

good idea

 andrewamarino.com/blog/

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Carll Tucker

Editor

The Saturday Review

1290 Avenue of the Americas

New York, New York 10019

Dear Mr. Tucker:

I realize that many factors must necessarily affect your decision regarding Dr. Handler's proposed article. The very fact that he would react as he has done brings into sharp focus the basic problem reported in Susan's article. When a dispute develops concerning scientific matters which strongly affect the national interest and welfare, who should decide and how? I could well understand a decision that such a debate was not appropriate for Saturday Review; but, on the other hand, Dr. Handler has never done anything like this before, and publication of his article, together with a suitable rebuttal, would, I think, be highly readable and distinctly in the public interest. I hope you find it possible to publish his article, together with perhaps two replies—one from Susan and one from me, since we're both attacked at roughly equal efforts. If you feel that this would not be worthwhile, I'd be very grateful if you let me know so that I could pursue this idea of an open exchange with other publishers who might feel it would be appropriate for their readers.

Sincerely,

Andrew A. Marino, Ph.D.

Research Biophysicist

Assertions Made by Handler in the Article He Sent to Saturday Review and Marino's Replies

Handler's Assertion: "Our environment is suffused by electric and magnetic fields of many origins and much higher than an electric blanket."

Marino's Reply: The present electromagnetic environment contains some components arising from galactic sources and from the earth's own geomagnetism. But the overwhelmingly dominant portion is man-made. At virtually every frequency, the intensity due to man-made sources is from thousands to billions of times greater than a natural background—the background which has prevailed throughout evolutionary history. The natural electric and magnetic fields of the earth are direct-current fields. The man-made fields are alternating current fields. To compare the magnitude of AC and DC fields is simply to compare apples and oranges; such comparisons are almost never made by workers in the field of biological effects of electricity.

Handler's Assertion:	"The maximum associated electric fields directly under a 765 kV power line is approximately 10,000 V/m; the maximum magnetic field is approximately 0.5 gauss. Both fall off sharply with distance from the source. At 500 feet they are less than the natural levels, 100 V/m and 0.1 gauss."
Marino's Reply:	The statement is false. The fields of transmission lines do not reach "natural" levels for distances on the order of 5000 feet on either side of the centerline. Even at that distance, the fields due to the transmission lines exceed the naturally present field at that frequency.
Handler's Assertion:	"Most houses and other buildings are shielded from the electric field by conductors in their walls and roofs."
Marino's Reply:	There is no scientific study which demonstrates this, and, therefore, the contention cannot be accepted. Furthermore, it seems clear on general principles the magnetic field would be completely unaffected by walls and roofs. Finally, either the fields create a health risk or don't create a health risk; if they don't create a health risk, then whether or not they are shielded is immaterial.
Handler's Assertion:	"In any case, such an internal electric field is thousands or more times smaller than the external field in the air."
Marino's Reply:	There is no proof that the fields which penetrate human beings are only 'thousands or more times smaller' than the applied fields. And, therefore, the statement cannot be regarded as truth or fact. Some scientists using vastly oversimplified models of human beings—models in which they are envisioned as metal balls—have calculated that the internal fields are everywhere very small. But there is ample evidence to indicate that mathematical calculations involving simple models such as spheres, ellipsoids, or solid rectangles, can result in asserted internal values which vary over millions of percent, depending on the initial assumptions one cares to make. Thus, it is true that (1) there is no evidence to support the claim, and (2) the claim itself is based on arbitrary calculations which have no greater claim to correctness than other calculations which can establish internal values that are different by more than 100 million percent.
Handler's Assertion:	"In considering whether such a field is a hazard we move into insufficient experimental science and controversy."
Marino's Reply:	It is well to remember that whether the evidence is "insufficient" depends not only on the evidence per se, but also on the individual making the judgment. If Dr. Schwan, for example, or some other utility industry consultant says the evidence is "insufficient," that's one thing. But it's quite another for a person without an economic interest to make such a judgment. For another example, Dr. Handler has appointed Dr. Schwan to an NAS committee charged with evaluating whether evidence in this area indicates whether there exists a health risk—that is, is sufficient or insufficient. If Dr. Schwan turns out to be biased, what does that say for Dr. Handler's judgment? Suppose Dr. Handler appoints three men to a committee and they all turn out to be biased; this, I submit, can have an important impact on Dr. Handler's view of the scientific evidence—its sufficiency or insufficiency with regard to health risks—when Dr. Handler himself decides to give scientific opinions.
Handler's Assertion:	"While there are plentiful data, much of them are contradictory, and some simply experimentally invalid."

