Journey of a Humanist

Alfredo V. Lagmay

College of Social Sciences and Philosophy
University of the Philippines-Diliman
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To Leticia and Alfredo Lagmay

Love & Gratitude

Elizabeth R. Ventura
Ana Daisy Carlota
Ma. Lourdes Carandang

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INTRODUCTION

Thought-provoking and inspiring. These are the effects of conversations with Doc L. It would be good for anyone to hear him at his most relaxed and reflective moments. So about two years ago, Honey Carandang and I thought about taping, editing and publishing a volume on our conversations with Doc L. But it was difficult to coordinate our schedules. So luck would have it, Doc L's beloved Leti had patiently searched for and compiled Doc L's work from his M.A. thesis in Philosophy to his article on Science and Siddharta. When she turned over the articles to us—Daisy Carlota, Honey and myself—we immediately plunged into the task of publishing Doc L's writings.

It was not difficult at all to make decisions about the sequence of the articles in this volume. The three of us readily discerned the threads—philosophical, experimental-psychological, educational-psychological and humanistic. It is in this sequence that the articles are presented. It is also somewhat chronological in terms of Doc L's concerns and interests. The unity of his ideas can be seen in the final article on Science and Siddharta.

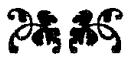
I say developing concerns and interests because Doc L never ceases to reflect on the world around him. Conversations with Doc L should follow.

Elizabeth R. Ventura

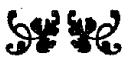
ALFREDO V. LAGMAY

FOREMOST FILIPINO PSYCHOLOGIST-PHILOSOPHER

(1919-)



Pacifico Espanto writes a well-documented and empathic biography of Dr. Lagmay in this article. He traces Dr. Lagmay's humble beginnings as well as his early affinity for academic work culminating in a BA Philosophy (cum laude). His work, with BF Skinner at Harvard is well illustrated as well as his contributions to psychology and philosophy (most especially to the development of psychology as a basic discipline in the Philippines in general, and the University of the Philippines in particular).



ALFREDO V. LAGMAY

FOREMOST FILIPINO PSYCHOLOGIST-PHILOSOPHER

(1919-)

By Pacifico D. Espanto

Scientist and philosopher of distinction, and scholar in the humanist tradition..."With this citation, then President Corazon C. Aquino highlighted the achievements that provided the basic reasons for the Philippine government to confer the rank and title of National Scientist on Academician Alfredo V. Lagmay on July 13, 1988. This is the highest award for scientists in the country.

Paramount among these reasons was "Lagmay's distinction as a major influence in the rise and growth of scientific psychology in the Philippines. His writing and publications, here and abroad, in experimental and clinical psychology on Filipino values, and on the significance of the native culture bearer in indigenous research, exemplify the high standard of excellence and originality that has made him an influential teacher for over four decades in the academe... He is founding father of the Psychological Association of the Philippines, of which he was president three times, and was Chairman of the Philippine Social Science Council, the national federation of learned societies in the social sciences..."

CHILDHOOD AND EDUCATION

Alfredo Villagracia Lagmay was born in Manila on August 14,1919. Early childhood found him caught in a web of poverty from which he struggled to extricate himself.

His father, as a young man, had wanted to migrate from Ilocos to work in the sugarcane fields of Hawaii, but managed to secure only a small amount of fare money that brought him to Manila where he found a job in the pre-war gas company called Socony.

Childhood in Intramuros exacted diligence and a firm resolve from the young Alfredo in his struggle against poverty. The eldest of three children (with a sister who would later work at the National Bureau of Investigation and a brother who went into business), he responded to the challenge by working hard and studying conscientiously. He

developed an early liking for various kinds of serious reading materials, unmindful of discouraging remarks from relatives. *"Basa ka nang basa. Anong makakain mo sa kababasa?"* (You keep reading and reading. What can you get from reading?)

He believed that *"Walang bato na di mapupudpud sa tulo ng tubig."* (No stone remains unweathered through little drops of water.")

Alfredo graduated as valedictorian in Burgos Elementary School (in old Sta.Mesa, now Ramon Magsaysay Ave., Manila). Much later on, he remembers marching to the stage on *bakya* (wooden clogs) to deliver the class poem on an improvised stage in the inside quadrangle of the Araullo High School (then in Intramuros) on a drizzling, rainy day when the graduating class was bidding good-bye to the school.

He used to be in the high school sports team for the 100-meter dash, and as an athletic bug during his undergraduate years at the University of the Philippine (UP), he felt that at 20 years, he was as strong as anyone in the office where he worked.

Previous to UP, he was employed for about a year with the United States Army in Port Area, just outside of Intramuros, where he scrubbed and polished the floor, cut the lawn grass, and served as messenger-office boy.

Both of his parents barely finished grade one in the elementary. He acknowledges, however, the analytical mind of his father and his mother's intuitive approach to problems. He encouraged Alfredo to learn using the typewriter, and when he passed the second grade civil service examinations (and the first grade examinations not too long afterwards), he sought employment in UP.

He worked initially with the Property Division of the UP administration and about a year afterwards, with the Dean of Men's office, and after this, as a reception clerk with the office of UP President Bienvenido M. Gonzalez. Working at daytime with the UP since 1939, he attended evening classes. He wanted to pursue a medical degree and forthwith enrolled in the pre-medical program.

"I had always wanted to heal... to assuage pain," he recalls pensively. Realizing however his lack of material resources to pursue a medical degree, he shifted to psychology in 1941. There were also opportunities in psychology to "heal or relieve pain and suffering."

Earlier, he had applied for scholarship and undergraduate admission with ten universities in the US. There were two replies, one

from Purdue University and the other from the University of Chicago. On the advice of Dr. Conrado Benitez, an alumnus of the University of Chicago and the Dean of the UP College of Business, he enrolled for undergraduate work as soon as he got employed by the University. But World War II erupted and changed everything.

Resuming his studies after the war, he shifted once more, this time to philosophy because there were no teachers to handle the program in psychology. He graduated in 1947 from UP with a Bachelor of Philosophy degree, *cum laude*. In the same year, he was appointed Instructor in Philosophy. While teaching in the Department, he studied for a Master of Arts degree, still in Philosophy which he obtained in 1951, *in absentia*. He had already left in 1950 for Harvard University on a UP fellowship to pursue advanced studies in psychology.

He passed his thesis orals in January 1955 and was awarded the Ph.D. degree in experimental psychology in June 1955. He returned to UP to resume his teaching post, this time as assistant professor of psychology.

CONTRIBUTIONS

RESEARCH AT HARVARD

As a graduate student in the 1950s, Lagmay was research assistant and teaching fellow at Harvard's department of Psychology. He worked with B.F. Skinner, at that time with a growing reputation as among the leading psychologists in learning and conditioning. The 1950s were the golden years of Skinner's experimental work on operant conditioning[1] and, for several years, Lagmay was part of Skinner's research team at the Harvard Psychological Laboratories. There he learned how scientific knowledge was generated through empirical exploration of functional relationships between behavior and environment contingencies, which was the main reason anyway for his original preference to study at Harvard instead of at Yale University.

Skinner in the 1950s was a leading exponent of behaviorism in psychology[2] and Lagmay's research at the Psychological Laboratories then are duly cited in *Schedules of Reinforcement (C.B. Ferster and B.F. Skinner, New York; Appleton-Century-Crofts, 1957, pp. 498-502,550-551)*, a compendium on very extensive research work there from September 1, 1949 to June 30, 1955. This is a book which is acknowledged to be one of the most valuable references on how the response of an organism is shaped, strengthened, or weakened and extinguished under various arrangements in the environment. It explored quite extensively the idea of *contingencies of reinforcement* (Skinner's

main contribution to psychology, so he said himself on one occasion to Lagmay), with the time factor, i.e. *schedules of reinforcement,* as the main conceptual pivot for arranging the various conditions of the experiments.

In 1952, while still a graduate student in America, Lagmay was elected to the scientific *Honor Society of the Sigma Xi,* the science parallel of the *Phi Beta Kappa* for general scholarship.

THE SCIENTIST IN THE PHILIPPINES

Upon his arrival in the Philippines in 1955, Dr. Lagmay was appointed as the officer-in-charge of the UP Psychology Department for two years (1955-1957),as acting head for another two years (1957-1959), then as head. Later on, he was appointed as chairman, then re-appointed to the same position several times, and thus served in that capacity for 18 years (1959-1977).

Like most administrators, Lagmay had limited research time that could be squeezed between instructional and administrative functions. Like most experimental investigators at UP, he had to contend with inadequate funding for scientific equipment and supplies. These constraints were, of course, generally experienced, especially during the mid-1950s in the University. UP was still recovering from the ravages of the Second World War. Added to these limitations was the general policy that research interest in the social sciences, including psychology and the humanities, was not-and never has been - among the top priorities in UP's research and development agenda.

These conditions were, no doubt, a far cry from those of Harvard's well-endowed Psychological Laboratories. Then in 1962, on assignment by UP President Vicente Sinco for him to study programmed instruction for application in the University and the country, Lagmay was awarded by the University once more, where Skinner anf his followers and his followers were developing programs on teaching machines and the idea of programming in accordance with the principles of operant conditioning.

He returned to UP at yearend. In 1964, Lagmay published the results of the experiments which he had conducted at Harvard. His work as sole author, entitled *The Pacing of Behavior: A Technique for the Control of the Free Operant,* which was published in the *Natural and Applied Science Bulletin,* may be considered as a milestone in his career as an experimental psychologist and his first major scholarly contribution to scientific psychology in the Philippines.

The Rockefeller Foundation awarded him a postdoctoral fellowship assignment, again at Harvard University in 1967-1968, the last two months of which were devoted to visiting some research centers in psychology of his choice in the United States and Europe.

In a retrospective which Lagmay appended to a follow-up article he published almost 20 years later, *Experiments on Pacing Under Fixed-Ratio and Variable-Interval Schedules of Reinforcement,* he reviews the experiments reported in the 1964 paper and compares them with the more recent experiments.

There were results, he says, that were quite unexpected during the experiments which were not really part of the original project. "The most fundamental of these," he points out, "was that a slow-pacing contingency, as here defined, had repeatedly demonstrated its aversive character: when an animal is prevented [from] running at optimum rates under the very strict conditions of pacing, even if the task be as simple as executing a ratio of less than 50 responses, the organism will develop a strong indisposition to respond. Almost like a profound extinct process seems to be set in motion, or that some aversive condition is generated in the behavior of the animal itself such that the organism would rather starve than engage in paced behavior."

More pointedly, Lagmay notes: "There are *suitable analogues* to this type of situation *in behavior,* such as that of an aspiring writer who has all the elementary skills for turning out a good paper but who is kept from achieving a satisfactory output because of *self-imposed criteria of excellence* that makes his task extremely difficult." (Underscoring supplied.)

To be sure, let us look back at the analogical implications that have been drawn much earlier by Skinner. In his book, *Science and Human Behavior* (Macmillan, 1953), he extrapolated behaviorist principles and theories to the study of more complex organism--man and his environment, and considered individual and group behavior as well as the roles of such "controlling agencies" as government and religion.

Two complementary fields of study touched by the broader implications of Skinner's work (and, by extension, Lagmay's too) were linguistics and education. The application of behavioral principles to educational technology led to widespread interest in what Skinner called teaching machines and "programmed instruction."

Lagmay contributed to the development of educational technology in the Philippines in his own way. He served as consultant

on programmed instruction at the UP Science Teaching Center (1962-1965) and special consultant on programmed instruction and teaching machines at the Office of Development Services, Program Implementation Agency (PIA), Office of the President of the Philippines (1965-1966).In the Philippines, programmed instruction became popular during the 1960s and has continued to be useful in education business, and industry.

More importantly, Lagmay constructed two projective tests which are suitable to Philippine education and culture. Designed in the mid 1960s and published in the *Philippine Journal of Mental Health* in 1975, the "Philippine Thematic Apperception Test" and the "Philippine Children's Apperception Test" have been considered by his colleagues in the profession as two of Lagmay's most significant contributions to psychological testing and research in the Philippines. These tests have been widely used as instruments by clinicians and researchers in psychology, anthropology, sociology, and education.

He was also the director of a UP seminar-workshop on behavioral modification, which was held for counselors, educators and psychologists for three months (January-March, 1974).

In 1975, he became an honorary member scientist of the Pacific Science Association. In 1978, he was also chosen as one of the original members of a committee that organized the National Academy of Science and Technology under Presidential Decree 1003-A. Immediately thereafter, he was elected as Academician (member) of the Academy.

He was senior Fulbright-Hays scholar of the Philippine-American Educational Foundation in 1978-1979 in the University of California at Berkeley, where he was Research Associate.

Under another Fulbright-Hays award, he was Asian-Scholar-in-Residence at San Jose State University, where he received an appointment as distinguished visiting professor in January- June 1983.

Lagmay, as distinguished visiting scientist, was invited to present the paper *The Human Reaches of B.F. Skinner's Science* in May 1983 before the San Jose State U. Department of Psychology Colloquium. Previous speakers in this Colloquium were B.F. Skinner and Carl Rogers, both of whom were his teachers in the 1950s.

This was immediately followed by another scholarship award by the Japan Foundation. For this, Lagmay stayed at Sophia University as visiting professor from August to October 1983. He wrote out his paper on EEG-alpha here during which he consulted with professor Hirai of

Sophia who was a specialist on electromyographic biofeedback and relaxation states, an area of physiological research very much related to that of brain waves.

Science and Siddhartha: Confluence in Two Differing World Views was thought out and designed during his appointment at Sophia but was read later in the 1988 International Conference on the Unity of the Sciences which was held in the United States. *Bodily disposition under EEG-alpha: in search of the Middle Way,* the other paper, prepared almost the same time as the *Science and Siddhartha* article, was read, also much later (1989) in the University of Cambridge, England, under the auspices of the Esalen Institute which held a conference on "Philosophy and the Human Future."

THE ADMINISTRATOR AND ORGANIZER

Dr. Lagmay served as officer in charge, head and chairman of the UP Department of Psychology from 1955-1977.

On the university and college levels, Lagmay chaired the activities of various working groups and committees. These included, among others, the Committee to Draft the Principles of Governance of the University (for the University Council, 1962-1963), the Self-Study Committee of the Graduate School of Arts and Sciences (1961-1963), and the Board of Management of the UP Press (1976-1977). He was also adviser of the University newspaper, the *Philippine Collegian* (1956-1977) and of the UP Writers' Club (1961-1963).

Among the more important committees and administrative bodies, of which he was a member, the following may be cited: UP Social Science Research Council (1961-1965), UP Community Development Research Council (1962-1984), Law Research Council (1962-1977), Research Advisory Committee, Office of the Executive Vice-president (1961-1962), Editorial Board, *UP Research Digest* (1961-1963), UP Code Revision Committee (1962-1963), and the University Council Committee on Student Organizations and Associations (UCCSOA,1962-1963).

Also notable are the Committee on Demography, at the Population Institute (1961-1967), the Social Science Committee, Graduate School of Arts and Sciences (1961-1970), the University Textbook Committee (1966-1978),the Curriculum Committee, College of Arts and Sciences (1968-1971), the President's Committee on Research Coordination and Promotion (1969-1970), the Advisory Committee of the Computer Center (1971-1975), and the Behavioral Sciences Committee, College of Medicine (1971-1975).

In 1962, he established the Psychological Association of the Philippines. He was a founding member, incorporator, among the first members of the Board of Directors, and writer of the original constitution of the Association. Since 1962, he was re-elected as member of the Board, except for three years. He also served as President of the Association in 1964 and 1970-1972.

SCIENCE AND PHILOSOPHY: LAGMAY'S SEARCH FOR THE MIDDLE WAY

Lagmay widened his research interests to include values education. His reflections on the direction of science and technology led him to plumb the depths of human understanding with the tools of science in search of meaning.

His broadening outlook evolved as he took active part in discussing academic as well as socio-cultural issues that were presented in various national and international fora which he attended. He attended and often read papers at the annual convention of the Psychological Association of the Philippines since 1963, the year after its founding, except for a few times when he was abroad. As a member of the American Psychological Association since his Harvard studies, he attended the annual conventions in Boston (1953 and 1967), Washington, D.C. (1968), and in Los Angeles (1985). Also as a member, he attended the International Congress of Psychology (of the International Union of Psychological Science) held in Tokyo (1972), Paris (1976). Leipzig (1980),and Acapulco, Mexico (1984). In Acapulco, he read two papers: *Idiographic Premises of Knowledge Formation and the Third World Social Sciences* and *Bahala Na II: Externally- Induced Dysfunctional Interpretations of Uncertainty.*

AWARDS AND RECOGNITIONS

Dr. Lagmay received high honors before and after his official retirement from UP in 1984 as professor of philosophy and psychology.

Two years before his official retirement as professor at the University of the Philippines on December 10, 1982, the *Pambansang Samahan ng Sikolohiyang Pilipino* (National Association for Filipino Psychology) honored him with the Award of Recognition for his "continuing and undeviating dedication to the development of psychology in the Philippines; because of his scientific and humanistic outlook in teaching and research; and most of all, because of his profound understanding of the meaning of Filipino psychology in culture and society." This association would confer him another award, *Gawad Sikolohiyang*

Pilipino on December 10,1996 with this citation:...*Para sa kanyang natatanging ambag sa paglinang ng Sikolohiyang Pilipino bilang disiplina; sa pagsulong niya sa pagsusuri sa mga epistemolohikal na usapin sa katutubong sikolohiya at patuloy na pagharap sa hamon ng isang siyentipiko at unibersal sa sikolohiya; sa kanyang pakikiisa sa pagtatag ng Pambansang Samahan sa Sikolohiyang Pilipino at patuloy na pagtaguyod sa mga adhikain at gawain nito.*

On November 17, 1984, the International Association of Anthropological Diplomacy and the Association of the Third World Studies bestowed upon Lagmay the Distinguished Service Award "for outstanding contributions to psychology as scholar, researcher, and administrator." The award was given during the annual convention of the American Anthropological Association held in Denver, Colorado.

On June 15, 1985, the UP College of Arts and Science Alumni Association and the College of Social Sciences and Philosophy accorded him the Award Of Distinction in Psychology.

All these accolades prefigured, in a sense, the National Scientist Award that was bestowed upon Academician Alfredo V. Lagmay on July 13, 1988.

On November 18, 1985,the National Association for the History of Psychology awarded him the Honor of Recognition for his "unique contribution to the growth and development of Filipino psychology in its rise as a science which is nationalistic and humanistic."

THE FAMILY MAN

In his younger days, career pursuit had taken precedence over settling down till he reached mid-30s. Despite a relatively late marriage to Leticia G. Amante in her mid 20s, the couple was blessed with seven children within 10 years; three daughters - Violet, Helen, Susan; and four sons - Alfredo, Jr., Sulayman, Gracian, and Mahar. All of his children are now professionals, some raising their own families, too. Grand parents Alfredo and Leticia travel to recharge their aging bodies through brief visits with their children and grand children.

CONCLUSION

He values freedom above all. "You have to give up pursuits that detract your attention from the more meaningful side of life", he says. He shares these thoughts about the value of the academe, the joy of teaching and of life:

"I remember the wrestles, the numberless bouts with word and thought to define and impress upon ourselves the concept that our University is a guild of intellectual craftsmen, that it is a community dedicated to arts and letters, to science and philosophy, to the art of making music, great violins, vintage swords and fine metal work, with masters willing, as they must, to transmit and teach their skills, their art and their knowledge to those who wish to learn from the master:

This job of transmission and creation, of nourishing the mind and the spirit of man, has been for me a chastening experience. I remember how somewhere along the road I rediscovered my faith in the youth, the young ones who come trooping fresh to our doorsteps every year, as I did 50 years ago in 1939. To me every batch of new eager faces has become a renewal of a vow of poverty and the duty to transmit and create new possibilities in our art and our vision of the human future.

