.

- Werner Heisenberg: A theoretical physicist of international stature who developed the principle of quantum theory named after him and for which he received the Nobel Prize in 1932.
- Ivan Illich: An Austrian born philosopher and internationally acclaimed social critic of medical hegemony in his book, “Medical Nemesis”.
- Konrad Lorenz: An Austrian zoologist, a founder of modern ethology who discovered the principle of “imprinting” in new born birds and shared the Nobel Prize in 1973.
- Robert M. MacIver: Chancellor of the New School of Social Research at Columbia University and President of the American Sociological Society.
- Joseph Needham: A British Scientist and historian of Chinese Science who was a fellow of the Royal Society, the British Academy and recipient of the Queen’s Companionship of Honor, the only person to hold all three titles.
- Isador Isaac Rabi: Received the Nobel Prize for Physics in 1944 honoring his discovery of nuclear magnetic resonance.
- Sir Sarvepalli Radhakrishnan: An Indian scholar of comparative religion whose writings reconciled the traditions of East and West. He was President of India after the end of British rule from 1962 till 1967. He was also Professor of Eastern Religion and Ethics at Oxford University (1936-1952) and received a knighthood from the King in 1931.
- Karl Rahner S.J.: A German Jesuit and one of the most respected theologians of the 20th. Century whose ideas influenced the Second Vatican Council.
- Sir Alexander Sachs: An American economist, member of the National Policy Committee prior to World War II, he recommended to President Roosevelt that America pursue nuclear research. Knighted by Queen Elizabeth for counsel to the Office of Strategic Services during the war.
- C.N. Yang: A Chinese-American physicist who became Albert Einstein Professor of Physics at Stony Brook and founder of the Institute of Theoretical Physics named after him. He received the Nobel Prize for Physics in 1957.

Finding himself in such distinguished company it is impossible to know if Jose Delgado was emboldened or seduced but, either way, he chose a thought provoking, perhaps provocative title for his volume, *“Physical Control of the Mind: Toward a Psychocivilized Society”*. (Delgado JMR 1977). Nor is it possible to know how much editorial influence was exerted either by the editorial board or the series editor on the title, style or content. But because this book became the backbone of the controversy that engulfed Jose Delgado it seemed imperative that I become familiar with what was actually said. So I was able to purchase a used hardback copy from Amazon for only eleven dollars.

What follows is a brief review of the book’s structure and content with verbatim quotations to represent Delgado’s actual thoughts and ideas.

The editor's introduction to the series contains this statement (p.xiv), "The Volumes in this series endeavor to demonstrate that only in a society in which awareness of the problems of science exists can its discoveries start great waves of change in human culture..."

This ideal finds an echo in Delgado's own Acknowledgments; "As T.M. Hesbacher, president of Notre Dame University has said; "Scientists cannot be neutral. We must understand the social responsibility attached to our research and the moral impact it has on the world of men, including ourselves".

The volume begins in Part 1 with a discussion of "Natural Fate Versus Human Control". Contrary to the reflexive feel of "Control of the Mind" (aka as mind-control) this is a nuanced discussion of the caution required in exerting freedom of choice, the need for awareness of outcomes, personal responsibility and a caution that mankind should pay more attention to development of man himself rather than machines.

The next chapter contrasts our increasing knowledge and control over material resources with our relative ignorance of the functions of the brain and mind. It ends with a quotation from a contemporary psychologist, "Man's greatest problem today is not to understand and exploit his physical environment but to understand and govern his conduct ... If he is to survive he must proceed to explore himself and to control his own activities ... If science provides knowledge society will display wisdom". (Beach F.A.1966).

The concluding chapter of Part 1 on Mental Liberation and Domination ends with the following... "The thesis of this book is that we now possess the necessary technology for the experimental investigation of mental activities, and that we have reached a critical turning point in which the mind can be used to influence its own structure, functions and purpose, thereby ensuring both the preservation and advance of civilization."

Part II of the book is philosophical *tour de force* that explores the well-trod topic of "The Brain and Mind as Functional Entities" followed by "Extra Cerebral Elements of the Mind". Beginning with Aristotle, Plato and Socrates it proceeds on to an extended discussion of how mind and emotions develop, the nature-nurture hypothesis and the work of scientists from Freud to Harlow in humans and primates.

Next are back to back chapters on "The Mindless, Newborn Brain" and "Sensory Dependence of the Adult Mind" that end with the rather platitudinous statement, "The cerebral mechanisms which allow us to receive, interpret, feel and react, as well as the extra cerebral sources of stimuli should be investigated experimentally".