Marino's Reply: If Dr. Handler has personal knowledge of invalid scientific results that are currently held out in the general scientific literature to be valid, it is his moral obligation to disclose that fact; certainly none of the examples he cites below fall into this class. It must be asked why Dr. Handler has waited until now to disclose his knowledge that certain results in the scientific literature are invalid. I have diligently searched the literature in this field since 1974; my library is considerable, and yet does not reveal even one instance in which reputable scientists have published contradictory "results." I find it difficult to believe that Dr. Handler—whose interest in this field is very recent—could have discovered "contradictory" results which all other workers in the field have missed.

Handler's Assertion: "Efforts to search for biological effects have been imaginative, in particular utility linemen working on live 345 kV transmission lines."

Marino's Reply: ELF investigators have been hampered by the fact that the only two sources of research funds in the United States—the electric utility companies and the Department of Defense—have the strongest possible interest in denying all effects and hence all risks. That there have been some studies is a tribute to the tenacity and perseverance of a small group—perhaps several hundred investigators at most—who have labored under very different conditions. Even so, they have found and reported in the open scientific literature ELF effects on plants and animals, and have found changes in the physiological and cellular metabolism, and genetic and chromosomal patterns of many species including human beings.

Handler's Assertion: "The general conclusion extractable from the sum of these efforts is that if a hazard does exist, it has not been demonstrated."

Marino's Reply: The statement is certainly untrue. In my view, the potential hazards for human beings is demonstrated when it is shown that scientists can find biological changes in test animals when those animals are forced to live in an electrical environment similar to that in which people live. There are more than eighty scientific reports in the open peer-reviewed scientific literature in which investigators simulated the electric environments of either high-voltage transmission lines or the Sanguine antenna and found biological changes in the exposed organisms—those organisms ranged from amoebae to man. The first question to be determined is whether the scientific literature is creditable. In this connection it must be noted that the literature has met the same tests which have applied to scientific literature in every other field; how could a reasonable person reject all of it and yet maintain that the scientific literature in general is reliable? The only individuals who have attacked the competency and credibility of all of these ELF investigators is a small group of individuals who are consultants for electric utility companies, and, Philip Handler, who chose this small group as an "unbiased" and "expert" group to evaluate the Navy's Sanguine program and to advise him on the health risks of high-voltage transmission lines. In my judgment, it is a potential risk to health for individuals to be chronically exposed to the same environment shown to be productive of biological effects in laboratory studies—it's as simple as that. Reasonable men may differ in the degree of risk and, in a proper case, on the ratio of this risk to the costs involved in ameliorating it. But the time should be passed when an investigator is branded as incompetent merely because his published work violates a Procrustean bed of another party.

Handler's Assertion: "Many results have been inconsistent, with superficially similar experiments seemingly finding opposite results. For example, one report claimed a significantly increased human reaction time upon exposure to electrical fields of 3 hertz as compared to 10 hertz, whereas another report claimed that there was an increased reaction time at 12 hertz as compared to 2 hertz."