As for me, however, I should wish to say this: "I do not know that I shall come back to this earth again after I pass away, but if I do, I would like to start from where I left off the last time."

At age 77 (when interviewed at his residence at UP Diliman), he speaks of a working style which calls "*higawa*"(*higa* = to lie down / rest ; *gawa* = to work) - the alternation of rest and work. It is really a metaphor at the same time, for the rhythms of life itself.

He also says, "Good thoughts, like birds that home, have to be released, for them to wander back. Like the wind, they come and go. The released, is a free gift, and when they go home, we are grateful. Freedom is the open system in the realm of the mind.

In the things of the mind, Dr. Alfredo Villagracia Lagmay, the psychologist-philosopher, finds "the ideal home in the universe."

END NOTES

[1] Skinner's behaviorism were a strictly operational view of reinforcement—anything that increases the probability of a preceding response—and a strong emphasis on precise "schedules of reinforcement." To test his theoretical concepts, Skinner developed a new method of conditioning called 'operant conditioning, which differs from the classical Pavlovian conditioning process in that reinforcement occurs only after the animal executes a predesignated operation, such as pressing a lever or pecking at an illuminated disk. This method was greatly refined by extreme simplification of the animal's environment. For example, rats were confined in boxes, called 'Skinner boxes', which contained simply a horizontal bar that the animal could depress to release a pellet of food. Other experimental techniques involved the pecking response of pigeons, which can be precisely controlled. Lagmay used pigeons used pigeons as experimental subjects in his studies which were conducted at the Harvard Psychological Laboratories.

[2] In a survey by Korn, J.H.,R. Davis, and S.F. Davis, the *American Psychologist,* July 1991, 46 (7): 789-792, both historians of psychology and chairpersons of graduate departments of psychology voted that B.F. Skinner is the most eminent of contemporary psychologists. Also, the chairpersons of graduate departments of psychology voted him as the most eminent psychologist of all time.

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Ms. Jane F. Tenorio for conducting the interview with Dr. Alfredo V. Lagmay; Mr. Raimund C. Agapito for the occasional conversations with the author in preparation for the interview; and Mrs. Kerrima H. Espanto-Licardo, Ms. Leina H. Espanto, and Ms. Pamela C. Joyosa for the typing.

ALFREDO V. LAGMAY, PH.D.

EXPERIMENTAL PSYCHOLOGY

Date of birth : August 14, 1919

Birth place : Manila

Education : Ph.B. (Philosophy), *cum laude*,
University of the Philippines, 1947

MA (Philosophy) University of the Philippine, 1951

Ph.D. (Experimental Psychology),
Harvard University, USA, 1955

Year conferred as National Scientist : 1993

Alfredo V. Lagmay, scientist and philosopher of distinction, and scholar in the humanist tradition, has been a major influence in the rise and growth of scientific psychology in the Philippines. His writings and publications, here and abroad, in experimental and clinical psychology, on Filipino values, and on the significance of the native culture bearer in indigenous research exemplify the high standard of excellence and originality that has made him an influential teacher for over four decades in the academe. He is founding father of the Psychological Association of the Philippines, of which he was president three times, and was Chairman of the Philippine Social Science Council, the national federation of learned societies in the social sciences. He is President of the Division of Psychology and National Development of the International Association of Applied Psychology. For outstanding contributions to psychology as scholar, researcher and administrator, he was conferred the Distinguished Service Award during the 1984 convention of the American Anthropological Association. He was recipient of the Award of Distinction in Psychology from the University of the Philippines and Gawad ng Pagkilala from the Pambansang Samahan ng Sikolohiyang Pilipino.

IMPORTANT POSITIONS HELD

President, 1986- member of the Executive Board, 1982-, Professors' World Peace Academy (International Cultural Foundation), Philippines

President, International Social Science Honor Society of the Pi Gamma Mu (Philippine Chapter), 1971-1975

Vice- President, 1978-1982; Acting President, November 1989 and several times in 1980, 1981 and 1982; member of the Executive Council, 1978-1982; 1985-, National Academy of Science and Technology

Chairman, Philippine Social Science Council, 1972-1973

Chairman, 1979-1982,1985-1986, Social Science Division; member, Executive Board, 1974-1976, National Research Council of the Philippines (NRCP)

Editor, 1976-1980; Editorial Board member, 1970-1980, Philippine Journal of Psychology

Editor, Psychologica Ethnica (an international journal of indigenous, ethnic and cross-cultural psychology),1986-

AWARDS AND RECOGNITIONS

Gawad Sikolohiyang Filipino, National Association for Filipino Psychology, 1996

Honor of Recognition, National Association for the History of Psychology, 1985

Award of Distinction in Psychology, UP College of Arts & Sciences Alumni Association and the College of Social Sciences & Philosophy, 1985

Research Fellow, National Academy of Science and Technology, 1985

Distinguished Service Award, International Association of Anthropological Diplomacy and the Association of the Third World Studies, 1984

Distinguished Visiting Professor and Asian Scholar- in Residence, San Jose State University, San Jose, California, 1983

Award of Recognition, National Association for Filipino Psychology,1982

Professorial Chair, UP Alumni Association Research Professor of Psychology,1973-1975

Honorary Member Scientist, Pacific Science Association, 1975

Award for excellence in the biological sciences, Phi Sigma International Honor Society in the Biological Sciences, 1974

Member, Scientific Honor Society of the Sigma Xi (Harvard Chapter), 1952

MAJOR PUBLICATIONS

1957. Differential reinforcement of low rates, with pacing: multiple VI-VI with pacing. pp. 498-502,550-551 in C.B. Ferster and B.F. Skinner. Schedules of Reinforcement. New York: Appleton-Century-Crofts.

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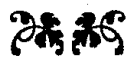
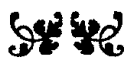
A Logical Analysis of the Concept of Existence Involved in Existence Propositions



The following article, which was published in the Philippine Social Sciences and Humanities Review in 1952, was based on Dr. Lagmay's master's thesis. The article examines the concept of existence propositions and determines the conditions under which existence propositions may be held to be true. Dr. Lagmay asks the following question: "... in what way are objects which are held to enter into existence propositions meant to 'exist'?" In search of the answer to this research question, he analyzed the syntactical and semantical problems presented by existence propositions.



A Logical Analysis of the Concept of Existence Involved in Existence Propositions*

SECTION I
INTRODUCTION (THE OCCURRENCE OF EXISTENCE PROPOSITIONS)

An existence propositions in the nomenclature of modern logic is an expression of the form "(Ex) P(x)", which is variously read thus:

(a) "There is an x such that P(x)."
(b) "There exists an x such that this x has the property P."
(c) "For at least an x, P(x) is true."
(d) "P(x) is sometimes true".
(e) "For some choice of x, P(x) is holds".
(f) "Some x's have the property P.
(g) "There is a value for which P(x) is satisfied."
(h) "P(x) is satisfied by at least one value of x".
(i) "An x satisfies P(x)."

The basis for calling this an existence proposition, perhaps, is best to be found in the rendering (b) where "existence" is ascribed, rightly or wrongly, to objects by reference to them thru a variable. A less obvious basis is (a) where the phrase "There is an x..." is usually taken to convey the meaning of "There exists an x..." In traditional logic and common parlance, at least, the phrase "there is" is held to convey "existence"; the impress of common sense and traditional grammar which was developed on the suppositions of the old logic survives and has been strong in identifying these two forms of expressions. It is not even unusual to find certain languages other than English the idiom of which gives *"existence"* as one of the meanings indicated by the phrase *"there is"*. For example, the word *"hay"* in Spanish may be mentioned, of the German phrase *"es gibi"* and the French idiom *"il y a."*

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It must be noted that, besides (a) and (b), all the rest of the above readings (c)—(i) are characteristic logistics as well as mathematical renderings, existence propositions being a basic statement form in these disciplines. (c), (d), and (e) are readings that seem to involve the notion of truth in connection with sentential functions, while (g), (h), and (i) have to do with the notion of satisfying a function. This is from a direct inspection of these renderings, although we cannot suppose that these ideas are not involved in the others also.

Examples of existence propositions abound in mathematical discourse and its applications:

(1) "There is an irrational number such that its square is equal to 2."
(2) "For at least an x, $x^2 - 5 = 20$."
(3) "It appears then that our requirements involve the existence of a number x and a point P, not one of the rational points already constructed, such that AoP = x, $x^2 = 2$;..." or, to put it differently, *"There exists a number x and a point P such that ...etc."*

These examples are at once recognizable for they are taken directly from a discipline where existence propositions are a basic form ofdiscourse. The more elusive ones are those that occur in conversational language, and these are the ones that are a constant source of trouble when employed in philosophical discourse.

For instance, there is an example which Pap[1] uses for establishing the point that the predicate of "existence" is eliminable: "Lions exist." This is translatable into the form "There is an x such that x is a lion" or "For at least an x, x is a lion," etc.

One problematical expression that we must note is the particular statement in the traditional syllogism, i.e., "Some men are mortal." The logistic form for this is held to be an existence proposition, thus: "There is an x such that x is a man and mortal."[2] This is interesting because from the logistic point of view, it is not possible to derive the proposition. "Some men are mortal" from "All men are mortal" unless there is additional information to the effect that "There are men," i.e." There exists an x such that x is man." Note that the statement "There are men" is another existence proposition.

Another one, which apparently is similar to the statement "Lions exist," is the troublesome form "An object *x* exists" which is frequently employed in philosophy as well as mathematics.[2] This example is

mentioned here as a possible existence proposition, although we must not decide whether it is one or not at this moment.

There are various other expressions with which the word "exists" attaches, e.g., "Pedro exists" or "The universe exists," which are not existence propositions. These two examples and the like are the historical forms of propositions about existence in contradiction to existence propositions: the former is of the form "the so-and-so exists" or "E(S)" where "E" is the predicate of existence and "S" the logical subject. This is intended to be a proposition which is either true or false depending on whether the subject has the corresponding property of "existence" or not. The latter, however, i.e., existence propositions, make reference to "existence" by means of a variable qualified by a phraseology introduced by "such that"; the phrase where the word "exists" occurs is a complementary part of a subject-predicate expression. Thus "There exists an x..." is an indispensable complementary part of what is introduced by the phrase "such that" namely, "P(x)."

A word nevertheless must be said on a general feature of existence propositions that might help us to recognize it. From available literature on the subject, it seems that a statement is considered to be an existence proposition when it satisfies the following: whenever the words "some", "something", "there is" "there exists", "at least", and the indefinite articles "a" and "an" are used such that a predicate or a function is asserted for the substantive that follows these words. For example, in "Some men are mortal" we may say that the predicate *mortal* is asserted for the substantive *men* which follows the word "some". Or, to take another instance: "At least one point O lies between A and B such that $\frac{2}{AO} - OB = 5$," i.e." *There exists a* a point O such that this point lies between A and B and $\frac{2}{AO} - OB = 5$." It is not difficult to locate the substantive which immediately follows "at least" or "there exists" and the function for which it is asserted. Note also that the substantive must be considered in its plural sense, for this is to be represented by a variable.

IMPORTANCE OF A STUDY ON THE CONCEPT OF "EXISTENCE" INVOLVED IN EXISTENCE PROPOSITIONS.

Because existence propositions, as they occur in ordinary discourse, as well as in philosophical or scientific discussions, is capable of various interpretations, which, if inaccurate in that they are not legitimately contemplated within the intentions for which existence propositions may be applied, might easily lend themselves to the construction of a false

metaphysics or theory of knowledge, it is essential that the preliminary of clearing the way for an accurate reading of this expression be undertaken. The task of doing this will involve us into the general conditions of assertability of expression of this kind as well as the sort of derivations that are possible from it.

To illustrate one kind of problem that may be associated with existence propositions, let us take the stock phrase frequently encountered in philosophical discussions: "An object *x* exists." This expression has a relation to existence propositions as may be judged from the way they are read, one of which is, as mentioned already before, "There exists an x such that P(x)." This contains the phrase "There exists an x..." It might be conjectured that the thesis of realism is dependent on the properties of this phrase, for common sense might consider it as a transcription for the phrase "The object *x* exists." It may be a legitimate transcription or it may be not. Those who say that it is not will say that the accurate reading of the existence proposition is "For at least a value of x such that P(x)." But what is there to prevent one from reading this as "There exists an x such that P(x)"? It is essential that this point be settled, for the problem of realism might be stated in an entirely different way if common sense has entirely misconstrued the meaning of the expression "The object *x* exists" in relation to "There exists an x such that P(x)". It is not being suggested at all that the solution to the realistic problem shall have been decided through a clarification of existence propositions. What is meant is that it should be possible to state the problem correctly in relation to existence propositions through an appropriate rendering of such expressions as "The object *x* exists" in terms of existence propositions, if this is at all possible. But this rests on the prior determination of the conditions under which existence propositions may be held to be true. This determination is the object of this study.

The case for realism or some other stand with respect to "existence", as stated in terms as general as possible with reference to the expression "The object *x* exists" which might be a part of "There exists an x such that P(x)", involves the corresponding statement for the principle of causality, or, to extend it further, for our knowledge of the external world-in what way are objects which are held to enter in existence propositions meant to "exist"? A clarification of the prior problem of existence propositions might help in understanding these persistent questions of philosophy.

SECTION II

STATEMENT AND DEFINITION OF THE PROBLEM

In order to understand now the above-mentioned examples, one is required to give an analysis of expression of the form " $(\exists x)P(x)$" and its derivatives. Analysis as contemplated in this study will be made under a two-fold presupposition of expressions in general, namely, syntactical and semantical.

SYNTACTICAL AND SEMANTICAL PROBLEMS WITH RESPECT TO EXISTENCE PROPOSITIONS.

An existence propositions, $(\exists x)P(x)$," as one may see, is composed of several distinct component, i.e. the existential operator,[4] a predicate, and a variable argument, the juxtaposition of which constitutes a syntactical problem should we inquire into the presupposition of such a juxtaposition. What is the relative independence of each of these component parts with respect to each other? If left standing alone, are they significant?

There is the possibility that an existence proposition is just another way of writing another expression which does not involve the component parts of said existence proposition. If there is, then we must give the conditions for the derivation of this expression from the other. This problem gives rise to the following complementary questions.

What is the relation between variables and constants?[5] What is meant by a sentential function and the notion of "satisfying a senténtial function"?

With respect to the inverted-E which is juxtaposed to the variable configuration "x" to form "$(\exists x)$", it must be asked whether this inverted-E can ever be construed as a predicate or not. This question is raised because one way of reading "$(\exists x)P(x)$" is "There is an x such that $P(x)$", which though already an interpretation of the symbolic form, easily leads in the case of the operator "$(\exists x)$" to the conversational form "There is an x..." or "x exists...". We must consider the possibility that a syntactical method for clarifying this point might be available.

The most general way of posing the semantical problem involved in existence propositions is by asking in what way such expressions are construed to be true. How is their truth related to our notion of a constant? Do variables denote such that, if they do, the sentential function "P(x)" has meaning in a way that may be compared to an expression which contains no variables, say "P(a)" where both "P" and "a" are constants?

Considering the usual notion that a proper name is related by the relation of designation to something in virtue of which it is a name, and that proper names constitute the "reference" of the variable which is a part of existence propositions, it might be profitable to investigate the properties of this relation (of designation) in the hope that this might throw light on the nature of existence propositions. A treatment of this problem may lay emphasis on either of the following: (1) on the non-verbal term of this relation, i.e. those that are named-objects, in which case the main interest in this problem will center within an area which is primarily epistemological and metaphysical in character; and (2) on the verbal term of this relation, i.e..., the names as signs. In this study, attention shall be confined to the second of these two points of emphasis. Indeed, the question of truth concerning existence propositions is dealt with here in order to analyze its immediate relation to the most elementary forms of expressions and their general truth-conditions and not in order to uncover its epistemological and metaphysical presuppositions. A discussion, therefore, of problems involving proper names or constants will be made only insofar as they immediately show the relation of existence propositions to another expression in which the former enters as an immediate derivation or assumption.

ADDITIONAL LIMITATIONS ON THE SCOPE OF THE STUDY.

Furthermore, no attempt whatsoever will be made to develop a calculus in order to meet the needs of a complete and thorough-going analysis. No such completeness is aimed at in this little study which will be confined merely to a re-examination of those portions of existing calculi which involve existence propositions in terms of certain distinctions which shall be our endeavor to state as precisely as possible.

Sometimes better insight is gained into the bearings of an analysis if it is applied to a specific problem. The purpose, therefore, for which certain philosophical attempts to state or solve the problem of existence shall be considered, will be insofar as this problem is contained in existence propositions. This is done in order to see how our theory of existence propositions might help in understanding these philosophical attempts. The concept of "existence" involved in the discussions of Quine, Aristotle, Kant, and Russell are taken up in a later part, consequently, as problems only in the sense that it is desired to clarify the problem of existence insofar as existence propositions become the vehicle of expression for the analysis of their problem. If they do not immediately relate to existence propositions, all other considerations, though important to a discussion of the concept of existence, are not comprehended within the scope of this study.

SECTION III
HISTORICAL SETTING OF EXISTENCE PROPOSITIONS

While the general problem of existence is, perhaps, as old as philosophy itself, it might be said on the other hand that analysis as to whether existence propositions contain or involve the problem of existence is of a comparatively more recent origin. Because the analytic treatment of variables, in terms of which existence propositions are couched, is distinctly a characteristic of mathematical discourse, no definite treatment of the problem of existence in terms of existence propositions was possible in traditional philosophy until only recently when the importance of mathematics as a symbolic language for dealing with abstract problems came to be realized. The background of existence propositions had been developed largely on the side of mathematical logic; hence any attempt to trace the setting of existence propositions must perforce center mainly on an area somewhat different from that considered in historical problems of existence.

There was, of course, the generally recognized mathematical locution for a function that is satisfied by a value, e.g., such statements as "There exists an x such that so-and-so" or "For at least an x such that so-and-so". The introduction of the functional notation in mathematics carried with it the phraseology borrowed from common usage "There exists an x..."

The first major attempt, however , within the English literature of the subject, to bring statements of this kind into focus with respect to philosophical problems more or less begins with Bertrand Russell who in 1905 published an article[6] on a theory which used existence propositions as a basis for what later on came to be known as the theory of definite descriptions.