Part III titled, "Experimental Control of Brain Functions in Behaving Subjects" is essentially a synopsis of Delgado's scientific research in lay terms accompanied by photographs of both animal and human subjects. It deals particularly with systems for punishment and reward; "Hell and Heaven within the Brain", with memory and hallucinatory mechanisms and finally with inhibitory effects, primarily on aggression.

Part IV is “Evaluation of Electrical Control of the Brain”. Here is where Delgado gets to grips with the essence of scientific and philosophical concerns raised by his research findings. To do justice to the claims he is alleged to have made I will quote his written words verbatim as they relate to each specific aspect of the research.

1. Activation of the “Will”: “We may conclude that electrical stimulation of the brain (ESB) can activate and influence some of the cerebral mechanisms involved in willful behavior. In this way we are able to investigate the neuronal functions related to the so-called will, and in the near future this experimental approach should permit clarification of such highly controversial subjects as “freedom”, “individuality” and “spontaneity” in factual terms rather than in elusive semantic discussions. This possibility of influencing willful activities by electrical means has obvious ethical implications, which will be discussed later”. (p.184-189)

What Delgado fails to point out is that all the evidence he cites is from animals, consisting of cats, monkeys and roosters which occasionally appear able to impose some volitional components on ESB induced changes in emotional state or motor activity. For example isolated roosters stimulated by ESB to become restless would attack other roosters when placed in their presence. This is far removed from his claim that “in the near future” it might be possible to use ESB to influence the highest levels of free will in humans. Jose’s hyperbole extrapolates far beyond the limits of his experimental findings and one can only be grateful that he adds a caveat about the ethical implications of what he is suggesting.

2. Characteristics and Limitations of Brain Control: “The possibility of man’s controlling the thoughts of other men has ranked as high in human fantasy as the control over transmutation of metals, the possession of wings, or the power to take a trip to the moon. In the world of science, however, speculation and fantasy cannot replace truth. In spite of its spectacular potential, ESB has practical and theoretical limitations which should be delineated”. (p.190).

Here a comment on semantics is appropriate. Although the overall tone is reasonable Delgado persistently substitutes the word “control” when “stimulation” would be more accurate. Similarly, while admitting the limitations of ESB he also alleges its “spectacular potential”. Note the company in which he places ESB by equating it with mind control.

3. Predictability: “When electrodes are introduced into a cerebral structure and stimulation is applied for the first time, we really cannot predict the quality, localization, or intensity of the evoked effects. We do not even know that a response will appear. The anatomical and functional variability of the brain are factors which limit the predictability of ESB results ... the location of a desired target requires careful exploration and implantation of only a few contacts may be rather disappointing. Present information about functional mapping in most cerebral areas is still rather incomplete”. (p.191).

Note that these modest assertions are made after twenty years of research in multiple species and tend to undermine Jose’s earlier hope that electrode placement would be a far more precise and predictable methodology than oral administration of drugs.

- Functional Monotony: “Electrical stimulation is a non-specific stimulus which always activates a group of neurons in a similar way ... The responses, therefore, are repeated in a monotonous way, and any variability is related to changes in the stimulated subject. This functional monotony rules out the possibility that an investigator could direct a subject toward a target or induce him, like a robot, to perform any complex task under remote-controlled orders... The inherent limitations of ESB make realization of this fantasy very remote ... Induced performance of more complex acts would be far beyond available methodology”. (p. 191-192).

This should be reassuring to a reader concerned about mind control but it is curiously discordant with the prior comments about ESB’s spectacular potential and possibility of controlling the human will.

- Skillful Performance: “The acquisition of a new skill is theoretically and practically beyond the possibility of electrical stimulation, but ESB can create the desire to perform certain acts which may be skillful.” (p.192).

This is a nuanced statement but what follows makes it clear that the “certain acts” are confined to those which already exist in the subject’s repertoire; what changes is the emotional or volitional climate that encourages them to appear.

- Individual Stability: “ESB cannot substitute one personality for another because electricity cannot replicate or influence all the innumerable factors that integrate individual identity. Contrary to the stories of science fiction writers, we cannot modify political ideology, past history, or national loyalties by electrical tickling of some secret areas of the brain.” (p.193).

Once again there is a puzzling dissonance between the disparaging tone of “tickling the brain” and Delgado’s opening aspiration to modify the highest levels of the human will. These might reasonably be imagined to influence political ideology and national loyalty.

- Technical Complexity: “Electrical stimulation of the central nervous system requires careful planning, complex methodology, and the skillful collaboration of specialists with knowledge and experience in anatomy, neurophysiology and psychology... These elaborate requirements limit the clinical application of cerebral electrodes ... At the same time, the procedures complexity acts as a safeguard against possible improper use of ESB by untrained or unethical persons.” (p. 194)

This is an accurate and honest statement but it omits to say that in addition to the technical constraints that stand in the way of wider clinical use of ESB is the paucity of compelling evidence of specific or replicable benefits in humans. (Discussed below).

