ly recognizes these two sources of inspiration for functional analysis, but it adds yet a third source, the problem of moments. The book does not present a chronological arrangement, inasmuch as the author's aim primarily is to provide mathematical perspective rather than "straight" history. Notwithstanding an apology expressed in the foreword "for shortcomings from the point of view of the historian," the exposition will be richly rewarding to a historically minded mathematician with a solid background in modern abstract analysis.

The mathematics of our time, permeated as it is by notions from topology, differs markedly from that of a hundred years ago, and one of the more palpable changes is an immensely greater generality of viewpoint. A century ago the function concept was all-important in analysis, but now this notion has been subsumed under the concept of a class (or space) of functions in which the study of the individual properties of the elements has given way to the search for a group structure. In his survey of the growth of this new modern analysis Monna recognizes three aspects as having dominated the development: (i) a tendency toward algebraization; (ii) a stream toward results of a structural character; and (iii) the strong influence of topology.

The first of the book's four chapters traces the development of functional analysis from Hilbert space to Banach space. It is with Banach's *Théorie des opérations linéaires* (1932), Monna writes, that "functional analysis began its course," and it was in the Polish school, of which Banach was a member, that "the explosive development of functional analysis started." Although the notion of a linear space is fundamental for functional analysis, it is a concept that belongs to algebra rather than analysis, and perhaps for this reason the author has treated it more or less independently in the second chapter. Here the presentation is more strictly historical and traces the ideas of a linear algebra from Cayley's n-dimensional geometry of 1843 to Peano's *Calcolo geometrico* of 1888. Considerable attention is devoted to the influence of the *Ausdehnungslehre* of Grassmann, an important transitional figure whose contributions all too frequently are inadequately recognized. Monna's compact volume closes with two relatively brief additional chapters. Chapter 3, "General analysis," describes the work of the Italian school, which, through the work of Volterra and Pincherle, adumbrated the general analysis of Fréchet and Moore and served as "the starting point for the theory of abstract topological spaces." Commenting on the fact that the results of the Italian school often are overlooked, the author remarks that "a history of the development of the theory of linear spaces is certainly desirable; in particular it would be most interesting to know more about the place of E. Artin and E. Noether in the development." Yet another account highly to be desired, he adds, is "the history of algebraization of geometry into modern times."

Having remarked throughout the volume the tendency toward algebraization of modern analysis, the author in the fourth and last chapter compiles a few instances of this tendency. In a closing section entitled "final remarks" he reiterates that in the course of development there has been a shift in attention from the original objects to structures. "This shift seems to be the main characteristic of the modern approach to mathematics." *Functional Analysis in Historical Perspective* is not easy reading, but it is recommended to serious scholars who wish to know how the modern abstract analysis which preoccupies graduate students today arose from the classical analysis of an earlier generation.

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Compliant Subjects

Obedience to Authority. An Experimental View. STANLEY MILGRAM. Harper and Row, New York, 1974. xx, 224 pp., illus. $10.

For about a decade the stock-in-trade of social science watchers has included an item about some crazy experiment in which a psychologist tried to make college students deliver painful electric shocks to each other—and succeeded. Some of the better-informed spectators know the experimenter's name: Milgram; and the site: Yale; but few know more details. They generally express one of two opinions about the experiment: that it illustrates a particularly callous instance of psychologists' treatment of experimental subjects; or that it exemplifies the trivialization of behavior that occurs in Mickey Mouse psychological experiments, since, surely, college students could not have truly believed they were delivering genuine electric shocks to real subjects. Finally, most social science watchers seem to believe that there was but a single experiment and that all the subjects followed orders completely in administering shocks. It is difficult to recall any other psychological investigation that has aroused so much discussion among nonprofessionals and simultaneously been so incompletely and inaccurately known.

It may be useful to clear up one misconception at once: no punishing shocks were ever delivered in the experiment and no subject suffered physical injury or, apparently, detectable psychological damage. The basic experimental situation is best described in Milgram's own words:

> Two people come to a psychology laboratory to take part in a study of memory and learning. One of them is designated as a "teacher" and the other a "learner." The experimenter explains that the study is concerned with the effects of punishment on learning. The learner is conducted into a room, seated in a chair, his arms strapped to prevent excessive movement, and an electrode attached to his wrist. He is told that he is to learn a list of word pairs; whenever he makes an error, he will receive electric shocks of increasing intensity.
>
> The real focus of the experiment is the teacher. After watching the learner being strapped into place, he is taken into the main experimental room and seated before an impressive shock generator. Its main feature is a horizontal line of thirty switches, ranging from 15 volts to 450 volts, in 15-volt increments. There are also verbal designations which range from SLIGHT SHOCK to DANGER—SEVERE SHOCK. The teacher is told that he is to administer the learning test to the man in the other room. When the learner responds correctly, the teacher moves on to the next item; when the other man gives an incorrect answer, the teacher is to give him an electric shock. He is to start at the lowest shock level

(15 volts) and to increase the level each time the man makes an error, going through 30 volts, 45 volts, and so on.