A definite description in brief is a phrase of the form "the so-and-so" such as, for example, "the father of King John" or " the center of the universe," which is symbolized thus: "$(?x)(\phi x)$." This is read as "the one and only one x that satisfies ϕx." Russell proposed to clarify the metaphysical problem of existence by applying the word 'exists' only to definite descriptions, i.e. to things-described. " When, in ordinary language or in philosophy, something is said to 'exist', it is always something *described*, i.e., it is not something immediately presented, like a taste or patch of color but something like 'matter' or 'mind' or 'Homer' (meaning 'the author of the Homeric poems'), which is known by descriptions as the "so-and-so", and is thus of the form $(?x)(\phi x)$."[7]

Russell now defined the existence of a definite description in terms of existence propositions: "...any statement apparently about $(?x)(\phi x)$ requires (1) $(\exists x)(\phi x)$ and (2) $\phi x \cdot \phi y \cdot \supset \cdot x = y$; here (1) states that *at least* one object satisfies ϕx, while (2) states that *at most* one object satisfies ϕx. The two together are equivalent to

$$(\exists c) : \phi x ; \equiv \cdot x = c,$$

which we defined as E: $(?x)(\phi x)$."[8]

The existence of classes and relations was also defined in terms of existence propositions: "A class is said to *exist* when it has at least one member: α exists' is denoted by '$\exists ! \alpha$'. Thus we put

$$\exists ! \alpha \cdot = \cdot (\exists x) \cdot (x \in \alpha) \text{ Df.}"[9]$$

On the other hand, the corresponding definition for the existence of a relation R is

$$"\exists ! R \cdot = \cdot (\exists x,y) \cdot xRy \text{ Df.}$$

i.e. "$\exists ! R$ means that there is at least one couple x,y between which the relation R holds."[10]

But the climate of thought under which the works of Russell was developing may be seen to be influenced by and within two perspectives: on the one hand was a growingly intensified interest in clarifying the foundations of mathematics, the *Principia Mathematica* of which had set an example in its own right; and, on the other hand, was the increasing realization that the language of mathematics was ideal for exploiting the classical problems of philosophy.

One of the most notable questions to come within the first perspective in relation to existence propositions was raised by Brouwer [11] with respect to the applicability of the law of excluded middle to transfinite set. This is interesting because the vehicle by which the problem is raised is the existence proposition. The following in brief is the argument of Brouwer:

Suppose for example that we have a function P(x). The law excluded middle with respect to this function would be stated thus:

$$(x)\ P(x) \vee (\exists x) \sim P(x)$$

which he says is applicable if there is a method of determining the truth or falsehood of either of the terms in this disjunction. If the range of the variable "x" is finite, the truth of "(x) P (x)" can be determined in a finite number of steps. Should it turn out that "(x) P (x)" is false, then by the

application of the above law, it is true that "$(\exists x) \sim P(x)$". i.e. *There exist* an x such that $\sim$ P (x)."

But suppose on the other hand that the range of the variable "x" is infinite. Since we cannot arrive at the last term in the series contemplated by the statement "(x) P (x)," we would not know whether this is true or false. Hence, we cannot decide whether "$(\exists x) \sim P(x)$" is true or false through mere application of the law of excluded middle. The law of excluded middle in the form stated above, consequently, is inapplicable to infinite sets.

Unfortunately, we shall have no occasion to deal with this problem as a technical subject in mathematics; attention will be confined merely to an analysis of the meaning of "There exists an x such that P(x)" or "There exists an x such that $\sim$ P(x)", which, I think, is the prior problem in the thesis of intuitionism.

The other perspective of which we spoke springs from the body of traditional philosophical doctrines which some people realized were in need of treatment by means of these precision tools being forged by the new logicians. For instance, traditional Aristotelian logic with respect to inferences from a universal proposition to the corresponding particular proposition was held to be invalid when formulated logistically; it has been claimed that an additional premise, which is an existence proposition, is needed to effect a valid inference of this sort.[12]

Also, there was the Kantian doctrine of "existence" which is believed to be precisely formulable in terms of definite descriptions[13] which in turn is definable through existence propositions. All these have been taken to be a sign that, as a tool for handling the traditional problems of philosophy, the new logistics is adequate to the purpose of philosophical analysis.

The problem now is to determine to what degree and in what sense "existence" is involved in existence propositions.

SECTION IV
SYNTACTICAL ANALYSIS

Having divided our problem under a two-fold presupposition of expressions, i.e. syntactical and semantical, we now have to specify in this chapter what is meant by syntax and syntantical analysis and show how these specifications apply to the problem of existence propositions.

It is usual to speak of syntax as formal in that its characterizations "speak only of the typographical constitution of the expression in question and do not refer to the meanings of those expressions."[14] This notion of syntax involves the idea that expressions are mere shapes and strings of events. Now, the syntax of a language, which is concerned with the formal properties of expressions, is given by an enumeration of the syntactical rules of that language, i.e., by its rules of formation and transformation.[15] The syntactical analysis of existence propositions, as required in this study, will then be confined to a discussion of rules of formation and transformation relevant to an understanding of it.

DEFINITE AND INDEFINITE EXPRESSIONS: SENTENTIAL FUNCTIONS.

Every language with a specific structure, e.g., such formalized languages as the deductive logic of the *Principia Mathematica* or Hilbert's geometry, begins with a set of undefined terms. All other expressions in that language must be formed or constructed from them in accordance with rules that state the conditions for writing of all other expressions outside these undefined terms.

Suppose for example now that our language admits of "a", "b", "c", etc. as undefined individual constants and "P", "Q", "T", etc. as primitive predicate constants.[16] Then by a juxtaposition of "P" with "a" under the limitations imposed by the rule of types,[17] we form the expression "P(a)". So that by this

D.IV-1.[18] An expression of the type "P(a)" is *definite* if and only if it is formed from initially given undefined terms or constants.

Another way of stating this is that if "P(a)" is made up of terms which are primitive constants of the system, then it is a definite expression in that system. From D.IV-1 can be obtained the notion of an indefinite expression by the following definition—

D.IV-1.1 An expression is *indefinite* if and only if it contains an element that is not among the enumerated constants.

By the above procedure, it is possible now to form a series of expressions, say, "P(a)", "P(b)", "P(c)",etc. each of which are definite in the sense of D.IV-1. We shall call each of these expressions an atomic elementary sentence.

Consider for the moment this set of atomic elementary sentences: "P(a)", "P(b)", "P(c), etc. where it is desired to speak of the individual argument constants in an expression of the same form as that of each of the atomic elementary sentences, but which expression is not to be identified with any particular elementary sentence. To accomplish this, the notion of a *variable* is introduced in order to handle the individual argument constants in such wise as when the variable, say "x", is juxtaposed to the common predicate , we have a resulting expression "P (x)" which is called a *sentential junction.* The variable "refers" to the individual argument constants, but does not, however, denote them in any sense of the word. The variable is merely a syntactical adjunct, a symbol-device[19] that enables one to deal with a collection of constants such that he is able to speak of the form of the expression in which these constants occur. The resulting expression "P (x)", as one may see, is not a definite expression in the sense of D.IV-I; this expression, to be sure, is indefinite by D.IV-I.I, for it contains an element which is not one among the enumerated constants.

The formation of *molecular elementary sentences* is accomplished with the aid of the operational connectives of disjunction and conjunction- "v" and ".". For example, "P(a) v P(t)", "P(a) v P(x)" as well as "P(a) • P(b)" and "P(a) • P(x)" are molecular elementary sentences that can be constructed form definite and/or indefinite expressions. We now introduce the concept of derivability with respect to molecular expressions of this kind.

R.IV-2. A disjunctive molecular elementary sentence is derivable if and only if *at least one* constituent expression in the disjunction is definite.

Thus in "P(a) v P(x)", though "P(x) is indefinite, the whole molecular expression is derivable, since the fact that "P(a) is definite satisfies R.IV-2. On the other hand,

R.IV-3. A conjunctive molecular elementary sentence is derivable if and only if every constituent expression is definite.

By this rule. "P(a) P(b)" is derivable, while "P(a) P(x)" is not.

Another derivable expression is the negative sentence which results from the operation of negation on elementary sentences. Thus, with the aid of the negation sign "~ " to indicate this operation, we construct the negative elementary sentence "~ P(a)".

Indeed, it is apparent now that the propositional calculus of the *Principia Mathematica* may be taken as a conjunction of rules for the writing of definite and derivable expressions. The notion of assertion, which is usually associated with that of truth, is interpreted as expressing nothing but the writing of definite and derivable expressions. The calculus of expressions properly belongs to syntax; while the notion of assertion, taken in association with that of truth,[20] belongs to semantics.

Of course, one may write any configuration of symbols, but if they are not allowed by the rules of syntax, i.e., rules of derivability as well as formation rules, there is no way of resolving it in terms of our undefined constants; hence it is indefinite or non-derivable.

THE NOTION OF "SATISFYING A SENTENTIAL FUNCTION."

Considering the sentential function "P(x)", which is an indefinite expression, at least either of two operations which follow are possible in order to transform it into a definite expression. Both of these operations ultimately give rise to existence propositions.

(1) The variable "x", as an expression-device that deals with a range of constants, takes each of these constants as replacement-values of the sentential function "P(x)". By fixing the variable "x" to a particular constant, i.e. by substituting a value-constant say "a" for the variable in questions, we transform the indefinite expression "P(x)" into a definite expression "P(a)". Now, from "P(a)", the existence proposition "$(\exists x)$ P(x)" is derivable by existential generalization.[21]

As an extension of these preceding ideas, we arrive at the notion that "a function is satisfied by the argument, say, "a". If, for the variable "x", in the function "P(x)", we substitute a constant, say, "a", where "a" is one of the range of replacement-values of "x", then, if we obtain the definite expression "P(a)", then we say that the argument "a" satisfies the function "P(x)". Note that this notion of "satisfying a sentential function" does not have to use the concept of truth which is usual in the writings of logicians. It is enough that the elementary sentence be resolved in terms of the initially undefined constants in order to decide whether the function is satisfied by the argument in question or not.

EXISTENTIAL QUANTIFICATION AND THE CONDITIONS THAT MAKE AN EXISTENCE PROPOSITION A DERIVABLE EXPRESSION.

Owing to the fact that "x" in the sentential function "P(x)" awaits determination before it can be said to be a definite expression in the sense of D.IV-1, expressions of the type "P(x)" the syntactical calculus of a definite language.[22] It is possible however, by another operation to transform this into a derivable expression such that it becomes a part of this definite language. This operation is known as *quantification.*

(2) For example, if by successive replacement of the variable "x" by each of the range of substitution-values of said variable, *at least one* of the resulting expressions is definite, then we may express the result of such operation by the derivable expression, say "P(a) v P(b) v P(c) v etc." where we know that this last expression I derivable if and only if at least one of the constituent elementary sentences is definite. On the other hand, this same operation is conveniently indicated in connection with sentential functions by the use of operators, i.e. in this case, by the existential operator "(∃ x)", thus "(∃ x) P(x)" - to be read "At least one substitution-value replacing 'x" in 'P(x) results in a definite expression." Since, however, we wish to construe this existence proposition itself as a derivable expression, we adopt the following definition-

$$\text{D-IV-4.}\quad (\exists x)\, P(x) \underset{Df}{=} P(a) \vee P(b) \vee \text{etc.}$$

where the condition for considering "(∃x) P(x)" derivable is to be found in the definiens. In accordance with R.IV-2. the expression which is the definiens is derivable if and only if at least one of the constituent atomic elementary sentences is definite.

An existence proposition, hence, may be considered as an indication of an operation on sentential functions as outlined above. It is not merely the prefixing of an operator and the transformation of a free variable into a bound variable; this way of describing it at best is only an expositional shorthand for the operation of replacement on sentential functions.

By a similar procedure as that above, we arrive at a convention for the reading of the universal operator "(x)" in "(x) P(x)", to be read "Every choice of a substitution-value replacing 'x' in P(x)' results in a definite expression." The corresponding definition of the universal proposition, then, is

$$\text{D.IV-5}\quad (x)\, P(x) \underset{Df}{=} P(a) \bullet P(b) \bullet \text{etc.}$$

In general, therefore, the manner by which we may determine whether an expression which contains an operator is derivable or not depends on how we determine the corresponding definition involving constants only: which is the same thing as saying that it is determined by the indicated operation on a sentential function as outlined above. It follows that problems involving existence propositions must have to be resolved in terms of expression involving constants only. Furthermore, for a language to be definite, every expression in it containing variables must have its variables bound; for by D.IV-4 and D.IV-5, such expressions as contain these two kinds of operators can be transcribed in terms of constants. With these observations, we arrive at a definition for the definite language.

D.IV-6. A language is *definite* if and only if it is composed wholly of expressions which are either definite of derivable.

I. e. it is composed of expressions where every element is a constant or, where variables occur, of variables which are bound or quantified.

Indeed, the use of free variables has been avoided in the construction of logical systems such as that of Alonzo Church.[23] Note also what Whitehead and Russell say in the revision of the *Principia Mathematica:* "...there is no need of distinction between real and apparent variables, nor of the primitive idea 'assertion of a propositional function.' On all occasions where, in *Principia Mathematica,* we have asserted propositions of the form '— • fx' or ' — • fp', this is to be of the form '— • (x) • fx or ' — • (p) • fp'."[24]

All variables must be bound and this is what is necessary in order to determine whether the expression involving the variable is derivable or not.[25]

THE POSTULATE OF EXISTENTIAL GENERALIZATION.

For the derivation of existence-theorems, Russell and Whitehead consider the following postulates to be necessary:

"$\phi a \bullet \supset \bullet (\exists x) \bullet \phi x$ (1)
$(x) \bullet \phi x \bullet \supset \phi a \bullet \phi b$."[26] (2)

(1) is known as the principle of existential generalization and (2), the principle of specification or application. From (1) and (2) it should be possible to derive the proposition "$(x) \bullet (\phi x) \bullet \supset \bullet (\exists x) \bullet (\phi x)$," which, as may be seen, cannot be done without the use of individual constants.[27] For by

$\phi a \bullet \phi b \bullet \supset \bullet \phi a$ (Simplification)
and the syllogism, (1), and (2) we obtain
$(x)\bullet(\phi x)\bullet \supset \bullet(\exists x)(\phi x)\bullet$ Q.E.D.

The sole connecting link between universal and existence propositions are expressions involving individual constants as in (1) and (2).

Apart from the idea that individual constants are necessary in order to derive existence propositions, it is worthwhile to note that the postulate of existential generalization state the necessary condition for valid passage to existence propositions; an atomic elementary sentence must be definite for the corresponding existence propositions to be derivable. This is one way of saying that existence propositions are rooted in the notion of an atomic elementary sentence.

THE EXISTENTIAL OPERATOR IN A SYNTACTICAL CAPACITY.

It is usual in current writings on logic to read expressions involving the existential operator—"(∃x) P(x)"—as "There is (exists) an x such that P(x)". The latter is evidently an interpretation of the former; but form this, it is but one step to the form "x exists" for the operator "(∃x)" and to consider it an independent part of the whole existence proposition. This, of course, is a mistake on grounds previously considered in connection with the notion of satisfying a sentential function. But apart form this, it can be shown that any attempt to construe the usage of the existential operator in the sense of "existence" as in "x exists" leads to a regress of non-derivable expression.

Consider "(∃ x) P(x)": If "(∃ x)" is meant to be as "x exists", then "(∃x)P(x)" will be an expression of the form "Q(x) • P(x)", since the inverted-E here is construed as an "existence" predicate. Now, this is a molecular sentential function which needs to be quantified again in order to transform it into a derivable expression. If existential quantification is chosen in order to transform it into a derivable expression, and, if the quantification sign is meant to be read again in the predicative sense, then the same problem recurs again, *ad infinitum.* Of course, we know initially that the expression "(∃x)" is composed neither of a predicate nor an argument, being an indication of an operation rather than something to be asserted by itself as in the case of the rendering "x exists." Russell classifies the existential operator as an incomplete symbol, i.e. the expression in which it occurs is capable of transcription into one where this notation has completely disappeared.[28]

It must be concluded therefore, that the existential operator is an expression that functions in a syntactical capacity in a definite language, being an incomplete expression which is neither an individual argument or predicate nor their combination, but a logical sign[29] which indicates

the operation of replacement of the substitution-values of the variable in a sentential function.

DEFINITION OF THE PREDICATE "EXISTS" FROM EXISTENCE PROPOSITIONS.

Following Russell and Whitehead, it becomes possible now to define "existence" as a predicate in terms of existence propositions: this is done for class-expressions (one-place, two-place,...and n-place predicates interpreted as class-expressions) as well as for definite descriptions.[29] We shall pass over the detail of how class-expressions are constructed in terms of predicates with the observation that a class-expressions are constructed in terms of predicates with the observation that a class-expression, say "$\hat{x}\{P(x)\}$", constructed out of the sentential function "P(x)" may be considered as a short for the totality of constants every one of which has the predicate "P". The characteristic relation of "membership" held to obtain between this totality and the individual constants out of which it is constructed, say "$a \in \hat{x}\ \{p(x)\}$", merely reflects the relation between the predicate "P" in the function "P(x)" and these individual constants. Whether this relation between the individual. constants and the predicate may be taken to be an expression of the same relation between constants and the class or not, or whether the latter is reducible to the former by a logical operation, is another question into which we may not enter here. But the epsilon-sign "$\in$" which is used to indicate the relation between class-expressions and constants is characteristics of the definition for the predicate of "existence" asserted of class-expressions. Thus "existence" is to be employed in connection with class-expression only under the condition that the membership relation holds between the totality "$\hat{x}\{P(X)\}$" and *at least one* value of the variable. Thus we have

$$\text{D.IV-7. } \exists;\ \hat{x}\{P(x)\} \underset{\text{Df}}{=} (\exists X)(x \in \hat{x}\{P(x)\})$$

Note that the predicate "exists" ("$\exists!$") is eliminable at will by this definition in favor of another expression where it is not found. Also this predicate is not an independent term: Like the class-expression which is juxtaposed to it, it is not significant in isolation.

But the definiens in this definition is only a translation in terms of classes what we were originally able to express by means of functions, i.e. "$(\exists x)\ P(x)$", for as we said the relation between individual constants and the totality "$\hat{x}\{P(x)\}$" is a derivation of the corresponding relation between the predicate "P" and these same individual constants. So that we may take the expression "$(\exists x)\ (x \in \hat{x}\{P(x)\})$" to be translatable into

the language of existence propositions, i.e. "$(\exists x)\ P(x)$, where the predicate "P" in the function "P(x)" defines the totality "$\hat{x}\{P(x)\}$". We shall now express this replaceability by the following definition—.

$$\text{D.IV-8}\ (\exists x)\ (x \in \hat{x}\{P(x)\}) = (\exists x)P(x) \quad \text{Df}$$

Thus existence of class-expressions entirely reduces to existence propositions, i.e. the "existence" predicate is definable in terms of existence propositions.

We must note as a matter of emphasis that the predicate of "existence" is juxtaposed to the class-expression "$\hat{x}\ \{P(x)\}$" (the argument) whose mention is always with respect to the predicate that determines it..

It must also be observed that, because of the necessity of having to distinguish between "existence" in existence propositions and that for classes, the inverted-E is used for the former and an inverted E-exclamation-point is used for the latter. As to whether this procedure, however, is well-grounded or not is another matter, for the assumption seems to be that there is "existence" at all to be found in existence propositions. We have been trying to show that there is no good reason for this supposition, since the existential operator in existence propositions does not indicate "existence" but an operation.

SECTION V
SEMANTICAL ANALYSIS

"By a *semantical system* (or interpreted system) we understand a system of rules, formulated in metalanguage[31] and referring to an object language, of such a kind that the rules determine a truth-condition for every sentence of the object language, i.e. sufficient and necessary condition for its truth."[32] So that together with the rules of formation and transformation in a syntactical system, *rules of designation* and finally *rules of truth* are given.[33] With respect to the problem of existence propositions, a semantical analysis, therefore, would involve the discussion and formulation of the rules of designation and truth-conditions for expressions of that type.

AN INTERPRETATION OF THE CALCULUS OF DEFINITE AND DERIVABLE EXPRESSION.