- Functions beyond the Control of ESB: “A pattern of behavior which is not in the brain cannot be organized or invented under electrical control... Because of its

lack of symbolic meaning, electricity could not induce effects comparable to post-hypnotic performances.” (p.195)

These statements are reassuring.

- Medical Applications: Delgado begins with a general overview of the role of implanted electrodes in medicine which he describes as a “magic window ... a new method found to impose therapeutic order upon disorderly activity”. He notes that, “In spite of the tremendous potential ... The growing acceptance of even experimental surgical interventions in most organs including the human heart is in sharp contrast with the generally cold reception to the implantation of wires in the human brain”. He attributes this to, “the persistence of old taboos in scientists as well as in laymen, and to the more logical fear of opening some Pandora’s Box.” Following this hyperbolic rhetoric he moves on to discuss specific medical applications.
- Diagnosis: Delgado rightly points out that EEG recording from the surface of the skull have been relatively unhelpful in localizing abnormalities in psychomotor epilepsy due to lesions of the temporal lobe compared to depth electrodes. He concedes that both EEG and depth electrodes have “failed to provide decisive information” in mental disturbances and states, “The absence of significant data must be attributed to the lack of refinement of present methodology”. Next he suggests that the administration of drugs via implanted electrodes may be useful to “test the specific pharmacological sensitivity of a patient thus orienting his medical or postsurgical therapy”. He provides no examples or citations in support of this. Finally he correctly notes the utility of electrical stimuli in the accurate localization of areas for ablation in Parkinson’s disease. One can conclude that while implanted electrodes may be useful in dealing with structural lesions of the brain they have not been shown useful or effective in mental disorders. After twenty years of experimentation it is perhaps overly optimistic to blame this on defective methodology as opposed to a faulty hypothesis.

Therapy: In addition to the acknowledged use of electrocoagulation of localized areas of the brain in neurological disorders (involuntary movements, intractable pain and focal epilepsy) Delgado lists a variety of mental conditions it has been tried in including anxiety, fear, obsessive-compulsive disorder and aggressive behavior. Again he cites no results or research but comments, “others are more skeptical about the usefulness of depth electrodes and electrocoagulation in treating mental illness”. Delgado concludes this section by stating, “Many other possible applications could be explored ...” He lists what these might be and the appropriate brain location to be stimulated by EBS including a two way radio communication system. These are anorexia nervosa (feeding centers of the lateral hypothalamus), insomnia (median or caudate nucleus), and “the increase of patient’s communication for therapeutic purposes by excitation of the temporal lobe”. Earlier he provides three citations to support the production of “pleasurable sensations by repeated excitation of the septum and other areas” in

patients with schizophrenia but makes no comment on the significance of this in the treatment of the disorder. Jose concludes by saying, “The delivery of brain stimulation on demand to correct cerebral dysfunctions represents a new approach to therapeutic feedback. While it is speculative, it is within the realm of possibility according to present knowledge and projected methodology”.

Clearly Jose is extrapolating far beyond the bounds of his or any other research, possibly in response to the series editor’s desire to “reveal basic new trends in civilization, to interpret the creative forces at work today ... and to point to the new consciousness which can contribute to a deeper understanding of the interrelation of man and the universe, the individual and society and to the values share by all people.” (Back cover). This is a grandiose and burdensome mandate for any scientist to fulfill without risking the mantle of mad scientist!

- Circumvention of Damaged Sensory Inputs: Delgado begins by saying, “The miracle of giving light to the blind and sound to the deaf has been made possible by implantation of electrodes, demonstrating the technical possibility of circumventing damaged sensory receptors by direct electrical stimulation”. After citing individual case studies in a blind and a deaf individual where the technique was used diagnostically, Delgado concludes by stating, “It is doubtful that refined perceptions comparable to physiological ones can be provided by electronic means, but the perception of sensations – even if crude-when hope had been lost, is certainly encouraging and demands the continuation of research efforts.” The contrast between the concluding and opening statements is a striking example of the struggle between a scientist striving to remain objective and an author responding to the humanitarian and philosophical demands of his editor.
- Brain Viability: The question of when to terminate life support in an apparently brain dead individual and the limitations of the EEG as a determining factor lead Delgado to speculate on the possible use of electrode implants to “determine the parts of the brain considered essential for the survival of human personality”. This novel suggestion has not stood the test of time. The ethical squabbles continue.
- Ethical Implications: Delgado begins with a telling admission; “Therapeutic use of electrodes in cases of mental illness must still be considered an experimental phase” (p.209). He moves on to define the characteristics of informed consent for the procedure; “The experimental subject understands all the essential aspects of the study, the types and degrees of risks, the detrimental or beneficial consequences, if any, and the purpose of the research.” (p.210). This is in line with the NIH *Policies for Protection of Human Subjects* issued in 1966. He goes on to a more specific caveat; “Children and adults with mental disturbances cannot give proper consent, and relatives must