Marino's Reply: Dr. Herbert Koenig is professor of electrophysics at Technical University in Munich, Germany. He has a long and distinguished career in the study of ELF bioeffects. Among his publications is one in which he describes his observation of decreased human performance at 3 hertz as compared to the field-free situation, and increased performance at 10–25 hertz when compared to the field-free situation. Dr. James R. Hamer worked in the Space Biology Laboratory of the Brain Research Institute at the University of California. Dr. Hamer performed studies using two discrete frequencies within the 2–12 hertz range and found a decreased performance at the higher frequency as compared to the lower frequency. Both scientists reported their results in the open peer-reviewed literature—the studies were both found to meet the tests for competency and quality which are applied to the scientific literature in general. There is simply nothing contradictory about these results. It is difficult to imagine why Dr. Handler thinks these results are contradictory. Even if they were contradictory, that would mean that one scientist was correct and one incorrect; but this would still mean that there was such a thing as an ELF bioeffect and hence for people to be inadvertently exposed to the fields constituted a potential risk. So that unless Dr. Handler is prepared to assert that both scientists are wrong—that is, they fooled themselves into thinking that they had an effect, and succeeded in fooling the peer-review and editors in the journals in which they published their results—then it follows that Handler's statement has no merit.

Handler's Assertion: “Two studies assess the effect of 60-hertz fields on the growth rate of chickens; one found no effects and the second found a decreased growth rate. Such inconsistencies...”

Marino's Reply: There have been many studies of the effects of electric fields on the growth rate of chickens. Some—for example, those performed under a contract to the Electric Power Research Institute at Penn State University—have been kept secret, and others have been reported in the literature. In general, the results show that fields can affect the growth rate of chickens—but not every experiment demonstrates this effect. Whether or not an effect is seen depends on the length of time the field is applied, and the intensity of the field. Surely, Dr. Handler will agree it is silly to compare experiments done at widely different intensity levels and for widely different durations of exposure—yet that is what he has done.

Handler's Assertion: “Their evaluation is not facilitated by ad hominem attacks.”

Marino's Reply: That is a laudable sentiment which I heartily endorse. But it should be pointed out that the only scientists who have engaged in ad hominem attacks are Dr. Handler himself, and those who he appointed to the Sanguine Review Committee. For example, the Chairman chosen by Dr. Hastings has called me a “quack.”

Handler's Assertion: “Aside from inconsistencies, there are flaws in some experiments, incomplete information in others, and a drawing of conclusions not supported by what has purportedly been measured.”

Marino's Reply: Such broad-scale attacks on an entire group of scientists is unworthy of the chairman of the National Academy of Sciences. Let him come forth and stipulate the inferior studies, or let him be silent.

Handler's Assertion: “To illustrate, Soviet investigators have reported a number of complaints but scientists at Johns Hopkins University found no physical, mental, or emotional effects and studies in Canada, Germany, Sweden, and Japan have failed to show effects on workers from the electric and magnetic fields in which they intimately work.”

Marino's Reply: The nine-year study conducted by scientists at Johns Hopkins University found reduced sperm counts in some workers. This has led to a number of other studies of exposed workers and the great majority have found biological effects associated with the exposure conditions. Dr. Handler has simply misread the literature. Studies in Canada and Germany and Sweden have all shown significant effects of high-voltage transmission line-type fields—it is difficult to believe that Dr. Handler could have so misread the literature. The Soviet studies were much more thorough and involved many more subjects than the Johns Hopkins study and the Soviets found many biological effects associated with exposure to transmission-line fields. In response, the Soviet government has recognized diseases associated with field exposure as occupationally related, and they have instituted work rules governing the amount of exposure, and have embarked on a large research program to devise such rules for the public at large. The Soviets have evolved a large regulatory apparatus to govern the exposure of human beings to transmission-line-type fields. Pursuant to information exchanges between the U.S. and the USSR, NIOSH has been given copies of the latest Soviet research in this area, the great majority of it demonstrating marked effects of transmission-line fields on animals and people. With all this, Dr. Handler's reading of the literature seems particularly jaundiced.

Handler's Assertion: "Similar puzzles crop up in experiments with rats and mice. One experiment reports no effects and one asserts statistically significant effects. We shall return to its (the negative report) appraisal below."