By utilizing the syntactical system discussed in the previous chapter, rules of interpretation are now introduced in order to create a semantical system:

R.V-1. Every definite expression is interpreted as a true elementary sentence.

R.V-2. The negation sign is read in the sense of falsity.

R.V-3. Every undefined individual constant is correlated with an individual object: these constants now become proper names.

It turns out now that the *Principia Mathematica* is an interpreted system corresponding to the resulting system through the application of R.V-1 to R.V-3. This is insofar as the propositional calculus at least is concerned. Note that in a syntactical system, there are no such concepts as proper names or names, our primary interest having been confined merely to expressions classified in accordance with general transformation properties. But now that these expressions enter into the system in their capacity as symbols, we must see to the general conditions when, say, sentences are true, when expressions designate, etc.

NAMES AND PROPER NAMES.

R.V-3 speaks of a correlation between constants and individual objects in virtue of which constants become proper names. This relation between proper names and objects is what is ordinarily called the relation of designation. This needs elaboration and for simplicity we shall take individual argument constants only, i.e. "a", "b", "c", etc.

The relation of designation is one which we shall call understand to hold between terms—one which we call the symbol expression and the other, the "object." "Object" is the non-verbal term in this relation; the other term is verbal and is any one of "a", "b", or "c", etc. We shall call "a", "b", or "c" proper names under the condition that each designates an object. At the level of atomic elementary sentences, proper names are constituents of true expressions. It may happen, nevertheless, that "a", "b" and "c", designate only one subject, in which case we say that they are all identical to each other. The relation of designation, therefore, becomes a many-one relation;[34] that is to say, a proper name designates only one object, but an object may have many proper names. The statement involving this fundamental property is a rule.—

R.V-4. A proper name designates only one object; but an object may have many proper names.

Proper names which designate only one object can be used interchangeably for each other: they may, therefore, be substituted for each other: they may, therefore, be substituted for each other in true expressions of which they are constituents and the expressions remain true as before. This property is expressed in the well-known theorem of logistics-

$$(f)(x,y)(x=Y) \equiv f(x) \equiv f(y)$$

where "f" stands for a variable property. By the principle of specification, this theorem gives rise to

$$(f)(a=b) \equiv f(a) \equiv f(b)$$

which gives the condition for the identity of constants or proper names: all the predicates of one are also the predicates of the other.

Furthermore, by the above property in R.V-4 of proper names, there is always the possibility that an array of constants or proper names may be identifical to each other, i.e. names for just one object. We have to note this down for use in connection with a later problem.

The same treatment goes for undefined predicate constants as for individual argument constants.

Now, if "a" be a proper name for an individual and "P" the name of a corresponding property, then the juxtaposition or "a" and "P" to form the true elementary sentence we shall understand to be an indication of the complex, which is a fact, involved in the experiencing of the object having the corresponding property.

By the above procedure, it is not difficult to see how a variety of sentences can have just one meaning, for owing to the fundamental property of names rooted in R.V-4, every expressional construction from our undefined constants, which includes sentences, must share this characteristic property.

ELEMENTARY SENTENCES AND PROPOSITIONS.

Consider now the definite expression "P(a)". By the rule of interpretation R.V-1, this reads " 'P(a)' is true" (in place of *is definite*). Since by R.V-3 both the predicate and argument constants designate, we have to give the conditions under which the juxtaposition of these terms gives rise to a true elementary sentence. We touched upon this in the preceding section; now, let us give it a little detail. This condition evidently is not to be found in the expression as such; rather it must be referred to the non-verbal state expressed by the juxtaposition of these terms. If the predicate "P" designates a property and the argument "a" an object, then this condition must speak of the property and the object, which are both non-verbal. Accordingly we have

> R.V-5. An elementary atomic sentence is true if and only if the object designated by the argument constant possesses the property designated by the predicate constant.

How one determines whether the object possesses the corresponding property, of course, is a matter that cannot be settled verbally, since this condition is an empirical one: it is necessary that experience of a fact-complex,[25] wherein the object and property are involved, be first secured in order to decide the truth of an atomic elementary sentence. We shall call the truth pertaining to this type of sentence elementary truth. Expressions, on the other hand, which are derivable from true atomic elementary sentences through R.IV-2 and R.IV-3 shall possess derivative truth, and, therefore, truth of a different level.[26]

Observe that truth is a property of sentences stated in a semantical system and not of propositions[27] which is usual in the writings of logicians. Indeed, it is found that the notion of the proposition is unnecessary for the reason that the predicate "true", for sentences under the above conditions is sufficient to take care of what is ordinarily intended in the usage of this notion of the proposition.

It is usually argued that what is meant can be expressed in a number of different ways; what is meant is called the proposition and the different ways of expressing it are called sentences. So that by this assumption, what is true is not intended to be the sentence but

rather what is meant and which is involved in the judgment, the proposition. Following still this line of argument, it is found, however, that a complex of facts is what makes a proposition true. It is now necessary to speak of a mediating concept, the proposition, in order to fill in the gap between sentences and the complex of facts.

An examination, on the other hand, of R.V-3 and R.V-5 show that a treatment of the concept of truth in terms of the conditions in these rules gains in simplicity over that which requires the notion of the proposition. What is *meant* by a true atomic elementary sentence shall be construed in this study to be none else than the complex of facts in virtue of which it is true. If, however, the term *proposition* is used it will be understood in the sense of an elementary sentence discussed above under conditions covered by R.V-1 to R.V-5. Other propositions shall be derivative from this notion of a proposition.

But what about negative sentences? This raises the question of negative facts, which, it seems, is a pseudo-problem, if this is interpreted to mean that a true negative sentence *means* a negative fact.

Consider the following definition for the falsity of elementary atomic sentences:

D.V-6. A sentence of the type "P(a)" is false[38] if and only if condition R.V-4 is not fulfilled.

I.e. "$\sim$ P(a)" is true if and only if the object designated by "a" does not possess the property designated by "P". The statement "$\sim$ P(a)" is not of the same level as that of "P"(a)", and, therefore, if the former is true, it cannot possess truth of the same level as that of the type "P(a)". It is, hence, not within our initial assumption for typing expressions to expect "$\sim$ P(a)" to mean a complex of facts, i.e., with respect to our problem, a negative fact. Indeed, if this is true, It must be true at the second level like molecular expressions.

The confusion usually attending the problem of negative facts, it seems, lies in the anomalous identification of expressions involving negative predicates with negative sentences. For example, the statement "`Socrates is bald' is false" is usually indiscriminately identified with "Socrates is not bald"; the latter meaning, perhaps, say, "Socrates has some hair in his head." In this case a negative predicate is held to be the equivalent of at least one other positive predicate that designates; and this, of course, is another matter.

Our interest, however, in negative sentences rests mainly on our concern for such existence propositions of the form "$(\exists x) \sim$ P(x)", where

the negative function "~ P(x)" is satisfied by at least one substitution-value of "x". Transcribing "(∃x)~P(x)" by D.IV-4, we obtain the molecular expression

"~P(a)v ~ P(b) v ~ P(c) v etc."

which is true if one of the constituent negative atomic elementary sentences is true. But any one of these constituents may be true even if there were no complex of fact indicated by it, since our concept of a negative elementary sentence does not require that, at the level to which this sentence belongs, there should be a fact that should answer to its truth. Since this may be so, the above molecular expressions, and, consequently, the existence proposition "(∃x) ~ P(x)" cannot in any way refer to "existence" embodied in facts or objects involved in the experienced fact.

Thus we see that in our analysis of the existence proposition, we did not have to premise it on a metaphysical concept of existence, which, of course, reiterates our findings on the same type of proposition in the field of syntax.

SECTION VI

GENERALIZATION TO EXISTENCE PROPOSITIONS

This chapter as well as the three succeeding ones shall deal with some attempts to clarify the problem of existence. An application of the concepts which were developed in Chapters IV and V will be made whenever possible in order to understand these solutions. Of these various attempts, the first that will be considered for analysis is embodied in two papers by W.V. Quine[39] which deals with generalization to existence propositions.

Generalization to existence propositions is a form of inference wherein, given an atomic elementary sentence, the corresponding existence proposition is asserted, i.e. "$P(a) \supset (\exists x)\, P(x)$." Quine believes that generalization to existence proposition is valid only if the argument "a" in "P(a)" designates. We are interested in his argument for this statement and not in the correctness of this claim, for we have already seen by our rule for true elementary sentences that "a" must designate for "P"(a) to be true, which is the prior condition for passage to the corresponding existence proposition. Now, in a number of examples, one of which we shall examine below, he tries to show the behavior of names with respect to existential generalization in order to establish his claim.

Quine associates a variable, say "x", with a realm of entities, the so-called *range of values* of the variable. The range of values is not to be confused with the range of substituends. The names are *substituends*; the named entities are values. "Numerals, names of numbers, are substituends for the variables of arithmetic; the values of these variables, on the other hand, are numbers."[40] Consider, then, the statement-

> 'Cicero' contains six letters. (1) Quine avers that "Cicero" in "'Cicero' contains six letters" does not occur designatively because if we place "x" for "Cicero in "'Cicero' contains six letters" and generalize existentially with respect to it, the generalization is not valid, thus:
>
> "(∃x) ('x' contains six letters)" (2), which means, according to him—

(∃x) (The 24th letter of the alphabet contains six letters) (3), which is a falsehood. [41]There is a question, however, with respect to the above procedure: the generalization (2) does not exemplify the intention of generalization because "'x'" is not a variable but a name of the variable-configuration "x". Therefore, if this is revised by placing a variable and not a name of a variable, (3) will not follow. His analysis, therefore,

leading to the conclusion that existential generalization is valid only if the argument in the premise occurs purely designatively is not satisfied.

Nevertheless, the statement "A word W designates if and only if existential generalization with respect to W is a valid form of inference,"[42] is a sound semantical rule. Recall in Chapters IV and V that the condition for the truth of "$(\exists x)P(x)$" is that a sentence of the type "P(a)" must be true, i.e. "$P(a) \supset (\exists x)P(x)$". His conclusion may be taken to be merely a transcription for the conditions under which existential generalization is applicable. For this principle cannot be applied unless "a" in "P(a)" designates.

Let us examine further the other parts of the paper in the light of the concepts which we developed previously in Chapters IV and V, with a view to reinterpreting the following statements which he says are five ways of saying the same thing. His assumptions about these statements may be different from those in this study at certain points, but with these aside, consider now—

"There is such a thing as appendicitis."	(1)
"The word 'appendicitis' is a name."	(2)
"The word 'appendicitis' designates."	(3)
"The word 'appendicitis' is a substituend for a variable."	(4)
"The disease appendicitis is a value of a variable."[43]	(5)

(2) and (3) are equivalent ways of speaking about the word 'appendicitis'; while (4) may be transcribed at length as "The word 'appendicitis'; is a *constant* substitution-value for a variable." (2) and (3) state a relation between a proper name and a designatum; while (4), between a proper name and a variable. All these statements are about proper names, but (4) has a different meaning from that in (2) and (3). (4) leads to the operation of replacement in a sentential function, which should result in a true expression. (2) and (3) do not suggest this operation at all.

(5), however, becomes an insignificant expression, if we should pursue the notion developed previously that a variable is not an ambiguous name of anything but rather an expression device with which one may deal with constants. For now no disease can ever be a value of a variable; only their names (proper names or constants) can be the values of a variable.

(1), of all the others in the set, is the most curious statement in that it apparently has the form of an existence proposition. But the purport

of the word 'appendicitis', as it occurs in this statement, is as a designative term[44] in the capacity of a constant. This expression, (1), cannot therefore be an existence proposition, since it is couched in terms of constants, i.e. "There is such a thing..." is juxtaposed to the constant 'appendicitis'. This proposition, therefore, is of the form "E(s)" which is a proposition about existence and not an existence proposition.

If, on the other hand, "appendicitis" is construed as a variable, (1) becomes of the form "x exists", also like "E(s)", but indefinite, and, therefore, neither true nor false, because this is a sentential function. As we had intimated before, this expression is undecidable unless the value of "x" is fixed.

A word now is in order about certain problematical expressions similar to (5) above, which may be decided in terms of our notion of existence propositions.

Consider the statement "An object *a* exists," where "a" is a name of a specific object or event. This expression seems to be an admixture of incompatible elements. The usage of the word "an" certainly might qualify to pass an existence proposition; but we must abandon this thought, since "*a*" is a constant and not a variable which is the one required for existence propositions.

The only remedy is to proscribe the use of the word "an" in connection with a constant in favor of a variable in order to form the statement "An object x exists", or to retain the constant "*a*", leaving out the phrase "An object. . .", in order to secure the expression "*a* exists". The latter expression, as one may see, is a proposition about existence; we shall not pursue this any further. But the expression "An object x exists" is interesting, for this seems to be a genuine existence proposition.

Transcribing "An object x exists" in terms of the corresponding equivalents for the ordinary reading of existence propositions, this now reads: "For at least an x, x exists", or "There exists an object x such that x exists." In order to simplify the discussion, let us take the last statement to be the same as "There exists an x such that x exists." Here we have a striking example of an existence proposition which contains as part of itself an expression about existence. The symbolic form should help us to visualize this: "(∃ x) E(x)". "(∃x)" says "There exists an x..." which is the first part of the existence proposition; while "E(x)" says "x exists", which is the second part. The double-fold occurrence of the word "exists" in the non-symbolic form of the existence proposition certainly would have left the impression of a paradox in the mind of any one who would not undertake to take the trouble to distinguish the meanings of the phrases

"There exists an x..." and "x exists" in this existence proposition. Certainly the meaning of the word "exists" as they occur in each of these two phrases must be radically different from each other, for as we had before discovered, the phrase "There exists an x...", which is a transcription for the existential operator "(∃x)", is merely an indication of an operation and not of "existence" in any sense of the word.

The reader may well ponder, likewise, on the syntactically correct statement: "There exists an x such that x does not exist."

SECTION VII

EXISTENCE PROPOSITIONS AND THE ARISTOTELIAN CONCEPT OF EXISTENCE

In this chapter, the Aristotelian concept of existence is taken up in relation to existence propositions with a view to finding out whether there is any ground for the claim current among some modern logicians that a particular proposition, say, "Some men are mortal", is not deducible from the corresponding universal proposition "All men are mortal", unless we are provided with an additional premise which is an existence proposition—in this case, the existence proposition "There are men" or "There exists an x such that x is man."[45]

In order to be able to examine this problem, however, it is essential that the background of the logical doctrine against which the above criticism is levelled be the first clarified. This takes us directly into discussion of Aristotle's notion of the proposition and his doctrine of substance.

To Aristotle, "only such are propositions as have in them either truth or falsity"[46] and "which either asserts or denies something for something"—it is "a statement, with meaning, as to the presence of something in a subject or its absence...". [47] Statements of this kind are of the subject-predicate form as in "Socrates is mortal" or "Man is mortal."

Now Aristotle says, "Some things are universal, others, individual. By 'universal' I mean that which is of such a nature to be predicated of many subjects, by 'individual' that which is not thus predicated. Thus 'man' is a universal, 'Callias' , an individual."[48] Individuals are classified in the *Categories* as substance which, "in the truest and primary and definite sense of the word, is that which is neither predicable of a subject nor present in a subject; for instance, the individual man or horse."[49] Substances "are the entities which underlie everything else, and that everything else is either predicated of them or present in them."[50] In saying that substances underlie everything else, what is meant is that they are the very ultimate in what may be considered as the subject in logical discourse. Should one take, therefore, any quality, say, 'blue', the ultimate subject of this in a proposition is some concrete individual, like a man or stone or mountain. Hence, it would seem that the undefined logical subject of Aristotelian propositions are individual objects of the common sense world. Such is what is embodied in the proposition "Socrates is mortal" where the universal 'mortal' is predicated of the individual 'Socrates'.

A universal can also be predicated of another universal, say 'mortal' of 'man' in "Man is mortal". This proposition, however, is not a universal

proposition without the qualifying word 'every' and must not be confused with it. While the term 'man', just like the term 'mortal', can be predicated of many individuals, this alone does not give us information as to the extent of the predication—whether to Socrates only, or to Socrates, Aristotle, Plato, etc., namely, to *some men* only, or to *every man or no man.* A proposition assumes a universal character only with the use of the qualifying word 'every' as in, say, "Every man is mortal."[51] Thus it would seem that Aristotle was aware of the notion of quantification which was intended to convey the repeatability of predication with respect to the individuals covered by the quantified subject.

Consider further the universal negative statement "No man is white", the contradictory of which is "Some men are white."[52] Here we have some evidence that Aristotle clearly had in mind the interconnection between the notions of *every, none,* and *some* which, in modern logic, can easily be written with the aid of the logistic universal and existential operator.

The essential point to bear in mind, however, is the Aristotelian distinction between a universal and a particular proposition. He says, "By universal I mean the statement that something belongs to all or none of something else; by particular, that it belongs to some or not to some or not to all."[53] Note that both the universal and particular proposition need a base to which the qualifying words 'all', 'none', 'some', or 'not to all' may be prefixed. And since the above words apply to the subject, the latter must be capable of having instances, i.e. must be a universal. The universal subject, therefore, is involved in every base proposition to which these quantification words are prefixed, e.g. the subject 'man' is universal in 'Man is mortal' which is transformed to a universal or particular proposition by prefixing respectively 'every' to form "Every man is mortal" or 'not all' to obtain "Not all men are mortal."

Let us now examine the base proposition "Man is mortal" in order to see whether a statement of the type "Socrates is mortal" is contained in it. 'Socrates' in this statement is an individual and not a universal.

It would seem that individual substance is a prior condition for the assertion that "Man is mortal", for, to paraphrase Aristotle, 'mortal' is predicated of the species 'man', therefore of the individual man, for if *there were no individual man* of whom it could be predicated, it could not be predicated of the species at all.[54] But these individual men precisely are such objects as Socrates, Plato, etc., all individual substances that exist in the metaphysical sense.[35] Hence, "Man is

mortal" contains the elementary sentence stating that 'mortal' is predicable of the individual substance 'Socrates", i.e. "Socrates is mortal".

To bring back the discussion to universal and particular propositions: Since the base proposition "Man is mortal" involves "Socrates is mortal" as a statement contained in it, and since "Man is mortal" is the base proposition for the universal and particular statements "Every man is mortal" and "Some men are mortal", respectively, it only follows that "Socrates is mortal" is contained in both the universal and particular propositions. This elementary sentence is what is involved in the passage from a universal proposition to the corresponding particular statement. But this is, however, not an existence proposition. The sort of existence that Aristotle had in mind in "Socrates is mortal" was metaphysical existence in connection with the individual substance Socrates.

Let us now consider the claim of some modern logicians that an existence proposition is necessary in order to validly infer "Some men are mortal" from "Every man is mortal". The logistic form for the traditional inference from a universal to a particular proposition is

$$(x) \quad \{P(x) \supset Q(x)\} \text{ Every man is mortal}$$
$$\therefore (\exists x) \quad \{P(x) \bullet Q(x)\} \quad \therefore \text{ Some men are mortal}$$

which is not valid without the additional premise $(\exists x)\ P(x)$, i.e. "There are men" or "There exists an x such that x is man." This additional premise is an existence proposition which, however, does not express the metaphysical existence pertaining to the subject of "Socrates is mortal", which, as we have said, is involved in the passage from the universal to the particular proposition in traditional Aristotelian logic, This is one reason why we must conclude that the logistic formulation of the inference from the universal to the particular proposition does not apply to Aristotle's assumption with respect to it.