be consulted. Their decisions however are easily influenced by the picture presented by the attending physician, thus increasing his responsibility which preferably should be shared by a group of three or more physicians”. This last suggestion may reflect the NIH proposal to initiate Institutional Review Boards (IRBs) as a mechanism for wider input into ethical decision making. This was not fully implemented until after the National Research Act (1974) promulgated a National Commission for the Protection of Human Subjects (1974-1978) following which DHSS and the FDA provided detailed guidelines (1981). Despite all this there has been continuing concern about their implementation because, by definition, the IRB’s may at times fall prey to their Institution’s conflicts of interest in order to obtain research funding. After expressing these constructive and ethical constraints on the therapeutic use of implanted electrodes Delgado goes on to propose a loophole that meets his philosophical agenda; “There is one aspect of human research which is usually overlooked: the existence of a moral and social duty to advance scientific knowledge and to improve the welfare of mankind”. (p.211) He continues, “Subjects with implanted electrodes provide a good example, because... this type of research may provide data of exceptional value- available only from man- without any risks or even demands on the patient’s time and attention”. (p. 211-212) Note that Jose had inadvertently replaced “subject” with “patient”.

- Electrical Stimulation of the Psyche: Here Delgado begins an attempt to justify his not yet fully revealed philosophical objective. He first lists the anticipated objections to mind control via ESB; “The prospect of any degree of physical control of the mind provokes a variety of objections: theological objections because it affects free will, moral objections because it affects individual responsibility, ethical objections because it may block self-defense mechanisms, philosophical objections because it threatens personal identity.” (p.214). The next sentence begins, “These objections however are debatable. A prohibition of scientific advance is obviously naïve and unrealistic”. He considers that “the role of electrical stimulation of the brain” is to “add anew factor to the constellation of behavioral determinants”, (p.215)
- Toward a Psychocivilized Society: This, Part V of his book, is where Delgado finally unveils his philosophical intent. The purpose is development of “a future psychocivilized human being; a less cruel, happier and better man”. (p.232) This is a startlingly grandiose idea; to do what two millennia of admittedly flawed religion has failed to accomplish. And this alteration in normal human behavior is to occur using the same technique that has failed to remediate the brain’s malfunctions and about which the scientist in Delgado has expressed many realistic reservations and constraints. The justification for this intrusion into normal human behavior is that, “The concept of individuals

as self-sufficient and independent entities is based on false premises”. (p. 232) Later on Jose expands on the concept of external control of normal human behavior; “To discuss whether human behavior can or should be controlled is naïve and misleading. We should discuss what kind of controls are ethical, considering the efficiency and mechanisms of existing procedures and the desirable degree of these and other controls in the future”(p.249). He lists the available techniques for accomplishing control into two groups; modifications in neurophysiological activity (chemical and physical agents, including EBS) and positive or negative social reinforcements (including hypnosis, sensory deprivation, conditioning and brainwashing). (p249) To be fair to Delgado he does attempt to present a benevolent view of what he is proposing; “The phrase ‘control of human behavior’ is emotionally loaded, in part because of its threat to the ‘inviolability of the ego’ and in part because of unpleasant associations with dictatorships, brainwashing and selfish exploitation of man. Well known novels like Huxley’s *Brave New World*, Orwell’s *1984* and Condon’s *The Manchurian Candidate* are exposes of utopian societies with obedient, soma drugged, satisfied individuals whose activities are planned by the master minds of the ruling council” (p.247). Jose’s response is to stress that his “orientation should not be identified with authoritarian control. To the contrary, awareness of our own needs and attitudes is our most effective instrument for maintaining our own integrity and control of our own reactions ... Awareness is a major element in defense against external manipulation” (p.254-255) Mankind’s motto should no longer be “Know Thyself” but “Construct Thyself” (p.244)

The irony of all this is that the subtlety and ambiguity of Delgado’s presentation of his often conflicting scientific and philosophical goals would be to place his book in the same category as the novels he sought to distinguish himself from. But unlike the authors of fiction he would be held to account personally and vilified as a consequence.

Here it is important to underline the fact that Delgado’s view of “mind control” was as a benevolent and elective mechanism to improve human behavior. It is justifiable to suggest that this grew out of his early adult experiences with the evils of fascism which deprived him of his mentor, terminated his medical and neurophysiology training and, as a medical corpsman for the side opposing fascism, probably exposed him to its evils, ending with his incarceration in a concentration camp.