The "teacher" is a genuinely naive subject who has come to the laboratory to participate in an experiment. The learner, or victim, is an actor who actually receives no shock at all. The point of the experiment is to see how far a person will proceed in a concrete and measurable situation in which he is ordered to inflict increasing pain on a protesting victim. At what point will the subject refuse to obey the experimenter?

An accurate and detailed account of Milgram's investigation has been available through psychological journal articles appearing between 1963 and 1967. Now these results, together with some discussion of method, ethical questions, and broader societal implications, are accessible to a wider audience in a book that is clearly and simply written, yet meticulously accurate and complete. Milgram has anticipated and answered virtually every question that a reader could raise about the investigation; and he deals calmly with the attacks of a variety of critics, reflecting not only his extensive experience in lecturing on his work but also the extent to which he has been able to come to terms with a discovery that must have been personally disturbing as well as scientifically puzzling.

The discovery was simply that all the 40 college students who took part in the first version of the experiment obeyed the experimenter's orders at least to the extent of using the switches labeled "intense shock" (that is, about 300 volts) despite the "learner's" cries and protests; and almost two-thirds of the "teachers" obeyed the orders of the experimenter to the end, administering the most potent shock available. The puzzle of how apparently well-socialized, self-controlled, normal young men could be induced to inflict such pain led Milgram to conduct further variations of the experiment, in a search for factors affecting obedience level. Among other things, he varied the proximity of the victim to the subject, from a condition where the victim was out of sight and his voice could not be heard to a condition in which not only were subject and victim together in the same room but the subject was ordered to force the victim's hand into contact with the shock source. He moved the site from a Yale laboratory to a seedy office building in Bridgeport, where the ostensible sponsor was a private research firm; changed the personal characteristics of victim and experimenter; hired adult men and women from the local community as subjects; let the subject know that the victim had "a heart condition"; removed the experimenter from the room, leaving him connected by phone to the subject; allowed the subject to decide what degree of shock to administer; arranged for two experimenters to give contradictory orders about continuing to increase shock; and let a peer of the subject (an "ordinary man") give the orders. (The reader who is unacquainted with Milgram's results may wish at this point to consult his intuition as to which of these variations, if any, had a marked effect upon obedience.)

The reporting of results occupies a little more than half the book and includes, besides quantitative findings, excerpts from postexperimental interviews with subjects, occasions that were used for checking subjects' acceptance of the experimental illusion and also for helping them deal with any anxiety or guilt it may have aroused. Both functions appear to have been successfully fulfilled, and Milgram's painstaking efforts to minimize possible damage to subjects clearly overmatch his critics' concerns on this point. The content of the personal interviews is usually interesting, sometimes dismaying, but the subjects' comments are not nearly so enlightening as Milgram's theoretical analysis of obedience to authority, which takes up most of the remainder of the book.

In 1961 Milgram entitled his report to the National Science Foundation "Dynamics of Obedience." The title of the present work is not simply stylistically different. Rather it reflects a fundamental change from emphasis on the obedient individual and his internal psychological processes to emphasis on his relationship with the authority giving him orders. This change corresponds to the key explanatory concept in Milgram's analysis, namely "the agentic state"—or the psychological condition in which the activities of the subject are dominated by the wish to perform competently as the agent of the experimenter. As Milgram points out, most well-socialized adults have been preconditioned to obey legitimate authority through their experiences in the family and the institutions of society. They enter the experimental situation voluntarily and hence have an internalized basis for accepting the legitimate authority of the experimenter. The psychological shift to "the agentic state" entails the subject's redefining the situation from one in which he has responsibility for his own actions to one in which his responsibility is for compliance with authority. The agent no longer senses that his behavior flows from his self and his actions no longer reflect upon his self-image. Furthermore, the subject is bound to the situation in such a way that he finds it extremely difficult to disobey by refusing to administer further shocks. The binding conditions include the step-by-step commitment in which "earlier actions give rise to discomforts, which are neutralized by later ones"; by obligations implicit in his agreement to serve as a subject and embarrassment about challenging the authority of the experimenter; and by vague fears about vague consequences of disobedience.

The binding of agent to authority is not without strain, however, for the victim's suffering is manifest and the agent must deal with his own feelings about it. Milgram's observations suggest there are many ways to do this: by avoiding looking at the victim and paying exquisite attention to the details of the task; by denying the suffering of the victim; by minimal compliance —giving the briefest possible touch of the shock switch; by giving the victim hints to the "correct answer"; by conversion of tension into physical symptoms; by asking for social reassurance from the authority. The shock machine itself serves to "buffer" the agent from the victim's pain. Many agents blame the victim for his own stupidity, or otherwise denigrate him, a result that has been found in other psychological experiments too. A few express dissent while continuing to obey, thus apparently managing their feelings by explicitly loading all responsibility on the authority's shoulders.