Marino's Reply: There is nothing in Dr. Handler's history which suggests that he has ever used such an argument previously. That is, nothing in which he tries to draw a contrast or parallel between two widely different experiments and imply that they are contradictory or that there is a "puzzle" about them. Nature is what it shows; if two different and competently done experiments are performed, then their results are what we use to determine theory. The procedure does not work the other way around; we do not say 'We expect such and such' and reject all results which do not conform. So, the only issue is whether the experiment is competently done, not whether, in Dr. Handler's mind, the results comport with an entirely different experiment—that is not the criteria of scientific validity.

Handler's Assertion: "Human volunteers confined to a small room and exposed to unusually high intensity electromagnetic fields did, one experimenter reported, show higher triglyceride levels than did controls. But, again, one is left on slippery ground for public decision, for another experiment in which humans were exposed, again day and night, to similar electric and magnetic fields found no differences between control and experimental subjects. "

Marino's Reply: The experiment was performed by Dr. Dietrich Beischer in 1973 at a time when he was Director of the Naval Aerospace Medical Research Facility in Pensacola, Florida. As part of the Sanguine research project, Dr. Beischer exposed human volunteers to an ELF magnetic field and found that after 24 hours, their serum triglyceride levels were affected. The results were at marked variance with the policy of the Navy, which was to build Sanguine. In consequence, it was necessary for the competency of the study—Dr. Beischer at that time was perhaps the most prestigious investigator in biomagnetics in the world—to be attacked and destroyed. To his shame, Dr. Handler has participated in this shoddy episode. Dr. Handler appointed Dr. Michaelson to the Sanguine review committee; Dr. Michaelson reviewed Dr. Beischer's experimental procedures and concluded that the experiment was sloppily done, incompetently run, and completely worthless—Dr. Michaelson did not mention that at the time of the Beischer experiment, he had been a scientific advisor to Dr. Beischer. We can only speculate about Dr. Handler's motivation in cooperating with the vicious attack on Dr. Beischer, but it is clear that the attack has no merit, that the study was competently done, and showed a biological effect, and, therefore, that the comments made by Dr. Handler here are without merit.

Handler's Assertion: "In a related series of experiments conducted on personnel involved in the Navy's Project Sanguine/Seafarer facility at Clam Lake, Wisconsin, supposedly elevated serum triglyceride levels were found both in these personnel and in matched controls living in Illinois. "

Marino's Reply:	Studies done at Clam Lake also found elevated serum triglycerides in workers exposed there. These studies in fact led to the studies by Beischer in the laboratory. Soon after the physician in charge of the Clam Lake facility reported the elevated serum triglyceride levels, he went on "extended sea duty" and a second physician who repeated the measurements found no effects. The circumstances here do not suggest credibility on the part of the Navy. Certainly, it seems difficult to understand how someone as prestigious as the President of the National Academy of Sciences could have been fooled by these developments.
Handler's Assertion:	"One could continue in this fashion, but the leitmotif remains the same: a preponderance of the data showing no effects and some data purporting to indicate small effects of uncertain relation to the public health, all without a guiding theoretical background."
Marino's Reply:	There is no data showing "no effects." There is only some data in which investigators have failed to find any biological effects under certain circumstances. Such failures can have no public health significance in the face of the vast amount of literature in which effects have been found.
Handler's Assertion:	"Oddly, the author opines that "metal balls and calculations cannot determine what is or is not a dangerous assault on internal organs." What chutzpah!"
Marino's Reply:	If it's shaped like a ball, and has the electrical properties of metal, then, to me, it's a metal ball! It is precisely this—metal balls—which Professor Schwan has used to calculate what he says are safe values for ELF fields. That's chutzpah.
Handler's Assertion:	"Dr. Schwan's funding largely derives from the National Institutes of Health."
Marino's Reply:	Dr. Schwan has been supported by the Department of Defense almost from the day he entered the United States (January 17, 1949, as part of the Navy's project Paperclip). The record clearly shows that for almost two decades, he has enjoyed almost continuous DoD support—perhaps more than any single investigator in history.
Handler's Assertion:	"Dr. Schwan, a member of the National Academy of Sciences, is perhaps the leading authority in the United States, if not the world, on the interactions of electromagnetic fields with living tissue."
Marino's Reply:	I hope that's not true!
Handler's Assertion:	"Let us return to the experiments of Andrew Marino which have been rejected as valueless by the rules by which science guards against shoddy work."
Marino's Reply:	My work has been rejected by Drs. Michaelson, Schwan, and Miller and by Dr. Handler, but I understand their motivation and readily concede that they have a right to attack anyone they please. It is another matter, however, to try to make it appear that a full committee, the National Research Council, the National Academy of Sciences, organized science, and perhaps others, have unanimously joined in roundly condemning my work. That seems to be the thrust of Dr. Handler's argument and fair-minded people must reject it.
Handler's Assertion:	"Dr. Marino published claiming that fairly low intensity electric fields cause "stress" in experimental animals."
Marino's Reply:	Our initial studies were published in 1976. Subsequently, further work by us and others has strengthened this conclusion. It is not established beyond reasonable doubt that low-intensity electric fields can cause biological stress.