“It is the certainty that they possess the truth that makes men cruel”

Anatole France

Hubris is an occupational hazard for the scientist, an overflow from the natural seedbed of belief and enthusiasm essential to support the energy and enjoyment needed in the pursuit of discovery and the “eureka” moment. What triggers the growth of hubris from a natural sentiment to excessive pride and how that manifests itself is less obvious. Clearly, at some point, there is a loss of objectivity essential to good science with a resort to hyperbole about personal accomplishments, both resulting in exaggeration of results beyond the limits of the data.

Factors that enable the evolution of hubris include the fame and fortune essential to a successful scientific career; fame to support academic stature and promotion, fortune to fund research and sometimes for personal gain. Also included are public adulation and iconic named awards, not least the Nobel. Certainly the scientific and public Zeitgeist can contribute an environment of expectation to help seduce a susceptible or unwary scientist.

In her preface to the series “World Perspectives” and Jose Delgado’s volume, *“Physical Control of the Mind”* Ruth Anshen states; “Our authors are aware that the sin of hubris may be avoided by showing that the creative process itself is not a free activity if by free we mean arbitrary or unrelated to cosmic law”. There is an ironic lack of awareness in this rather obscure statement; of failure to see that placing her authors in the company of intellectual and international giants and offering them a world stage might unleash the hubris she views as avoidable, inviting the cosmic law the Greeks named nemesis. Whether Jose’s philosophical beliefs were predetermined or influenced by being in such company remains unclear.

Jose Delgado grew up in the footsteps of his Spanish idol and role model, the Nobel Laureate Santiago Cahal and may well have viewed himself as the natural successor to his Portuguese predecessor and Nobel Laureate Egas Moniz, himself influenced by John Fulton who then became Jose’s mentor and role model. This was a distinguished lineage. Jose’s own discoveries and scientific contributions followed on the heels of the birth of modern neuroscience and peaked in the years preceding The Decade of the Brain. Scientific expectations and public adulation were high, both fed by the drama and publicity surrounding the bull experiment. While this might fairly be viewed as self-aggrandizement placing oneself at personal risk to prove a point became almost a right of scientific passage ever since William Harvey inoculated himself with syphilis (and wrestled with a bear that Queen Elizabeth the First gave him).

Delgado was almost alone in his field and had pre-empted his major rival, Bob Heath at Tulane, in electrical brain stimulation. This was in 1952 when the future of neuroscience was still an uncertain footrace between physiology and neurochemistry, between electrodes and drugs. During his twenty years in America Delgado moved rapidly up the academic ladder to the rank of full professor in both physiology and psychiatry, succeeding Fulton as head of research in physiology. During this time period (1950-1970) he accumulated 200 scientific publications, became a Fellow of the New York

Academy of Sciences and a Guggenheim Fellow. He was the Salmon Lecturer at the New York Academy of Sciences in 1968 and discussed the topics addressed in his book.

This was all heady stuff, enough to sustain and inflate anyone's ego. But itemizing the risk factors for hubris does not amount to an indictment. Probably the best indicator would be Delgado's book. Its title alone is evocative but the contents do not quite live up to what it claims. Speaking as a scientist Jose is relatively modest and stays quite close to his data; it is only as philosopher that he waxes grandiose. But philosophy, in its original meaning, has mostly to do with theories not facts; "the study of the fundamental nature of knowledge, reality and existence" (OED). In this regard the author did what was asked and expected of him. This does not rise to hubris but what may do so is that Delgado clearly linked this philosophizing to the results of his own research in an extravagant manner.

This raises the question of whether what happened next can be construed as a just, divinely ordained come-uppance or something that had a more complex etiology.

Nemesis

"Vaulting ambition that o'er leaps itself"

Shakespeare in Macbeth (Act 1, scene 7)

Whatever it was due to something looking like nemesis was not long delayed; in the early 1970s the scientific, political and social Zeitgeists all began to turn against the subject of brain electrodes. In the world of neuroscience it was impossible to not notice that chemistry was outstripping physics. Neuropsychopharmacology had reached its apogee; the success of new drugs for every category of mental disorder, the drama of deinstitutionalization, the explosive growth of Big Pharma with the largesse it showered on academics, clinicians, advocacy groups and scientific organizations, including the ACNP and, most importantly, the Nobel Laureate award to Jules Axelrod and colleagues in 1970 for work on the catecholamine hypothesis of depression.

All of these events stole the spotlight away from Delgado. Although he had been a founding member of the ACNP from 1961 he became something of an anomaly, a neuroscientist whose major interest was in physiology and electricity, not neurochemistry or drugs. In the timing and trajectory of his career he suffered the same fate as those most interested in ECT.