Another reason may be found in the logistic formulation for the universal proposition "$(x)\ \{P(x) \supset Q(x)\}$" which reads with respect to "Every man is mortal" thus: "For every value of x, if x is man, then, x is mortal." This statement is hypothetical in form and does not contain the assertion "Socrates is mortal", whereas in Aristotelian logic, this assertion is contained in the universal proposition "Every man is mortal."

The above considerations show at length that the modern criticism of Aristotle's logic with respect to existential premises has been entirely misapplied. It was thought that the sort of existence involved in an

Aristotelian inference of the kind discussed above could be sufficiently dealt with through existence propositions for the supposition that existence prepositions spoke of "existence" was strong in the minds of those who sought to supply what was believed to be the missing link in the passage from the universal to the particular proposition. This supposition as we have seen is a fundamental mistake, for no "existence" whatsoever is involved in existence propositions.

SECTION VIII
THE KANTIAN DOCTRINE THAT EXISTENCE IS NOT A PREDICATE

While the concern of the last two chapters was primarily with respect to the role of argument constants (the logical subjects) in connection with the question of "existence" involved in existence propositions, what follows now shall deal with the predicate of "existence", for which, in this chapter, we shall consider the Kantian solution.

A point of departure concerning what may be said about the logical subject which leads to Kant's conception of predicates proper to objects is a passage in the *Critique* to the effect:

> Either the predicate B belongs to the subject A, as somewhat which is contained (though covertly) in the conception of A; or the predicate B lies completely out of the conception A, although it stands in connection with it.[56]

Judgments in the case of the first of these two "add in the predicate nothing to the conception of the subject, but only analyze it into its constituent conceptions, which were thought *already in the subject (italics mine)* although in a confused manner; the latter add to our conceptions of the subject a predicate which was not contained in it, and which no analysis could ever have discovered therein."[57]

It stands to reason, therefore, that if what was considered a predicate belongs not to any one of the above two possibilities that a predicate may be, then it is not a predicate at all in the Kantian sense. The above disjunction about predicates proper to objects may be taken to be exhaustive and mutually exclusive.

Now, in saying that the predicate B belongs to the subject A (or that it is contained in the conception of the subject A), B being a part of A, determines A. For, if we should take away B which properly belongs to A, then A would be something else than when B was present in A. This defines determination of the subject by the properties which properly belongs to or is present in it.

The Kantian derivation of the concept of existence, however, starts from an analysis of the concepts of space and time. It is found that the notions of space and time do not represent any property of objects nor any determination of objects in the sense just stated above. "Space does not represent any property of objects as things in themselves,..." nor does it "...represent to us any determination of objects as attaches

to the objects themselves, and would remain, even though all the subjective conditions of the intuition were abstracted."[58]

The same remarks apply to time: "...time does not inhere in things as a condition or property...such properties cannot be presented to the senses."[59]

Indeed, time and space are modes or forms for representation, the *manner* by which our sensibility is affected by objects which give rise to sensations. So that "that in which our sensations are merely arranged, and by which they are susceptible of assuming a certain form, cannot itself be sensation."[60] Hence, only the property corresponding to the sensation, can be referred to the object predicatively. Not the mode of representation, which is not itself sensation, for the property corresponding to this sensation is the only one that properly belongs to the object or is connected with the object and, therefore, predicable of it in the sense of predication discussed in the beginning of this chapter.

It is, however, possible to speak of existence of an object for a subject not with reference to the properties of the object but with respect to the subjective conditions of representation of this object in the subject, i.e. the modes of representation, time and space. It may be said that an object exists only insofar as "the representative faculty of the subject is affected by the object."[61] Note therefore, that the Kantian notion of existence is attributed to the object only when a certain condition is satisfied, namely, when the representative faculty of an experiencing subject is affected by the said object. "The categories of modality [62] possess this peculiarity, that they do not in the least determine the object, or enlarge the conception to which they are annexed as predicate, but only express its relation to the faculty of cognition."[63] Recall now what was said previously concerning predicates which are proper to objects. If *existence* is to be construed as a predicate, it must be a property belonging to or determining the object in question; *since,* it is not a property belonging to or determining any object at all, *therefore,* it is not a predicate. So that the use of the predicate of "existence", if allowed, merely reduces itself to an abbreviated way of speaking about certain subjective conditions surrounding the process of knowing, which, in this case, concerns the object affecting the subject through the modes of representation, namely, space and time.

On the basis of the foregoing, we may lay down the conditions under which it is possible to define Kantian *existence*:

An object exists if and only if—

(1)That object affects the faculty of representation, i.e. the sensibility; and

(2)The effect, called sensation, has form arranged in accordance with the modes of representation, namely, space and time.

The predicate of "existence", consequently, by this definition, becomes an expression which is eliminable in favor of other expressions where this predicate does not occur. Indeed, it should be possible to banish the concept of existence by replacing every expression wherein this predicate occurs with the corresponding locution on the right-hand side of the definition for this predicate.

At this point, remember now the method discussed in Chapter IV for defining the predicate of "existence" in terms of existence propositions. The elimination of the predicate of "existence" by transcription into statements which define the conditions for its use is strikingly illustrated in this case. If only in this respect, the Kantian approach to the problem of existence constitutes an advance over those of his predecessors, for now we have the beginnings of a more or less well-defined procedure for the interpretation of the predicate of "existence" for which there is no immediately given designatum. Following this line of thought also, it should be possible to lessen the number of predicates that have been used in philosophy by eliminating those that are not proper predicates.

Heretofore, a summary exposition of what Kant meant by "existence" not being a predicate was undertaken without entering into a criticism of this doctrine. Now, we shall do this with a view to discovering how his approach relates to existence propositions.

In the definition above which was given for the Kantian predicate of "existence", note that "object" constitutes the argument in the definiendum as well as in the definiens, i.e. in the first constituent statement of the definiens. In the definiens, the use of the word "object" is allowable, since the word is employed in connection with what may be impliedly considered as a property involved in sensation. But in the definiendum, the predicate "exists" may not be juxtaposed with the word "object" because the predicate "exists" is not a predicate proper to "objects". This problem is raised here, but first let us clarify Kant's usage of the term "object" before attempting to say anything further on it.

Objects enter into the relation of knowing as *phenomenon,* which is the "undetermined objects of empirical intuition."[64] They have effects on the faculty of representation which is called sensation; and

that "which the phenomenon corresponds to sensation is called matter."[65] To say, therefore, that this object has this property, e.g. "This is blue", is to declare a relation of something undetermined to a subject which, through sensation, determines that object. This determination, however, is merely an assumed correspondence between the object and sensation. We may never speak of the object except through this correspondence, for the object considered as a thing-in-itself lies beyond our knowledge. "How things may be in themselves, without regard to the representation through which they affect us, is utterly beyond the sphere our cognition. ...so soon as I raised my conception of an object to the transcendental signification thereof, I find that the house is not a thing in itself, but only a phenomenon, that is, a representation, the transcendental object of which remain utterly unknown."[66] The meaning of the term "object", as may be judged from the foregoing, is confined to *things-represented* in our sensuous faculties corresponding to the sensations it evokes. Hence, if "a" be a term designating an object which is *not represented* through our faculty of cognition, standing alone it means nothing; it must be qualified by a proper predicate which signifies its relation to our cognitions. This object-qualified, or thing-represented, in terms of properties in relation to our sensuous faculties is to whose name we may now juxtapose the predicate of "existence". This takes care of the term "object" in the definiendum.

The meaning of the term "object" in the definiens cannot, however, be the same as that which is found in the definiendum. The term "a", qualified by a predicate which signifies a property corresponding to a sensation, is the logical subject, which, standing alone, is the unknown thing-in-itself. It appears now that we must distinguish between two sorts of "objects", corresponding to the distinction between the thing-represented and the thing-in-itself; the thing-in-itself admits of qualification by a predicate proper to it through correlation with sensations evoked in our sensibilities; the thing-represented, however, by the predicate of "existence" which does not designate a property as in the former case for no sensation can be correlated with it.

The upshot of all these is that, whenever we are to use the predicate of "existence" in the Kantian sense, its employment should be restricted only to things-represented or objects-described in terms of experience and never to unknown metaphysical things-in-themselves. This anticipates Russell's theory of definite descriptions.[67]

The reference to metaphysical objects by means of properties which are always in relation to our experiences may be taken as a starting

point for a definition for the truth of the elementary sentence "P(a)", wherein the property "P" is some quality determined in relation to the logico-metaphysical subject "a". This is, of course, still Aristotelian, but leaving this point aside, it may be seen that there is no syntactical obstacle to the derivation of an existence proposition from this type of elementary sentence, which, Russell tried to show, is the basis for the definition of definite descriptions.

SECTION IX

RUSSELL'S THEORY OF DEFINITE DESCRIPTIONS

One of the most significant contributions to come out by the logistic approach towards clarifying the problem of existence is Russell's theory of definite descriptions.[68] It will be recalled that a distinction was made between existence propositions and propositions about existence. The latter is of the form "the-so-and-so exists", namely "E(S)", where "E" is the predicate of "existence" and "S" the logical subject. In traditional philosophy, with the possible exception of that of Kant, "E" was supposed to express metaphysical existence.

Russell proposed to use the predicate "exists" only in connection with descriptions in order to form an expression of the form "E(S)" which, as we have seen in an earlier part of this study, is supposed to be definable in terms of existence propositions. By doing this, he claims to have removed "'existence' altogether from the fundamental notions of metaphysics";[69] for now, it is possible to eliminate this predicate by replacing the expression in which it occurs by another expression where this predicate is not found.

The theory of definite descriptions of Russell is taken up for consideration in this study, because it is felt that his definition of the existence of definite descriptions needs amendation in terms of what seems to have been not quite clear to him when he expounded this doctrine some four decades ago.

A definite description, of the form "the-so-and-so", is exemplified in such phrases as (to use Russell's own examples) "The author of *Waverley*" and "The King of France" and is symbolized with the aid of the iota-operator "(ιx)", thus: "(ιx) (Φx)", which says that the function 'Φx' is or is not satisfied uniquely by one individual constant or object. The phrase "the so-an-so" is taken in Russell's system to be an incomplete symbol which functions as an argument to a predicate. It is incomplete in the sense that it "is not supposed to have any meaning in isolation, but is only defined in certain contexts."[70] As an argument to a predicate, a definite description is different from a constant, for while constants are values of the variables in a sentential function, definite descriptions are not.[71]

Consider now Russell's own definition for the existence of a definite description:

$$\text{"14.02 } E!(\iota x)\,(\Phi x) \underset{x}{\equiv} (\exists\, b) : (\Phi x) \bullet \underset{x}{\equiv} \bullet x = b$$

"This defines: "The x satisfying Φx exists' which holds when, and only when Φx is satisfied by one value of x by no other value."[72]

Our problem with respect to this definition is this: Is the existence of a description legitimately reducible to an existence proposition in the sense of "$(\exists b) : (\phi x) \bullet \underset{x}{\equiv} \bullet x = b$" or not? It is essential that we resolve this question in order to know whether or not the predicate of "existence" which pertains to the definite description is capable of transcription into an expression where this predicate does not occur. If not, then it might be possible to propose a definition that shall secure this intention.

First let us determine what is meant by the phrase "value of x" in Russell's own paraphrase of the definition above. This expression is ambiguous, for it may mean, on the one hand, the substitution-values of "x" which are an array of *constants* or proper names; or, on the other hand, the *object* which is named by the constants. These two possibilities are mentioned because (a) for Russell, the variable "x" is a denotative term and reference to a value "x" may mean just what it denotes, i.e. an object which, of course, is non-verbal and (b) at one time Russell himself speaks of an *object*, and at other times, of terms (*constants*) as satisfying a propositional function. Compare for instance, the following two passages:

(A)"... any statement apparently about (ix) (Φx) requires (1) ($\exists$ x) (Φx) and (2) $\Phi x \bullet \Phi y \bullet \supset \bullet x = y$; here (1) states that *at least* one object satisfies Φx, while (2) states that *at most* one object satisfies x. The two together are equivalent to $(\exists c) : \Phi x \bullet x = c$, which we defined as E! (ix) (Φx)."[73]

(B) "There is a term *b* such that Φx is true, when and only when, x is b, and Φb is true. That is, writing '(ιx) (Φx)' for 'the term which satisfies Φx', Ψ (ιx) (Φx) is to mean—$(\exists b) : \Phi x \bullet \underset{x}{\equiv} \bullet x = b$: Ψb."[74]

A comparison of (A) and (B) shows that *object* and *term* are used interchangeably for each other in order to refer to what satisfies a propositional function. We must note this apparent ambiguity of the phrase "value of x" which is used frequently in the *Principia Mathematica*. On grounds of a kind developed in earlier parts of this study concerning definite and indefinite expressions, wherein we took variables in the strictest sense of the word to be expression-devices for handling constants and proper names, we must insist, nevertheless, that the values of "x" referred to above are constants or proper names. Otherwise, if they are alternatively interpreted as objects, where we understand an object to

be the non-verbal term in the relation of designation, the operation of replacement for the purpose of transforming the sentential function in question into a definite expression becomes a meaningless operation, for this operation is performed on symbolic entities, signs, and not on objects for which they are signs.

We note further in (A) that, since (1) and (2) together are the basis for the definition of "E!(ιx) (Φx)", it would seem that the "existence" of a description is reducible to a conjunction involving existence propositions. Nevertheless, the question with respect to "($\exists$ c) : Φx. $\underset{x}{\equiv\equiv}$ = c", which is the equivalent of (1) and (2), is whether the use of the existential operator to quantify a constant is warranted or not in order to express "existence" of the term 'c' which satisfies 'Φx'.[75]

In Chapter IV, we undertook to explain the condition under which the existential operator is employed in connection with the notion of sentential function. In conformance with these conditions, it would seem improper to use the existential operator in connection with constants; no significance attaches to this usage.

Unless, of course, the term 'c' is construed not as a constant but as a variable. But the intention for using the operator in connection with the term 'c' is not to obtain an existence proposition with a proper variable-operator. In the first place, Russell's convention for the use of 'c' is certainly for constants; and, secondly, he speaks of the term 'c' as satisfying the function 'Φx', which leaves one no alternative but to construe 'c' as a constant. But he wishes to secure the term 'c' which satisfies the function 'Φx', i.e., which would transform the function into a true expression 'Φc'. Recall now the semantical concepts which we discussed in Chapter V. 'c' as a term cannot satisfy 'Φx', such that 'Φc' is true unless 'c' is a proper name, i.e. is a name for an object. It would see that under this consideration there would be no necessity for using the existential operator in order to express the idea that this proper name is available. The mention of the proper name as a constituent part of a true elementary sentence is sufficient to indicate the purpose for which the existential operator has been used, for the quantification of this proper name or constant.

In order, therefore, to give consistency in the notation involved for the definition of the existence of a description, we cannot interpret the definiens in this definition to be expressive of an existence proposition. We must prescribe the usage of the existential operator for constants in favor of the elementary sentence where the constant occurs as a constituent part. In order to carry this out, the new definiens: "Φx. $\underset{x}{\equiv\equiv}$: x = c. Φc" is

proposed in place of "$(\exists c) : \Phi x \underset{x}{\equiv} .x = c.$" for the "existence" of a definite description. We shall call this proposal *N*.

A few observations now are in order with respect to the new definiens *N*. Firstly, there is not just one term which satisfies the function 'Φx': there are many of these constants; *but* they are all identical to each other. This condition, together with 'Φc' secures the idea that there is only *one object* for which these constants are different names, if *N* were true. This is the one and only one object contemplated in the definite description "$(\iota x)(\Phi x)$". Observe that the above explanations merely follow from R.V-3 which states a fundamental property of names in relation to objects of which they are names.

With this proposal for the correction of the anomalous use of the existential operator in connection with constants, we note that the dangers of metaphysically interpreting the existential operator, which is used for quantifying constants, was apparent for want of a means to express the relation between constants and objects for which these constants are names. We have forwarded a solution for this in the notion of a true elementary sentence for which the relation of designation between arguments and objects have been explained.[76] We have, accordingly, replaced "$(\exists\ c)$" with "Φc", where now metaphysical "existence" is removed in favor of indication of object by a rule of designation for the argument of the true elementary sentence "Φc".

SECTION X
CONCLUSION

The gap between the concept of existence involved in classical philosophy and common sense and that expressed in existence propositions is apparent both from our treatment of existence propositions as a part of the calculus of elementary functions and the analysis of the examples from traditional as well as modern philosophers—Aristotle and Kant, Quine and Russell. Considering the phrase "There exists an x..." which is a part of existence propositions, we find that this does not express "existence" at all in any sense of the word. This arises from various considerations which were discussed at length.

The most immediate of these is the point that "x", the variable constituent of an existence proposition, does not denote at all; so that no "x" is supposed to "exist" as far as the argument from common sense goes. But the notion that "x" does not denote carries with it consequences of a nature more far reaching than the disposal of the common sense argument; we have been led to the concept of the propositional function as an indefinite expression. Unless a propositional function is transformed into a definite expression, it remains undecidable in the language of which it is a part. The existential operator was introduced in order to indicate the operation involved in transforming the sentential function into a definite expression. From here, evidence was sought as to the purely syntactical character of the existential operator: because the variable "x" is considered as an expression-device, the existential operator which is used in connection with this variable merely constitutes a directive for the performance of an operation with respect to the function where in this variable occurs.

Now, the observation that the existential operator is merely a syntactical device speaks against the common notion that "existence" is involved in existence propositions,[77] where "existence" is meant to be a property of arguments that satisfy a sentential function. This anomaly is, perhaps, traceable to the ambiguity with which the term "arguments" that satisfy a sentential function is used on the one hand, it means an array of constants or proper names; and, on the other, it may mean an array of objects. It is the desire to secure these objects which are involved in true sentences that the word "exists" is employed. But, as we have seen, this word, as involved in existence propositions, is a misnomer; even the terminology "existence propositions", as a consequence of this, is also a misnomer.

From here, the break between the traditional conception of existence and that involved in existence propositions becomes more pronounced.

Whereas the ancients had been preoccupied with some kind of an independent "existence" which is a property of things and objects, we have in existence propositions on the other hand, something quite unlike it. In the latter case, the whole question of "existence" is avoided, given the notion of a true elementary sentence to start with.

The definition of the predicate "exists" from existence propositions necessarily must impart the above characteristics of existence propositions. The attempt to formulate a subject-predicate type of proposition about existence in contradistinction to existence propositions perforce must be a radical departure; for in these new proposals, no metaphysical elements of the kind considered in traditional philosophy would be relevant to the predicate "exists". There might be a feeling that metaphysics lurks in all definitions of the predicate "exists", because existence propositions, in terms of which it might be defined or which might contain it as a part, are ultimately dependent on the notion of an elementary atomic sentence which contains the undefined logical subject that denotes something in which a property inheres. This, however, may be disposed of by showing that the truth of a subject-predicate type of sentence is definable in terms of experiencing of objects rather than the "existence" of objects.

Because the use of the phrase "There exists an x..." in connection with existence propositions represents an entirely new meaning from that with which we have all been accustomed when this phrase is employed in common philosophical as well as scientific discourse, we must prohibit the usage of this phrase in the reading of what are called the existence propositions. This might even be pursued to the extent where the word "exists" and its variations may be eliminated in favor of a locution involving constants only or variable operators read without the qualifying phrase of existence, e.g. "For at least an x such that P(x)", instead of "There exists an x such that P(x)". This is for the purpose of removing existence propositions from troublesome associations with traditional metaphysical existence.