Handler's Assertion: "A prime role of committees of the National Research Council is to appraise the scientific validity of experimental results relating to the topic at hand; only scientifically valid, meaningful findings should reasonably figure in public decision making. Upon request from the Defense Department, the National Research Council appointed a committee to investigate the possible biological or other effects related to the construction by the Navy of a very large grid antenna to communicate with deep-running submarines, Project Seafarer."

Marino's Reply: Dr. Handler was approached by officials of the Navy and asked to empanel a group to evaluate the health risks of Project Sanguine. The Navy had empaneled its own group in 1973 and when the results of the committee evaluation proved displeasing to the Navy, they were quietly shelved. When the results were released to the public by Sen. Nelson of Wisconsin, the Navy approached Handler in early 1976 with a proposal for a second Sanguine review committee.

Handler's Assertion: "Appointment of the committee is the sole responsibility of the President of the National Academy of Sciences.."

Marino's Reply: That, of course, is Phillip Handler. Dr. Handler appointed Dr. Michaelson, Dr. Schwan, Dr. Miller to the committee; he did this despite the public positions by each of these men that ELF fields, approximately one million times stronger than those of Sanguine, were harmless. It was thus inconceivable that any of them would jeopardize their lucrative financial arrangements with the electric utilities by concluding that ELF fields one million times weaker than those of high-voltage transmission lines were possibly harmful—not to mention the problem of perjury that was thereby presented. A fourth individual Dr. Handler chose for the panel was Dr. Adey; he's an established ELF investigator well-known for his position that public discussion of potential side-effects must not take place until more knowledge is gained, or else the public may be unduly alarmed. Beyond these four, Dr. Handler chose eleven individuals who have virtually no training or experience or background in the field of ELF bioeffects. Dr. Handler did this in derogation of the rules governing the choice of NAS committees which state that they are to be composed of experts in the field. The choice of the utility witnesses and of a group of scientists unfamiliar with the field to me indicates a desire that the committee reach a specific conclusion—Phillip Handler clearly rigged the Sanguine committee. Having done that, it is not surprising Drs. Miller, Michaelson, and Schwan reached the conclusion that my work lacked merit and further, it is not surprising that Dr. Handler now agrees with them.

Handler's Assertion: "The committee reviewers found that the cages used to house the experimental animals could have transmitted small electrical shocks each time the rats ate or drank."

Marino's Reply: It is difficult to believe that the President of the National Academy of Sciences would argue in this manner. Of course it "could" happen; and I discussed the possibility in the original article. I gave there the scientific reasons why it was most likely that the results were due to ELF fields and not some supervening cause.

Handler's Assertion: "Was it the shocks or the fields that led to poor feeding by some rats?"