To make matters worse Delgado had collaborated with two Harvard researchers, Vernon Mark and Frank Ervin who published their book on *Violence and the Brain* in June 1970 in which they suggested brain surgery or ESB might be used to quell violence among inner city blacks. Matters were also made worse, attracting public attention, because one of Ervin's students, Michael Crichton, had published his best seller, *The Terminal Man*, about a bionic experiment gone wrong based on research by Delgado JMR, Mark V, Ervin F and others. (Delgado et al 1968).

Guilt also came by association; in 1972 Bob Heath at Tulane University published a controversial article describing an EBS experiment in which he attempted to change the sexual orientation of a gay man by stimulating the caudate nucleus while the man was having sexual intercourse with a female prostitute.

The most effective and persistent opposition to EBS and all forms of psychosurgery, often lumped together, came from within psychiatry by Peter Breggin. A one-time scientologist (from 1972 to 1974) and an avowed humanist and libertarian he is identified by some as “The Conscience of Psychiatry” and the “Ralph Nader” of our discipline. He has conducted lifelong and effective crusades against psychiatric medication, brain surgery and ECT publishing books such as, *“Toxic Psychiatry”*, *“Talking Back to Prozac”* and *“Talking back to Ritalin”*. He is an advocate for psychosocial treatments above medical or biological interventions and the iatrogenic harm he believes these cause.

Breggin has an immaculate academic background in psychiatry; graduate of Harvard (with honors), he trained at Massachusetts Mental Health Center and SUNY before a two year appointment at NIMH and has held academic appointments at the Washington School of Psychiatry, Johns Hopkins University and George Mason University. Like many zealots for causes he is also a polarizing figure with both the public and profession; his vehement opinions are cited frequently in the media and are eloquently expressed in a plethora of articles and books. In 1971 he founded the International Study of Psychiatry and Psychology, a non-profit organization devoted to furthering his causes. Thus has included lobbying Congress in opposition to Federal funding of the treatments he opposes, including psychosurgery in 1972.

Breggin has been an expert witness in trials that involve harm to patients but not a dispassionate one. In 2005 the Philadelphia County Court of Common Pleas disallowed his testimony on the grounds it failed to meet legal standards for scientific rigor and that it critiqued a treatment, not because it was counter to acceptable standards of care, but instead conflicted with Breggin’s personal ideology about what treatment standards ought to be.

In an editorial in the *Duquesne Law Review* (Breggin 1978) that critiques psychosurgery Breggin describes Delgado’s book as, “The most totalitarian document in the psychosocial literature”. He goes on to say, “He (*Delgado*) attacks the concepts of free will and personal freedom ... he declared man wholly unfree and called for experimentation to facilitate his control through physical means. He literally wanted our children educated in their early school years to turn them on to psychiatric neurosurgical technology as a panacea for human anguish and conflict”.

Here, verbatim, is exactly what Delgado wrote about education; “What I am proposing is a modification of the curriculum to introduce the discipline of “psychogenesis”. Its purpose would be to teach factual scientific material about cerebral mechanisms, to increase the student’s awareness of his own mental and behavioral activity and to show him how to use his intelligence to decide which behavioral determinants to accept and which to reject. The present orientation of courses in psychology and sociology should be adapted and expanded to this plan.” (p.261-262).

In essence what Delgado is suggesting is that neuroscience should be added to psychosocial factors in the curriculum in order to broaden a child's awareness and choices in later life. For Breggin to turn this reasonable and nuanced suggestion into the "infliction of neuropsychological techniques as a panacea for human anguish and conflict" is selective quotation driven by personal opinion and paranoid thinking, wrapped in political rhetoric.

Breggin also uses selective quotes from Delgado's philosophical discussion of the relative role of personal and social factors in shaping behavior to accuse him of joining others doing research on EBS who, "impose their ideas upon individual human beings ... by words and deeds alike these psychosurgeons have assaulted political liberty and personal freedom".

In sequence with the shifting scientific Zeitgeist was a similar swing in political and public sentiment. This had roots going back to World War II when the public enemy number one was communism which reached its peak in the early to mid-1950s instigated by the rhetoric and witch hunting of Senator Joe McCarthy and fuelled by defeat in the Korean and Vietnam wars. Sometime in the early 1950s the CIA initiated a large scale operation to explore chemical and electrical methods of altering and controlling behavior that might be useful in covert operations. This continued into the late 1960s when Richard Helms served from 1966 to 1973 as Director of the CIA under Presidents Johnson and Nixon. Code named MK-ULTRA this effort channeled millions of dollars into the research coffers of 149 projects distributed among 44 colleges or universities, 15 research institutions, several pharmaceutical companies, 12 hospitals and 3 prisons.