Also, any discussion of existence pursued along lines laid down by tradition must inevitably require the invention of a new type of symbolism so as not to confuse it with existence propositions. As for the prospects of this endeavor, it is difficult to say at this moment to what extent they have already been preempted by the treatment of existence propositions in these chapters.

We cannot now indulge in a detailed discussion of certain conclusions which are quite evident in the particular chapters in which they occur; but a word on the limits to which this study had been confined.

It will be noted that our aim all along was to discuss existence propositions and its immediate assumptions or derivations as they occur in current logic, in order to uncover what sort of "existence" is involved in this type of the statement. All the other considerations were subsidiary to this. With some degree of effort, metaphysical and epistemological points were avoided in order to restrict the problem to the exploration of the subject within narrower limits than was thought possible so as to throw light on the concept of "existence". This is because it was found that the essential preliminary of clarifying existence propositions was necessary before one could discuss metaphysics and epistemology in terms of existence propositions. But these latter points must be the subject of a separate study.

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NOTES

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[1]Pap, Arthur, *Elements of Analytic Philosophy.* New York: Macmillan, 1949, p.142.

[2] Or "(Ex) {P(x) • Q(x)}" where x is a variable for individuals, "P" the predicate "men" and "Q" the predicate "mortal."

[3] E.g. "The number (n + 1) is attributed to the concept F if there exists an object *a* which is subsumed under F and if F is so constructed that the number *n* is attributed to the concept 'subsumed under F but not equal to *a*'." Katsoff, Louis O. *A Philosophy of Mathematics.* Iowa: Iowa State College Press, 1948, p. 26

Consider also: "If one assumes that the naive realist is using the words 'see' and 'touch' in such a way that to say of *an object* that it is seen or touched does not entail saying that it *exists* or that it really has the properties it appears to have, then it is clear that the argument form illusion cannot be used to refute him" (*Italics mine*) Ayer, A. J. *The Foundations of Empirical Knowledge.* London Macmillan, 1947, p. 46.

[4] The existential operator "(∃x)" is a qualifying expression corresponding to "There exists an x..." or "For at least an x..."

[5] A *variable* is ordinarily thought to be an ambiguous term which has a range of values called *constants.* V. *infra.*, Sec. iv.

[6] "On Denoting," Mind, 14, 1905. Reprinted in *Readings in Philosophical Analysis,* H. Feigl and W. Sellars, ed. New York: Appleton-Century-Crofts, 1949.

[7] Whitehead, Alfred N. and Russell, Bertrand. *Principia Mathematica.* 2nd ed. Vol. 1. Cambridge: The University Press, 1925, pp. 174-175.

[8] *Ibid.*, p. 68.

[9] *Ibid.*, p. 29.

[10] *Idem.*

[11] Katsoff, L. O., *op. cit.*, pp. 1158-159.

[12] V. *infra.*, ch. vii.

[13] Quine, Williard V. *Mathematical Logic.* New York: Norton, 1940, p. 151. "Russell undertook to resolve the anomalies of existence by admitting the word 'exists' only in connection with descriptions... This course supplies a strict technical meaning for Kant's vague declaration that 'exists' is not a predicate; namely, 'exists' is not grammatically combinable with a variable to form a matrix 'y exists''.

[14] Quine, W.V., *op. cit.*, p. 283.

[15] Carnap, Rudolf. *Logical Syntax of Language.* London: Kegan Paul, 1937, pp. 2, 6-7.

[16] The number of these argument and predicate constants is finite; this is what is contemplated in the expression "etc." The enumeration of these constants,

therefore, can be completed in a finite number of steps.

[17] The rule of types requires that the predicate should be one level higher in type than that of the argument; no function or predicate can then take itself as an argument. On the necessity for the rule or types, consult Whitehead, A.N. and Russell, B., *op. cit.*, pp. 37 ff.

[18] All definitions in this study will be indicated by a letter "D" before the number assigned to it, while rules will be identified by a number with the letter "R" prefixed to it. It will be understood, of course, that all definitions are to be interpreted as decisions merely to use a certain notation or expression in place of another, while rules are to be taken as directives.

[19] This notion of the variable is due to Dr. Ricardo R. Pascual, who has maintained for some time that contrary to Russell's doctrine, the variable is not a denotative term. *Vide* Pascual, Ricardo R. *Elements of Logic,* Quezon City: University of the Philippines, 1950, pp. 145 ff.

[20] C.f. Carnap, Rudolf. *Introduction to Semantics.* Cambridge: Harvard University Press, 1942, p. 26. "To assert a sentence is true means the same as to assert the sentence itself." *Also* Whitehead, A. N. and Russell B., *op. cit.,* pp. 8, 92.

[21] For existential generalization, *v. infra.,* p. 40.

[22] For definition of a definite language, *v. infra, p.38* (D.IV.-6).

[23] Katsoff, L.O., *op. cit.*, p. 136.

[24] Whitehead, A.N. and Russell B., *op. cit.*, p. xiii.

[25] Cf. Carnap's definition of definite expressions: "An expression will be called *definite* when all the constants which occur in it are definite, and when all the variables in it are limitedly bound; otherwise *indefinite.*" A symbol is "definite when it is either an undefined constant or a defined one in the definition-chain of which no unlimited operator occurs; otherwise indefinite." (*Logical Syntax*, p. 45).

We depart from Carnap's definition in this chapter with respect to limited operators which specify the *number of arguments* for which the function is satisfied. It is believed that his specification is unnecessary with respect to the problem of the study, since the only relevant problem raised with respect to range operators take insofar as their number is concerned is that of Brouwer who maintains that the law of excluded middle is applicable only to finite sets, and, therefore, the operator must have only a finite range. The intention of our operators, however, is precisely to convey the idea that we are considering only a finite range, for we are not concerned with infinite ranges in this study. We are not, consequently, required to specify the number of arguments which is the use for which the limited operator is intended. The unlimited operators "E x)" "(x" are used, therefore, to define the definite language wherein variables occur.

[26] Whitehead, A.N. and Russell, B., *op. cit.*, p. xiii.

[27] Cf. Carnap, R. *Logical Syntax*, pp. 140-141.

[28] Whitehead and Russell, *op. cit.*, on "Incomplete Symbols", pp. 66 ff.

[29] Cf. Carnap, R. *Introduction to Semantics*, p. 57, on logical and descriptive signs.

[30] For definite descriptions, V. *supra*, p. 19 ff; *infra.*, ch. ix.

[31] A metalanguage is a language used to make assertions about another language

(the object language).

[32]Carnap, R. *Introduction to Semantics*, p. 23.

[33]*Ibid.*, p. 24.

[34]"A relation is said to be 'one-one' when, if x has the relation in question to y, no other tem x' has the relation to y, and x does not have the same relation to any term y' other than y. When only the first part of these two conditions is fulfilled, the relation is one-many, when only the second is fulfilled, it is called many-one." (Russell, B. *Introduction to Mathematical Philosophy.* London: Allen & Unwin, 1920, p. 15.)

[35]Pascual, R.R., *op. cit.*, p. 66.

[36] This distinction in levels of truth between that of elementary sentences and general statements (derivable generalizations) is found in the *Principia Mathematica*, p. 45. Russell and Whitehead use the term elementary truth for elementary propositions and second-order truth for general statements. Second-order truth taken for molecular statements is the same as that for general statements, because general statements can be transcribed in terms of molecular statements and vice-versa.

[37] The notion of proposition that is being criticized here refers to the traditional proposition which is supposed to denote judgments which are psychological.

[38]We adopt the convention that truth and falsehood are exhaustive and mutually exclusive values.

[39] (1) "Notes on Existence and Necessity," *Journal of Philosophy*, XL (5): 113-127 (1943). To be referred to hereafter as "Notes."

(2)"Designation and Existence," *Journal of Philosophy*, XXXVI (26) : 701-709 (1939). To be referred to hereafter as "Designation."

[40]*Designation*, pp. 707-708.

[41]*Notes*, p. 117.

[42]*Designation*, p. 706.

[43]*Designation*, p. 708.

[44]*Designation*, p. 701: "The expression following the word 'as',... purports to designate some *one specific entity*—perhaps an individual, as in the case of 'Pegasus' and 'Bucephalus', or perhaps a property or other abstract entity, as in the case of 'appendicitis'." (*Italics mine)*

[45]Cf. Reichenbach, Hans. *Elements of Symbolic Logic.* New York:Macmillan, 1947, p. 95.

[46]*De Interpretatione*, 5, 17a, 3-4.

[47]*Ibid.*, 5,17a, *passim.*

[48] *Ibid.*, 5, 17a, 38-40.

[49]*Categories*, 2,2a, 11-13.

[50]*Ibid*, 5, 2b, 16-17.

[51]*De Interpretatione*, 5, 17b, 8-13. "As instances of propositions made with regard to a universal, but not of universal character, we may take the propositions 'man is white', 'man is not white'. 'Man' is a universal, but the proposition is not made

as of universal character; for the word 'every' does not make the subject a universal, but rather gives the proposition a universal character."

[52] *Ibid.*, 5, 17b, 20-23.

[53] *Prior Analytics,* I, 1, 24a, 17-19.

[54] Categories, 5, 2a, 35-38. "'Animal' is predicable of the species 'man', therefore of the individual men, for if there were no individual man of whom it could be predicated, it could not be predicated of the species 'man' at all."

[55] The term *individual man* being a constant "There is no individual man" is a proposition about existence and not an existence proposition.

[56] Kant, Immanuel. *Critique of Pure Reason,* J.M.D. Meiklejohn, tr., rev. ed. New York: Willey Book Co., p. 7.

[57] *Loc. Cit.*

[58] *Ibid., passim,* pp. 26-27.

[59] *Ibid.*, p. 31.

[60] *Ibid.*, p. 21.

[61] *Ibid.*, pp. 42-43. Cf. also: "For as conditions of all existence in general, space and time must be conditions of the existence of the Supreme Being also." *Idem.*

[62] One of which is *existence.*

[63] *Ibid., p. 142.*

[64] *Ibid.*, p. 21.

[65] *Idem.*

[66] *Ibid., p. 129.*

[67] "The distinction between existence and other predicates, which Kant obscurely felt, is brought to light by the theory of descriptions, and is seen to remove "existence" altogether from the fundamental notions of metaphysics." Russell, B. *Mysticism and Logic.* New York: Norton, 1929, p.176.

[68] The usage of the word 'definite' in connection with definite descriptions has nothing to do with our employment of this term in the conception of a definite expression found in Chapter V.

For Russell's works on definite description, consult the following:

(1)Principia Mathematica, 2nd ed., Vol. X, pp. 30 ff., 173 ff.
(2)Introduction to Mathematical Philosophy. London: Allen & Unwin, 1920, Chapter 16.
(3)"On Denoting", reprinted from *Mind,* 1905, v. 14, in *Readings in Philosophical Analysis,* Feigl and Sellars, ed. New York: Appleton-Century-Crofts, 1949, pp. 103-115.
(4)"Knowledge by Acquaintance and Knowledge by Descriptions" in *Mysticism and Logic,* New York: W.W. Norton, 1929, pp. 209-232.

[69] *Mysticism and Logis,* p. 176.

[70] *Principia Mathematica,* p.66.

[71] *Ibid.*, p. 68

[72] *Ibid.*, p. 174.

[73] *Ibid.*, p. 68.

[74] *Ibid.*, p. 173.

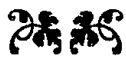
[75] Cf. *Introduction to Mathematical Philosophy,* p. 178. "' The term satisfying the function x exists' means: *"There is a term c* such that x is always equivalent to 'x is c'. (*Italics mine. 'There is a term 'c'* where 'c' is a constant is a metaphysical expression.)

[76] *V. supra,* ch. V.

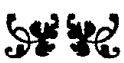
[77] Cf. Russell, B. *Introduction to Mathematical Philosophy,* p. 167: "Now if x is sometimes true, we may say there are x's for which it is true, or we may say arguments satisfying x *exist.* This is the fundamental meaning of the word "existence".

THE PACING OF BEHAVIOR

A TECHINIQUE FOR THE CONTROL OF THE FREE OPERANT



This paper, written in 1964 shows Dr. Lagmay's contribution to the concept of "pacing." In his own works, the study demonstrates a technique for the control of the free operant. "By not reinforcing high rates, nor low rates of responding, one has an experimental condition which we may call pacing, which is a very strict condition for reinforcement because, in effect, too "enthusiastic" responding as well as "sluggish" behavior will not be reinforced even if the animal is highly motivated." This creates an aversive situation for the animal so that when the pacing condition is removed, the response rate reaches a maximum level which is suggestive of exhilaration after the removal of an aversive contingency. The experiments which were the basis of this paper show Dr. Lagmay's prowess in the analysis of behavior.



THE PACING OF BEHAVIOR

A Technique for the Control of the Free Operant*

INTRODUCTION

In the analysis of behavior under intermittent reinforcement, many problems are conveniently dealt with in terms of such categories as time, number of responses since the last reinforcement, or the prevailing rate at the moment of reinforcement.[3,4] Skinner states the general argument thus: "The reinforcement of a response has an effect upon the subsequent behavior of the organism which is controlled by the extent to which subsequent stimulating conditions resemble the stimulating conditions at the time of reinforcement. The performance characteristic of a schedule may become stable if the conditions which prevail at reinforcement under it are precisely the conditions needed to maintain it."[5] To be sure, there are occasions when changes do occur in the conditions just at the moment of reinforcement. These are brought about by changes in the behavior of the organism itself. In the case of fixed-ratio responding, for example, the development of the rate is always towards a high limiting value since the experimental conditions allow for a reinforcement at progressively higher and higher rates.

This is a study of the case where the rate is not allowed to change. The rate at which the organism is reinforced is "frozen" at a certain level right from the beginning of exposure to the schedule. By insisting on a constant rate of responding at the moment of reinforcement, it is possible to show how other factors than the rate prevailing at the moment of reinforcement do intervene to give the schedule performance the characteristics it has.

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* These experiments were performed at the Harvard Psychological Laboratories, as part of a long-term research project on intermittent reinforcement under U.S. Office of Naval Research Contracts No. N5ori-0731 and N5ori-07656 with Harvard University. My gratitude to Prof. B.F. Skinner for his kind guidance and support all throughout the course of these studies and to Dr. Charles B. Ferster for a most pleasant apprenticeship in the technical instrumentation of these experiments.

Some control of rate at the moment of reinforcement has heretofore been achieved by means of either of two techniques in the study of schedules of reinforcement:

(1)By differential reinforcement only of low rates,** i.e., by requiring that the interval of time between the reinforced response and the preceding response be at least a certain value, say, 4 or 5 seconds.

(2)By differential reinforcement only of high rates, that is, insisting that at least a certain number of responses preceding and including the reinforced response be emitted within a relatively short period of time. These two cases determine an upper and lower limit for rate of responding, respectively.

A third possibility, to be developed here, shall be called "pacing".

(3) In pacing, the organism is required to respond at a rate which lies between an upper and a lower limiting value.

The following study was concerned primarily with the development of a technique of pacing at slow rates and with the investigation of certain of its properties under certain schedules of reinforcement.

APPARATUS

Although most of the features of the experimental box, the recorder, and the programming apparatus are discussed in more detail elsewhere [1], these will be briefly described here in order to make this account self-contained. The pacing apparatus, however, is not described anywhere else.

EXPERIMENTAL BOX.-This was a standard Skinner box for pigeons of the type being used in the Harvard Psychological Laboratories for the study of operant behavior. It was made from a picnic ice-box about 11" x 13" x 20". The insulation and thickness of the walls afforded a considerable amount of soundproofing from outside extraneous sounds. In order to further secure adequate masking of unwanted sounds, white noise was constantly delivered inside the experimental chamber.

The box was divided into two compartments by a panel. On one side was the pigeon chamber and on the other, the food-magazine. The bird pecked at a plate of translucent plexiglas, which was mounted

** Strictly speaking, responding at low rates is what is reinforced. More generally, responding with a given property or responding under a specified set of relations is what is reinforced. In this study, all usages of the term *reinforcement* and its cognate forms may be similarly translated.

behind a circular opening in the panel about one inch in diameter at about the level of the bird's head when it was standing normally. When the bird pecked at this plate, a pair of metal contacts were separated from each other and a corresponding electrical circuit was broken. A relay operated by this circuit was used for programming the experiment and for recording. The plexiglas key was always lighted from the magazine side of the panel. When a response was reinforced, the key light went off almost simultaneously with that response and a light over the food-magazine, which was below the key, went on. For the duration of the reinforcement, which was about 3.5 secs., food was available and the magazine light was on. After this 3.5 secs., food was no longer available, and the magazine light went off; at the same time, the light through the response-key was turrted on again.

A light of moderately low intensity was furnished by a 6-watt bulb in the bird compartment during the experiment. At the end of the experiment, this light as well as all other lights in the box were turned off, thus leaving the bird in complete darkness.

In one corner of the box was a cup where fresh water was always available.

In order to minimize grain-hunting behavior during the experiment, the cross-wire grid floor of the pigeon chamber was raised by about 1 inch from the metal bottom of the box. Any grain that might be thrown into this compartment from the food-magazine was therefore completely out of reach of the bird.

Fresh air was constantly kept in circulation inside the experimental chamber by means of a motor ventilator.

THE PROGRAMMING APPARATUS AND CUMULATIVE RECORDER. —The experiments were run through a system of switching circuits which arranged for the automatic delivery of critical stimuli and which, with timers and counters, made the programming of reinforcements possible. From the time the bird was put into the box up to the end of the experiment, there was no direct contact of any form between the experimenter and the subject. Responses as well as reinforcements were recorded through a cumulative recorder, which gave continuous records throughout the experiment.

THE PACING APPARATUS.—The requirement of control of rate of responding at the moment of reinforcement, for which the experimental apparatus must provide, may be satisfied by the following conditions:

1) Too *long* an inter-response time is not to be reinforced: a lower limit for rate of responding is imposed;
(2) Too *short* an inter-response time is not to be reinforced: an upper limit for rate of responding is required; and
(3) The animal must have emitted just before and at the moment of reinforcement an arbitrary, number of successive responses at a rate the limits of which are set by (1) and (2) above.

The instrumentation of conditions (1) and (2) was achieved by means of two vacuum-tube timers each of which set the limits for inter-response times.

Consider two variable timers X and Y, the activating pulse durations of which can be adjusted independently of each other. X is set, say, at 2 secs., and Y at 1 sec. The apparatus circuits are arranged such that X and Y are activated from zero time by each peck at the response-key. When both X- and Y-pulses are on or when both are off, the next peck is not going to be reinforced. But when X is on and Y is off, that is after 1 sec. but before 2 secs., a response will be reinforced.