Milgram's analysis is thorough and explains the outcomes of several experimental variations. It explains, for example, why the personal characteristics of subjects and experimenter do not affect the level of obedience, nor do the site and sponsorship of the experiment. Even the requirement of forcing the victim's hand onto the shock source does not reduce obedience, because it is the relationship not between victim and shocker but between authority and agent that counts. But, could another explanation be possible? Perhaps the

experimental situation provides a socially acceptable occasion for subjects to do what most of them would enjoy doing but fear to do: harm another person. One piece of evidence is ambiguous: subjects confronted with a victim who has "a heart condition" are less obedient, but only slightly so. Another piece of evidence unambiguously contradicts the "basic aggression" hypothesis: namely, that when subjects were allowed to decide themselves how great a shock to administer they usually restricted themselves to the lowest levels; only 5 percent chose to administer severe shocks. In support of the importance of the relationship between experimenter and subject-agent is the finding that when that is weakened, obedience is markedly reduced—as, for example, when the experimenter is out of the room and cannot observe which shock levels the subject chooses (or whether he administers shock at all); or when two experimenters issue flatly contradictory orders, making a dunce of the authority; or when an "ordinary man" not accoutered and cloaked with the authority of science tries to give the orders but is treated with contempt by the subject. Last, and very important, is the finding that when two apparent peers of the subject (actually confederates of the experimenter) who share the "teacher" role refuse to continue administering shocks, then obedience is greatly reduced. No other variation was as effective in undercutting the experimenter's authority as providing the subject with allies in rebellion.

The last chapters of the book include discussions of method and of ethical questions, with a glance at the similarities and differences between the experiment and its most popular analog, the Nazi persecutions. Milgram also examines the equally apt parallel for contemporary American society of the behavior of military inductees in South Vietnam. The section on problems of method is not simply an effective refutation of doubts about whether subjects took the experimental situation seriously and believed they were really delivering shocks. It is a compact and pointed exposition of the role that a relatively simple experimental paradigm can play, if used sensitively and flexibly, in helping to partial a complex social phenomenon into components and thereby enlarge the understanding of their relative contribution to the process—in this case, obedience. Milgram's experiment-based analysis is a model of systematic, sequential, patient pursuit of answers to a significant social problem. His investigations accomplish what we should expect of a responsible social science: to inform the intellect without trivializing the phenomenon. The research stands at the core of social psychology as a discipline: the linkage of individual (internal) states of cognition, affect, and motive with (external) social structure.

Finally, the analysis is convincing. The origins of obedience lie not in the personal characteristics of the participants, nor in the institutional auspices, nor even, indeed, in something so dramatic as a hardly repressed feral streak of aggressiveness. The analysis is correspondingly disturbing because it makes clear how banal the sociopsychological origins of obedience really are and, therefore, how chillingly commonplace obedience is likely to be in any even minimally stable society. "The culture has failed, almost entirely, in inculcating internal [to the person] controls on actions that have their origin in authority," says Milgram (p. 147); and the reader's thoughts leap at once to some of the large issues of our morally troubled times: loyalty and treason; duty and conscientious objection; civil disobedience and the maintenance of the minimal social order we need for survival. Milgram's work illuminates the psychological stress of principled dissent and its transmutation into action.

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Behavioral Surgery

Brain Control. A Critical Examination of Brain Stimulation and Psychosurgery. ELLIOT S. VALENSTEIN. Wiley-Interscience, New York, 1973. xxii, 408 pp., illus. $10.95.

We are still far from understanding how the human brain gives rise to the varied phenomena of subjective experience. Nevertheless we do know various ways in which behavior can be affected by physical manipulation of the brain, and there is a growing interest in the possibility of using such means to alter certain behavior patterns in human beings. During the last few years there has been wide-ranging controversy over the scientific and ethical aspects of behavior control. But no single aspect of behavior control technology has engendered more sustained or vehement debate than the one discussed in this book.

Brain control, as Valenstein uses the term, encompasses such techniques as electrical or chemical stimulation of discrete areas of the brain, electroconvulsive shock therapy, and psychosurgery. The last, also known as "psychiatric surgery," "mental surgery," "functional neurosurgery," and "sedative neurosurgery," is defined as the selective destruction of areas of the brain for the primary purpose of altering thoughts, emotional reactions, personality characteristics, or social response patterns (and is thus to be distinguished from other forms of neurosurgery). It is the main focus of Valenstein's excellent book.

Valenstein has succeeded in producing a scientifically accurate and well-balanced account of an exceedingly complex and many-sided issue. He offers a thorough, scholarly review of historical developments, a lucid description of the relevant electrophysiological and surgical techniques, and a critical survey of the available clinical evidence. His aim was to reach both his colleagues in the neurobehavioral sciences and a broader public audience. I believe he has surpassed that objective and has produced a book of great social importance.

In this time of acute social anxiety, when biological and behavioral scientists are being called upon increasingly to solve social problems, Valenstein has had the good sense to examine one proposed solution very carefully. The result should serve as a caution against simple-minded remedies. Some proponents of psychosurgery are attempting to treat the complex phenomenon of social conflict as if it were simply reducible to a personal brain affliction. Valenstein examines their factual evidence and finds it questionable. The book is at its best when it provides the reader with a clear summary of the background information necessary to draw his or her own conclusions. In this respect, the first 300 pages or so are superb: Valenstein gives a comprehensive recitation of results obtained in experimental animals and in human beings and raises (certainly in my mind) many serious doubts about the purported merits of brain control. Time and again he shows that psychosur-