Some public concern and awareness of these events must have begun circulating in the early 1970s because in 1973 Richard Helms ordered all CIA documents pertaining to the experiments should be destroyed. The following year the New York Times published an expose instigating public outrage and Congressional hearings. Naturally enough the destruction of the relevant CIA documents fed public paranoia and fuelled attempts to identify the scientists who might have been involved. In 1977 some saved documents surfaced and others were de-classified under the Freedom of Information Act in 2001. In much of this material names and places had been redacted. Successive Congressional hearings have followed these paper trails. The end result has been an internet flooded with websites authored by conspiracy theorists and victimologists that have continued for forty years and are still active today.

Searching these websites for truth and accuracy is akin to looking for needles in haystacks. Instead one finds innuendo, misinformation, guilt by association and outright falsehoods. Jose Delgado does not fare well in these Aegean stables; his name is inevitably linked to his 1969 book and its provocative title, "Physical Control of the Mind" since it provides a fertile source for out of context misrepresentations so ably demonstrated by Breggin.

An example from a website devoted to "Quotations on Technology of Mass Mind Control" (www.rense.com) lists alleged statements by Delgado in "1974 Congressional testimony". By this time Delgado had returned to Spain and the statements were made in 1972 by Breggin (a scientologist at the time) as part of his successful attempt to block further brain research by the Harvard group. That testimony consisted of a compilation of quotations from advocates of lobotomy and fabricated

statements attributed to Delgado including, “We need a program of psychosurgery for political control of our society”; “Someday armies and generals will be controlled by electric stimulating of the brain”; “Man does not have the right to develop his own mind”; and “Everyone who deviates from the norm can be surgically mutilated”. The website that propagates this travesty of truth couples these quotations with a quotation from Herman Goering, Nazi Reich Marshall.

Over a quarter century after Breggin’s intemperate testimony to Congress incited such unjust public and political condemnation of Delgado a chapter on “*Psychosurgery*” (Isaac J and Armat V 1997) in the book “*Ethics in Psychiatry*” includes a section titled, “*Breggin Mounts his Campaign*”. This is a detailed critique of the unscrupulous means by which Breggin acquired his information and manipulated it to his ideological intentions. The authors state, “Breggin’s ‘research’ paper on psychosurgery which was entered into the *Congressional Record* in February 1972 and his testimony in congressional hearings (chaired by Senator Edward Kennedy) early in 1973 relied far more on hysteria than on science”. In a more general condemnation of Breggin’s ethical behavior they later say, “Breggin was no more to be tied down by clinical realities than by scientific evidence; like his mentor Thomas Szasz, he offered rhetorical arguments and denunciation by analogy”. From then on, Breggin’s attacks on other forms of treatment would consist primarily of equating them with the long discarded lobotomy. All limbic system surgery was lobotomy. ECT was another type of lobotomy and treatment with neuroleptic drugs, “chemical lobotomy”. This adequately describes Breggin’s indiscriminate ideological agenda.

Another accurate appraisal of this campaign of disinformation in the context of Delgado’s career is contained in a *Scientific American* article (Hogan J 2005), “*The Forgotten Era of the Brain*”. He also relates the following; “Strangers started accusing Delgado of having secretly implanted stimoreceivers in their brains. One woman who made this claim sued Delgado and Yale University for one million dollars, although he had never met her”.

In early 2001 two reporters from the magazine “*Cabinet*” visited the 85 year old Delgado and his American wife at their home in Madrid (Bartas M, Exman F, Delgado JMR, 2001). In the article they cite the same website misquotations attributed to Delgado in 1974 but at the time the article was published a late retraction appears in the references; “Since publishing this article it has come to our attention that Delgado did not in fact testify to Congress on that date. The quote in question was actually a compilation of statements from Delgado’s various publications *which are accurately cited* (italics added) by Dr. Peter R. Breggin in “The Return of Lobotomy and Psychosurgery”. It was this article that was presented to Congress on 24 February 1972.”

The source of this retraction is not given but note that while it corrects the attribution it upholds the accuracy of Breggin’s allegations and almost certainly came from him.

The authors’ published interview with Delgado includes the following statements he made at the time, “We know too little about the brain. It is much too complicated to be controlled. We never knew which parts of the brain we were stimulating with the stimoreceiver”. Later on he says, “It is impossible to decode the brain’s language. We can obviously manipulate different forms of electrical activity but what does it prove?”

The questions raised on these websites about Delgado's possible involvement in CIA covert research is also dubious and vague, perhaps in part because of the destroyed and redacted material. Delgado did acknowledge receiving some support from the Navy and Air Force research arms and he did publish one article on *"Control of Behavior by Electronic Stimulation of the Brain"* (Delgado JMR, 1959b). Delgado denied any connection with the CIA but conspiracy theorists suggest that the Army and Navy research arms served as a conduit for funding.