Figure 1 shows how a pacing response is instrumentally defined with respect to a prior peck. Any key-response starts both timers X and Y

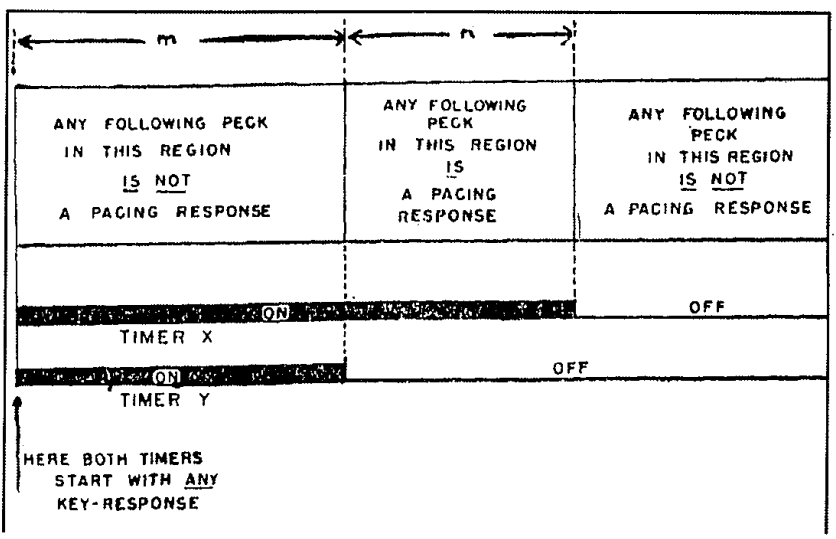

FIGURE 1

Showing how a pacing response is defined instrumentally with respect to any prior peck. In this arrangement m sets the upper limit and m + n, the lower limit, for rate of responding, n determines the precision of pacing.

from zero time. If the next response occurs within region m, when both X and Y are on, no reinforcement is possible. When the next response occurs beyond region n, when X and Y are off, no reinforcement is available either. Only when the peck is within region *n*, when timer Y is off and timer X is still on, will the succeeding response be reinforced. Any response within region n is defined as a *pacing response*. More generally, when the time-interval between any two responses satisfies the pacing limits set by the apparatus, the latter of these responses will be called a *pacing response*.

From the relations shown in the figure, it follows that the lower limit for rate of responding is set by timer X. For example, if one response is required within a 2.5 sec.-limit with respect to the preceding response, then the rate limit must be .4 response per second. Any rate slower than this is never reinforced. This satisfies condition (1). On the other hand, suppose that timer Y required that the next response does not occur sooner than 2.0 secs., or that the rate be not faster than .5 response per sec. This is the upper limit and satisfies condition (2). If the inter-response time, therefore, is between 2.0 and 2.5 secs., that is, if it is a value that lies within region n, the response may make a pacing count or may be reinforced. n may be varied by manipulating either timer X or Y. In any case n may be a very short interval or a long one. It determines the precision of pacing because by making this interval shorter, a relatively narrower distribution of inter-response times is reinforced.

Condition (3) is met by making every pacing response step a counter which in turn determines the number of successive-pacing-responses that must be made before a reinforcement is delivered. If a non-pacing response is made before the full count is reached, the counter resets back to zero count and the bird has to start all over again.

ISOLATION OF THE PACING APPARATUS. —Since the pacing response also required that there was to be no differential external stimulus-control with respect to the reinforced and non-reinforced regions of the inter-response time spectrum it was necessary to mask all critical sounds from the timers and the counter that had to do with marking those regions off. Clicks from the timer and relays connected to it were handled by the masking noise inside the experimental chamber. The pacing counter which made an unusually loud buzz when it reset for a non-pacing response or which clicked with some intensity when a successful pacing response was made, was set up in another room some distance away from the experimental box.

SUBJECTS

The subjects for this study were male White Carneaux pigeons which were obtained from Palmetto Pigeon Plant, Sumter South Carolina. They were about one and a half years old at the start of the experiments and since the life span of these is at least 15 years, variation due to age is ruled out.

The weights of the birds were brought down to a little below 80% of their *ad lib* weights by almost completely depriving them of food for about a week. About 2 or 3 grams of grain per day were given during this deprivation period, which was sufficient to prevent digestive disturbances that usually attend complete deprivation period. After this, the daily feeding schedule was merely a matter of giving them the balance of the ration that would bring their weights up to the 80%-level, as described below.

The birds were tamed before the start of the experiments in order to minimize handling effects.

All birds were trained to eat from the magazine hopper of the experimental box and to peck at the key by reinforcing progressive approximations to contact of the beak with the response-key.

CONTROL OF OTHER FACTORS

The birds were given a daily ration of a grain mixture consisting of about 40% vetch, 10% hemp seed, and 50% kaffir corn either in the experimental box or in their cages in the left. Their weight at the start of every experiment was always 80% of the *ad lib* weight minus the ration for the day, part or all of which they worked for in the experimental chamber. Any unfed portion at the end of the experiment which was necessary to bring the weight up to the 80%-level was given outside in the cages fifteen minutes after the bird was taken out of the box. This fifteen-minute delay for non-experimental feeding after the bird was taken out of the box was followed just to make sure that a relatively long period of non-responding in the experimental box was never correlated with the termination of the experiment and with a reinforcement immediately thereafter.

The room where the bird loft was located was lighted and darkened by an automatic switching-timer which kept the daily light-dark cycle constant from day to day.

There were no provisions for the control of humidity, but the temperature, though variable, was kept within limits of indoor comfort for the people working at the laboratory. It may be said, though, that

the performance of the White Carneaux is relatively insensitive to wide variations in humidity and temperature of the range obtaining at the laboratory.

SOME OTHER GENERAL PROBLEMS

MEASUREMENTS AND REPLICATES.—Data were obtained through a cumulative recorder which kept continuous records of responding as a function of time for the entire experimental session. Derivative data that were of any special interest could be obtained from this cumulative graph. Whenever a figure is given with respect to a day's performance by a single subject, it will be assumed to be typically replicated; otherwise, it will be accordingly qualified.

Every experiment was run with at least two subjects, with repeated measurements taken of the performance over a period of time. Occasionally, an experiment was repeated on the same subject at some other value of the experimental variable, provided that the process under consideration was known to be reversible.

The results of some part of an experiment were sometimes also replicated in the study of other subjects which underwent a similar history for other purposes. Consequently, some observations that are reported for any particular experiment may apply to more than two subjects.

CONTROLS.—The experiments were designed so that each subject was its own control. Before any experimental variable was introduced, baselines were usually first established by stabilizing the response of the bird over some schedule the properties of which were relatively better known. The time required to get such a baseline was arbitrarily determined by the nature of the experiment and the time course of the performance. The length of the experiment could usually not be specified in advance because the deciding criterion was the appearance of certain significant changes in the responding which could not be predicted. Different birds took different times to stabilize or to arrive at important changes in their behavior. The choice was made to allow each experiment to run its course as against the alternative experimental design in which individual differences with respect to time might be emphasized.

EXPERIMENT I

THE PACING TECHNIQUE—a method for the differentiation of paced responding (*slow rates*).

PROBLEM.—Whether or not a bird can be made to pace right away at a slow rate depends, among other things, on its previous history. If the bird has previously been reinforced consistently for very rapid,

grouped responses, a very slow pacing requirement may be too difficult. This is the case when the bird has been exposed to ratio schedules of reinforcement or to some contingency where there is differential reinforcement of high rates, e.g. a requirement that it shall have made a run of 4 or 5 responses per second just before reinforcement. As a result, there may be no contact between the bird's behavior and the reinforcing contingencies of the pacing situation. At least a reinforcement will be so rare that its effect will not be felt in the shaping of the response topography appropriate to paced responding.

The curve for a variable-interval schedule, which generates relatively evenly-spaced responses at moderate rates, is a good base from which pacing at some other rate may be formed. If the bird is a naive experimental subject, then the solution is simply to prevent reinforcement of grouped responding from the beginning by imposing the pacing condition. This latter case is especially suited for studies requiring control, right from the initial exposure to the response-key, for the history of the animal with respect to the rate at which it is reinforced.

In the experiment that follows, the variable-interval schedule was taken as a base-line in order to make it possible to judge in some way later on whether or not the pacing apparatus could in fact shape up the behavior of the bird. The technique involved was not different essentially from the other case where the variable-interval baseline was not used.

PROCEDURE.—The two subjects in this experiment were stabilized for about one week under a variable-interval schedule with a mean of one minute. The schedule was made by randomly arranging a set of interval values which when ordered formed an arithmetic progression from 1 sec. to 120 secs. Before this stabilization procedure, the birds had undergone a history of variable-interval responding in connection with some exploratory work.

The bird were taken off the variable-interval schedule and put under a pacing condition where reinforcements were delivered every time a given number of pacing responses was made. We shall call this "*continuous pacing*", where the only requirement for a reinforcement to occur is that an arbitrary number of responses, say, two or three, be pacing response. The continuous pacing requirement was first put at one pacing responses; then it was successively increased to two and to three pacing responses.

The initial settings for the upper and lower pacing time limits were determined in the following way: In Figure 1, consider again region n in relation to timers X and Y. Through a system of light signals outside

the experimental box, it was possible for the experimenter to adjust the length of M and m + n by manipulating variable timers X and Y such that, when the bird was responding under the one-minute variable-interval schedule, almost all of its pecks fell within region n. The pacing apparatus was not connected with the reinforcing device while these determinations were being made. Then m was moved up by 1/2n, and m + n by the same distance. This meant that when the pacing circuit was connected as a condition for reinforcement, responses falling within the second half of the interval n were the only ones to be reinforced.

Since the difficulty of pacing depends very much on how many pacing responses are required of the subject before a reinforcement can occur, it was important to require initially only one pacing response, later on increasing this to two as the bird showed some consistent evidence of success under the one paced-response condition.

So long as the bird was progressively getting reinforced more and more often as shown by the increasing density of reinforcement lines in the record, it was possible either to increase the lower time limit and/or the upper limit for the inter-response time in order to differentiate out the slower rates gradually. Step by step the slower rates were shaped up this way. The changes in time values of the limits or the number of pacing responses required were never too large; otherwise, the bird would not get reinforced for a long time and the initial differentiation might break down. This happened in some preliminary experiments conducted earlier.

When the bird was consistently pacing at some specified rate for at least three successive pacing responses, the one-minute variable-interval schedule was added to the pacing condition. This arrangement meant that a tandem schedule became operative: after every reinforcement, a variable-interval was always followed by a 3-paced-response requirement before another reinforcement could occur.

For this experiment, two different rates on a one-minute variable-interval schedule with a tandem pacing condition were differentiated by the above procedure.

The same technique was used for two other subjects where the object was to control for the history of the bird with respect to the rate at which it was reinforced. These birds were subjected first to a continuous reinforcement schedule where every single peck was reinforced 60 times. In following sessions, the birds were given 5 continuous reinforcements; then "continuous pacing" for one pacing response was introduced at limits of 1.3 and 2.3 secs. After they were reinforced 55 times on this schedule, two pacing responses were required. When this requirement

was frequently fulfilled, it was increased to three pacing responses. A one-minute variable-interval schedule was then added. It will be noted that the variation in technique consisted in the massing of reinforcements under continuous pacing conditions for gradually increasing number of pacing responses before the variable-interval schedule was introduced. This has the advantage of relatively quick shaping which cannot be done as easily with the other procedure if the rates eventually envisaged are slow pacing rates.

RESULTS. Figure 2 shows the cumulative record of one bird where some of the essential steps in one of the training procedures are illustrated. This bird had had a history of 1-min. variable-interval responding at about two responses per second immediately prior to being subjected to the pacing condition The record starts with a "continuous pacing" requirement of two responses at limiting inter-response times of 0.8 and 1.3 secs. The small horizontal lines jutting from the curve represent reinforcements for pacing responses that satisfy the time limits. As the density of the reinforcements increased, the pacing requirement was made more difficult by requiring three pacing responses instead of two, as shown in the figure. The one-minute variable-interval schedule was introduced later on as soon as the reinforcements commenced to mass themselves again. The rest of the record shows performance at about one response per sec. under a tandem schedule consisting of the variable-interval schedule and a three-paced response contingency. Similar records were obtained from the other bird.

The other procedure for differentiating the pacing response is illustrated for one bird in Figure 3. This bird was a naive experimental subject and had never had any history with respect to the response-key except for 60 pecks, each of which was reinforced. On Day 1, each of the first 5 pecks was reinforced. These reinforcements do not show in the record. Then the apparatus was switched immediately to reinforce on a "continuous pacing" condition at inter-response time limits of 1.3 and 2.3 secs. for just one pacing response. The bird quickly developed the response and reinforcements were massed for that day accordingly. This continued up to Day 4, when, as indicated, the number of pacing responses was increased to three. On the fifth day a one-minute variable-interval was introduced. The record for this day shows the characteristic brief pause after reinforcement under this experimental condition.

Figure 4 shows a set of three experimental records for one bird: (A) stable 1-min. variable-interval performance just before training under pacing conditions. (B) stable responding at 1 response per sec., under one-minute variable-interval with added pacing after being trained as

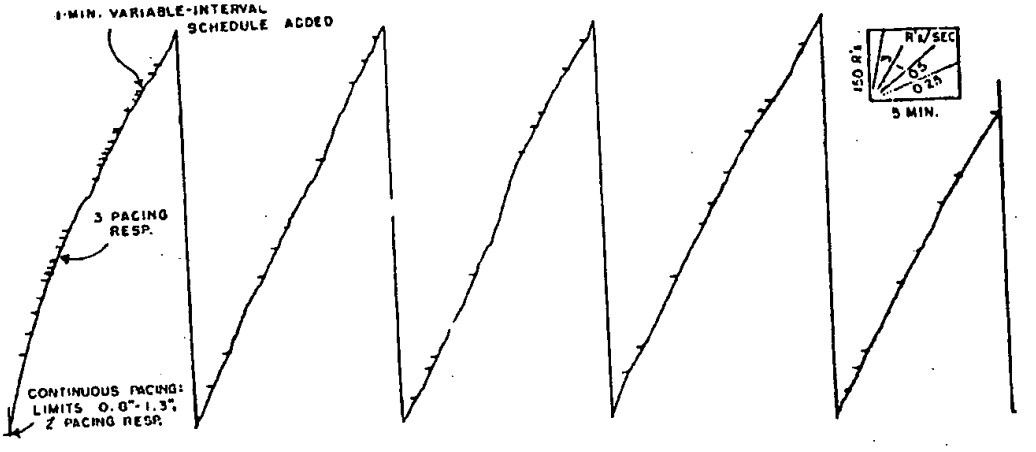

FIGURE 2

Cumulative record for one session which shows the essential steps in the training procedure for differentiating the pacing response in a bird with a history of variable-interval responding.

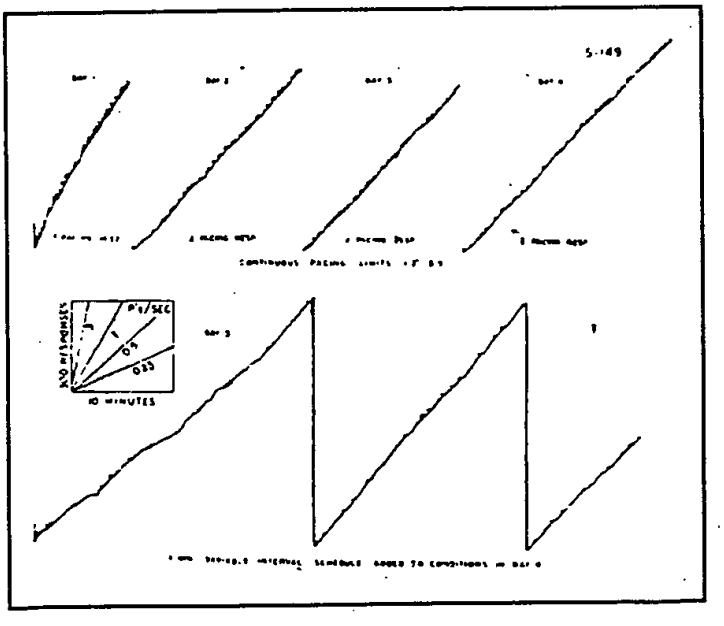

FIGURE 3

Records for 5 consecutive days which shows all the important steps followed in differentiating the pacing response in a bird without any history with respect to the response-key except for 60 continuous reinforcements.

described above at limits of 0.8 and 1.3 secs. (C) responding at .45 response per sec. under one-minute variable-interval with added pacing at limits of 2.0 and 2.5 secs. These records are presented in order to give some notion of how we can manipulate pacing rates. In addition, they permit some interesting comparisons to which we shall have occasion to refer to later on. Figure 5 is a set of similar records for the other bird.

MEDIATING BEHAVIOR IN PACED RESPONDING.—Observations were made of the birds' behavior through a plexiglas window on top of the experimental box. All of the birds mentioned in this study developed some form of mediating responses while they were pacing, which were quite marked and regular at slow pacing rates. For example, S-102 swung its head towards the top left-hand corner of the wall before every peck at the key. Its duplicate, S-104, was observed to bow its head towards the left, then tap at the floor, after which it swung back up to the key. Another bird "kept time", so to speak, by tapping about ¼" inch to the right of the response-key. The appearance of this behavior presents special problems which may not be found in pacing at higher rates.

DISCUSSION.—The two variations of the technique used in this experiment were applications of a familiar principle first discussed by Skinner.[4] Preliminary work on the pacing of the pecking response in the pigeon had shown that it could pace under the conditions we were working with as soon as it developed a relatively clear-cut mediating behavior in relation to the response that finally activated the response-key. Consequently, the task was narrowed down to the choice of a method the object of which was the rapid differentiation of the appropriate response topography. By making the reinforcements contingent upon the execution of a certain amount of behavior prior to the key-response and massing these reinforcements so long as the conditions for responding were met, it was possible to build up sustained paced responding by gradual approximations as described above.

A requirement one had to deal with in shaping the pacing behavior was that there was to be no external stimuli corresponding to the reinforced and non-reinforced points on the inter-response time spectrum. There were no signals in the external environment of the bird in terms of which it could "mark time". A response counted towards reinforcement only if the bird emitted a certain amount of another form of behavior before pecking at the key. When the response topography was consistent within certain limits, this amount of behavior measured off a certain time interval. It will be noted that this behavior could be regarded as a chain of which the only member that is reinforced is the peck at the key. This point will be dealt with later on.

The use of three pacing responses instead of four or five or six was dictated by the difficulty of meeting one other concurrent condition: the pacing counter reset to zero when just one response was either too slow or too fast. Choice had to be made between the possibility that the bird might form a discrimination with respect to the three pacing responses and the observed fact that too rigorous a requirement of, say, five pacing responses sometimes prevented the bird from getting a reinforcement indefinitely, thus placing the performance of the bird on a basis which could not be controlled.

EXPERIMENT II

EFFECT OF RELEASE FROM SLOW PACING

PROBLEM.—The demonstration that paced responding does exist is not by any means exhausted by the method pursued in Experiment I where, by starting with a one-minute variable-interval curve as a reference base, it was shown that the bird could be made to respond at comparatively much slower rates. The intent, however, in the previous experiment was centered on the technique for differentiating the pacing response. The inverse procedure probably is just as interesting: with stable paced responding at some specified rate, and at lower levels than normally obtain for a free variable-interval schedule of reinforcement as the baseline, what happens when the pacing requirement is removed? This experiment was directed towards a further demonstration that slow pacing can be obtained and to showing some properties of slow pacing when the subject is released from it.

PROCEDURE.—Two of the subjects reported in Experiment I were used. They were stabilized at slow pacing rates and then the pacing requirement was removed. One of the birds was put for 7 days under one-minute variable-interval schedule with added pacing at limits of 0.8 and 1.3 secs., and then observed for 14 days thereafter under one-minute variable-interval without the pacing condition. Then it was shaped up to pace at time limits of 2.0 and 2.4 secs., and was stabilized with an added one-minute variable-interval schedule for 14 days. During the next 7 days the condition was a one-minute variable-interview schedule without pacing. An identical procedure was followed for the other bird, except that the number of days it took to obtain the needed observations was different.