Marino's Reply: This question was first posed by Dr. Morton Miller during his tenure as an expert for the Rochester Gas & Electric Company. With the help of RG&E engineers, Dr. Miller built a duplicate of my apparatus, using detailed plans and schematics which I furnished him. Dr. Miller took color movies of rats exposed to ELF fields in his mock-up of my apparatus. Dr. Miller found that there were no shocks; these films are available from RG&E, and from the New York Public Service Commission.

Handler's Assertion: "A reviewer whose professional career has been devoted to the study of stress pointed out that stress can be validly ascertained only by comparisons under precisely controlled conditions. That was patently not the situation in the Marino experiments; thus, the animals that were exposed to ELF were housed three to a cage, while the control animals were each alone in a smaller cage; vibration isolation pads were added to the experimental cages but not to the control cages."

Marino's Reply: In the very first experiments we performed, we did not standardize the number of animals per cage in the experimental and control group. When we first began to observe ELF effects, however, we did. Only the very first studies we performed were done in the absence of such standardization. Later experiments confirmed the earlier experiments, thereby showing that the variation in number was not a significant determiner of the final result. Even if it were, and one ignored the initial study that did not control for cage number, and considered only subsequent studies wherein it was done, then, the evidence still clearly shows an ELF field effect. It was never true that vibration pads were used for the experimental cages but not the control cages; Dr. Handler's badly mistaken. Dr. Handler chooses to ignore many studies done simultaneously with and subsequent to the ones to which he refers which corroborate and verify the results which I've reported.

Handler's Assertion: "Like concerns beset interpretation of the alleged results of these experiments. The data were themselves paradoxical: Marino reported reduced levels of corticosteroid hormones whereas classic stress research shows that stress raises such levels."

Marino's Reply: We indeed found reduced serum corticosterone levels under the conditions of exposure which we employed. Again, the only proper question is whether we performed the experiment properly, not whether the results are "classic."

Handler's Assertion: "Independent analysis of Marino's own data shows that there was no statistically significant difference in the weight of the treated versus the untreated rats!"

Marino's Reply: We furnished all of the raw data for all of our experiments to the Rochester Gas & Electric Corporation because they said it would be useful to them in understanding our work. These engineers and their consultants then "analyzed" the data we had given them and, not surprisingly, came to the conclusion that the data were worthless and showed no effects at all. But fair-minded people will not agree that this was an "independent analysis," and the record shows that the utility company merely rearranged the data in an arbitrary fashion to obtain the results it wanted. Dr. Handler appoints approximately 200 committees to advise government per year; he is a member of each of the committees, and has ultimate authority over the final report and its time of release. I can only wonder if, in other important matters affecting the public health and welfare, Dr. Handler has exercised similarly poor judgment with regard to the scientific literature which he reviews.

Handler's Assertion: "Perhaps the growth of some mice was indeed stunted, but it must have been a very small fraction of the total."

Marino's Reply: On the contrary, the stunted mice shown were quite typical of those in the second generation. Dr. Handler would have realized this had he consulted our article in which all relevant details are given.

Handler's Assertion: "And the experimental procedures used do not unequivocally tell us why;"

Marino's Reply: Experimental procedures almost never do. There is no condition that an investigator know why a result which he observes does in fact occur.

Handler's Assertion: "They most surely do not provide scientifically acceptable evidence that extremely low-frequency radiation causes such effects."

Marino's Reply: The staff of the Public Service Commission of New York, the staff of the Energy Development Commission in New York, the full Commission in California, and the staff of the Department of Environmental Conservation in New York all disagree. Each has specifically found that our mice study was done properly, and could deservedly be the basis of a regulatory approach to high-voltage transmission lines. We shall shortly publish an experiment in which these results have been confirmed and extended.

Handler's Assertion: "...a conspiracy in which are united the National Academy of Sciences, the National Research Council, the Federal government, the legal system, and for that matter any scientist who dares to disagree with Marino's claims. Q.E.D.!"

Marino's Reply: Awww, c'mon, Phil! The dispute is solely with Drs. Miller, Michaelson, Schwan, and Handler.