Other distinguished psychiatrists are identified with somewhat more credibility. They include Jolyon West, Director of the Neuropsychiatry Institute at UCLA who is alleged to have worked on Sub-project 95 involved with experiments to induce post hypnotic suggestion and erase memories. West was an acknowledged expert on cults, torture, brain washing and mind control also alleged to have top secret clearance.

Another distinguished psychiatrist named was the Canadian Ewen Cameron whose involvement in CIA research was acknowledged and widely criticized including "depatterning" experiments in Sub-project 68. Cameron served as the President of the Canadian, American and World Psychiatric Associations.

I mention these two individuals not to discredit them but only to draw attention to the discrepancy between how their likely involvement in CIA research escaped the level of professional criticism and ostracism leveled at Delgado whose own involvement was never clearly established. Following Cameron's death the Canadian Medical Association journal published an obituary that was a paean of praise for his scientific accomplishments and benign personality; someone with, "an abiding interest in promoting the social wellbeing of the entire community".

The Rest of the Story

On the cusp between the sixth and seventh decades of the twentieth century Jose Delgado must have felt like a man alone in a leaky rowboat facing the onset of the 'perfect storm'.

In 1969 he was placed on the world stage by an editor-philosopher who invited him to extrapolate the accomplishments from his innovative and ground breaking research on EBS in an attempt to illuminate its relevance to the future of humanity. Seduced by this mandate he inflated the modest research findings into a grandiose philosophical vision intended to demonstrate its relevance to the future of humanity, toward what he called a benignly framed "Psychocivilized Society".

Unfortunately the timing, tone and title of his volume could not have been worse or more provocative. In the world of science and psychiatry it aroused the skillful rhetoric of a libertarian ideologue and fellow psychiatrist who was lobbying Congress successfully to eliminate all funding for this kind of brain research and which coincidentally stirred public outrage.

In the public and political domain this contributed to an upsurge of anger toward covert CIA research on aspects of mind control by drugs and electricity that involved some of the country's academic and psychiatric institutions.

Caught in these cross currents and the changing Zeitgeist Delgado was subjected to intense and disproportionate disapproval and ostracism at a time when he was almost certainly aware that EBS had run its course, had very little else to offer and no likelihood of being funded in the future.

He was providentially rescued from this existential predicament by an invitation to return to Spain and participate in the development of a new School of Medicine in Madrid. In 1971 he accepted the position as Chairman of Physiological Science at the Autonomous Medical School of Madrid with the promise of support and facilities equal to those at Yale. Here he found safe harbor but retained his post at Yale until 1974 at which time Jose and his wife left America and returned to reside in Madrid. Delgado had lived in America for 24 years, from 1950 at age 35 until 1974, at age 59.

Delgado continued to publish at a prolific rate in both English and Spanish in a wide variety of American and European journals. In Spain he continued his work on electrical cerebral stimulation in animals and extended his research into the influence of magnetic fields on cerebral function. Throughout this period he also continued to expound his philosophical ideas about brain-mind behavior relationships. His books and article on such topics increased in proportion to his scientific output in later years including such titles as, *"The Purpose of Human Life"*, *"Neurobiology of Values"*, *Biological Unity of Brain and Mind*" and *"The Neurological basis of Modern Humanism"*.

Jose Delgado's total scientific and philosophical output included over 500 publications, a majority written after he returned to Spain. Altogether he authored six textbooks, the last of which was titled, *"Happiness"* (*La Felicidad*) which went through 14 Spanish editions and remained on the top 10 best seller list for over a year in 1989. His bibliography on file with ACNP concludes in 2000 when Jose was 85 years old. In that year he had four publications including his last in English titled, *"Neural Imprinting of Human Values"* (Delgado JMR, 2000)

In the last few years of his life Jose and his wife returned to America and lived quietly in San Diego where he died at the age of 96; I was unable to find any obituary that recorded the life and death of this productive scientist and remarkable human being.

Redemption?

The title is posed as a question partly because redemption may be of little value post mortem except perhaps to disciples and family members. But more importantly not all the facts are at hand. Jose Delgado's career deserves the full time services of a talented, unbiased biographer with the time and resources to pursue many unanswered questions. This would be a service to the history of science. His story could be of inestimable value as an object lesson to young scientists in our field about the pitfalls and hazards of a scientific career.

What I was able to discover in the eight weeks I was given to write an obituary only served to wet my appetite in the search for truth due to the inescapable feeling that an injustice had been done to this man. The Greek playwrights were stingy in their allocation of redemption but here maybe is someone deserving of that benediction.

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