RESULTS.—Figure 6 shows the day-to-day course of responding by S-104 for each of the pacing limits. The point at which the pacing requirement was removed is indicated in each case. The curve shows that the rate rises to a maximal value and then subsides to a lower level. This final level is higher than that of the prior pacing condition and is

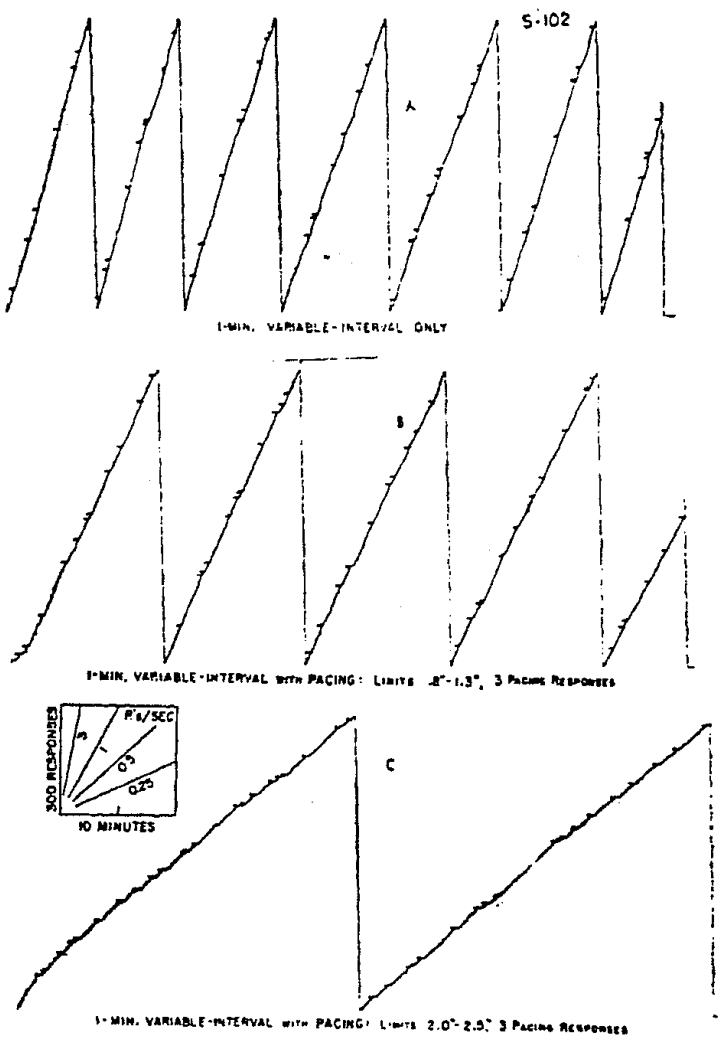

FIGURE 4

Comparative records for S-102 showing systematic changes in rate of responding as a function of the added pacing condition. All curves represent stable responding at the indicated schedule.

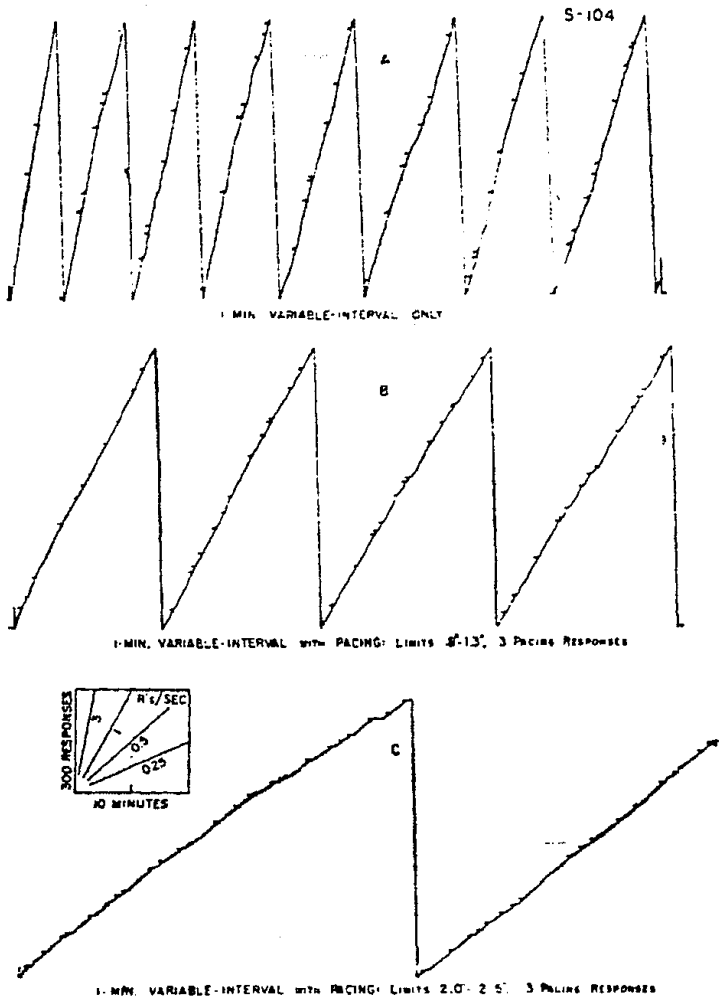

FIGURE 5

Comparative records for another bird, S-104, showing systematic changes in rate of responding as a function of the added pacing condition. All curves represent stable responding at the indicated schedule.

about of the same magnitude as that under the normal one-minute variable interval responding prior to this experiment. The two curves for this bird are similar.

Figure 7 is for S-102 and duplicates that for S-104. In one of the curves the rise to a higher value after the removal of the pacing requirement is not marked but is nonetheless present.

Comparative records for one of the birds to illustrate the difference between one-minute variable-interval with added pacing and release from added pacing are shown in Figures 8 and 9. There are two sets of curves, one for each of two different pacing limits. In number of responses, record 8-A differs from 8-B by a factor of about 2.6 and 9-A by a factor of about 5.

It will be noted that there is an increase in the number of reinforcements per unit time as soon as the pacing requirement is removed.

DISCUSIONS.—By removing the pacing condition from a given schedule under which the bird is performing and showing that there is a significant change in the responding which is appropriate to the new schedule, we have a complementary demonstration of the existence of

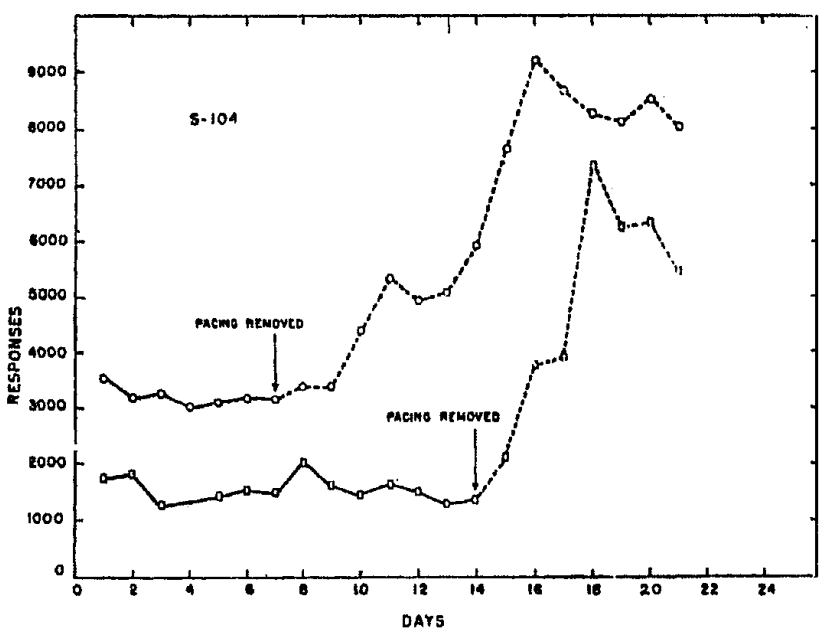

FIGURE 6

Time course of responding by S-104 for each of two different sets of pacing limits. It shows the effect of the removal of a slow pacing condition. Upper curve (solid line): Pacing limits—0.8" and 1.3". Lower curve (solid line): Pacing limits—2.0" and 2.5".

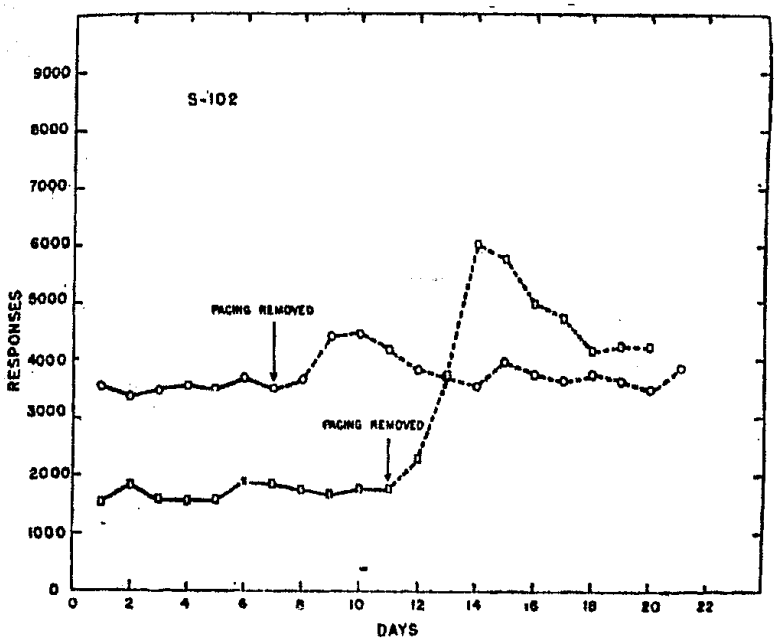

FIGURE 7

Time course of responding by S-102 for each of two different sets of pacing limits. It shows the effect of the removal of a slow pacing condition. Upper curve (solid line): Pacing limits—2.0" and 2.5".

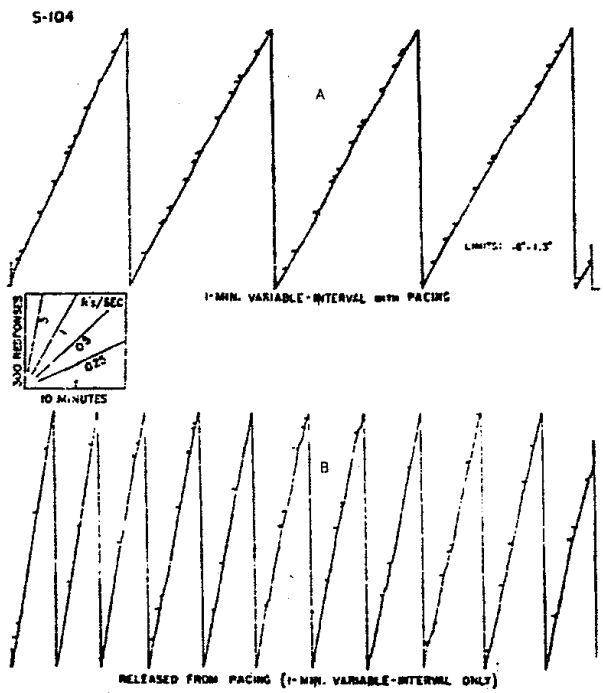

FIGURE 8

Showing changes in rate of responding for S-104 when the pacing condition is removed.

pacing behavior. This experiment shows that there are marked differences in rate of responding between that appropriate to a variable-interval schedule of reinforcement without pacing and that with the slow pacing condition added. The possibility that these rate differences are due to differences in the number of reinforcements per unit time may be ruled out by the fact that the same birds on a prior two-minute variable-interval schedule, providing fewer reinforcements per unit time than that of the paced one-minute variable-interval, gave rates just a trifle below those on a one-minute variable-interval schedule and certainly much higher than those on the one-minute variable-interval with added pacing of the limits herein considered. This question is also considered in another experiment, to be reported in another paper, where there were explicit arrangements for the control of number of reinforcements per unit time in comparing the paced and non-paced variable-interval schedules.

Herrnstein and Morse[3] have shown independently of this study that an organism will work to remove a slow-down contingency in order to be able to respond at faster rates to a variable-interval schedule of reinforcement. Therefore, the positively-accelerated rise in the curve for number of responses plotted as a function of the daily experimental periods suggests another possibility. If it is supposed that slow pacing is aversive, then the rapid responding following the removal of the pacing requirement reflects the reinforcing effect of removing an aversive condition. Actually, this point is consistent with and supported by observations in other experiments on paced behavior, under fixed-ratio as well as variable-interval schedules of reinforcement.

That part of the curve which rises to a maximum, indeed shows the effect of this release from an aversive slow-pacing condition: while the decline after this maximum towards a lower level of responding are the effects of normal reinforcing contingencies in the variable-interval schedule.

The end-points of the curves in Figures 7 and 8 are values that fall within the range of prior stable variable-interval rates of responding.

SUMMARY

In the analysis of schedules of reinforcement, it is necessary to take into account the organism's rate of responding at the moment of reinforcement. The pacing technique is a method for controlling the response rate prevailing when the organism is reinforced. This is done by requiring that the time-interval between the responses just before reinforcement have a value that lies between two limits.

Two variations of a procedure for the differentiation of pacing behavior at slow rates are described. Through the use of the curve for performance under a variable-interval schedule of reinforcement as a base reference, it was shown experimentally that slow-pacing rates could be obtained which changed systematically with the time-limits imposed by the pacing apparatus.

In a second experiment, the organism was released from a slow-pacing contingency. There was a positively-accelerated rise in the curve for number of responses plotted as a function of time. The function rose to a maximum, and then subsided to a lower level appropriate to the original schedule without the pacing condition. It is suggested that that part of the curve which rises to a maximum is due to the reinforcing effect of removal of an aversive condition.

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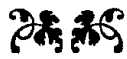
2. Fersters, C.B. and Skinner, B.F. *Schedules of Reinforcement.* New York: Appleton-Century-Crofts, 1957.
3. Herrnstein, R. and Morse, W. Personal communication. 1954.
4. Skinner, B.F. *The Behavior of Organisms: an Experimental Analysis.* New York: Appleton-Century-Crofts, 1938.
5. _____ Intermittent reinforcement. *AMer, Psychol.,* 1950, 5, 248 (abstract).
6. _____ Notes on seminar in *Analysis of Behavior: Intermittent Reinforcement.* Fall. 1951, Harvard University.
7. _____ *Project Pigeon Report N5ori-1:56,* 1953.

Rule-Specified Versus Non-Verbal Conceptualization



As a teacher-scientist and an academic. Dr. Lagmay has had a long-standing interest in the nature of the teaching-learning process as well as in utilizing the university's resources to nourish the intellectual climate therein and in the school system of the nation.

In this paper, Dr. Lagmay examines the nature of the learning transactions that transpire in the classroom between the teacher-scientist and the student. According to him, the concepts and conceptualizations involved in such transactions seem to be "almost entirely specified by...verbal constructions," generally embodying rule specifications. The student, therefore, is likely to master exclusively verbal structures, such as the material provided by textbooks. However, Dr. Lagmay points out that in actual scientific research work, the professional scientist is exposed to and makes use of important non-verbal concepts, some of which may be embedded in ways of behaving in relation to the environment. Non-verbal concepts may, of course, eventually develop into explicit verbal formulations and some of them do evolve into their corresponding verbal symbols/principles. However, there is no assurance that this transformation will happen. As a consequence those non-verbal concepts which do not become verbally articulated can not be taught within the purview of the current practice in the classroom. Thus, if they are to be learned by the student, they must be taught by example, by modelling, by the mentoring that is promoted through a very close relationship between the teacher-scientist and the student. In Dr. Lagmay's words: "There is much of unverbalized skills in research that the dedicated worker can transmit by example." In including verbal and non-verbal concepts in the learning process, the ultimate goal is to achieve "that congruence in the internal structure of personal knowledge in both student and teacher, which is the requisite to excellence of performance in the discipline."

Rule-Specified Versus Non-Verbal Conceptualization

Conceptualization in the natural sciences has characteristically led to a greater economy of terms in the description of natural phenomena. The abstract formulation, in addition, achieves in identifying the dimensions of description that are important in the control and manipulation of events. This has been done in varying degrees of success: certain parts of physics, such as mechanics and optics, are sets of logically-ordered propositions the generality of which embraces very widely differing experiences in field and laboratory work, while in others the order of conceptualization has not really advanced much beyond elementary taxonomic identification of its materials.

It is important to note that concepts ordinarily refer to the language by which one handles the materials of scientific work, and it is the verbal construction from them that constitutes the subject matter of the science—in texts, papers, manuals, and so on, for teaching, research, field operations, and discussions. The learning transactions of the classroom sometimes seem almost entirely specified by such verbal constructions and bear testimony to their importance. From this point of view, the language of science might be regarded as a set of rules for interpreting experience; therefore, the concepts contained therein as rule-specifications. There are those who are reasonably persuaded that theory, hypothesis, and inference in the natural sciences are a system of rules in the foregoing sense, and the task is to set up more adequate rules (or alternatively, descriptions) so that nature does not surprise us too often.

As the rules become more and more abstract, however, in the same proportion do the particulars of concrete experience disappear from the formulations. The clues by which to deal with the next occasion for the event in question are absent in the mind of the student when his preoccupation is to deal mainly with the verbal edifice of the science. For the effective behavior of the scientist is not dependent alone upon the verbal symbols (principles) of his discipline but also upon situational

contingencies which are nonverbal. This distinction, very well pointed out by Skinner (1), between rule-specified behaviors and those which are contingency dependent, seems to me at the heart of many problems in science teaching. The student may master the textbooks, complete with all the skills on how to manipulate verbal structures but may, in some significant sense, be literally ignorant of how to deal with the real thing. This is because the concrete situation does not automatically inform him of those aspects of the situation that are relevant to the verbal skills he has mastered (2). The procedures for sensitizing him to the material contingencies of the environment are separate, though the origins of the rules (principles) that he tries to apply were quite empirical enough.

The professional scientist is usually exposed to both verbal and nonverbal materials in the course of his work; and he makes a good teacher if he insists that the student under his tutelage undergoes a similar exposure early enough. This means that the education of our young learners in the concepts of science must be under conditions that approach what real scientists are doing or have done in the past.

The relation governing scientific behavior and the material environment may, if the terms are sufficiently accessible to the public observer, in time, be part of the verbal specifications of the science. In other words, the behavior may eventually become rule-specified. For example, the elements of the scientific method must have existed in the history of mankind even long before Galileo gave it to the modern world through his classic experiments on falling bodies and his Discourses. These had been, however, wholly nonverbal habits which survived chiefly because they were fruitful of results. Textbooks expositions on the controlled experiment, for instance, may be regarded as latter day verbal formulations of patterns of induced arrangements on nature which permitted of successful inferences about it.

The experimental method in science so-called is as old or recent in history depending on how you look at it. A non-verbal concept which is embedded in the habits of behaving man in relation to his environment may develop to the point where explicit verbal formulation is possible; on the other hand, this may not happen. The method that enabled men to turn stradivarius violins did not survive to the present day and modern man tries in vain to duplicate the feat by means of rule-specified behaviors of his science. The nonverbal concepts appropriate to the successful manufacture of this item did not receive explicit formulation; at least none exists today. We do not know the exact reasons for this. Some say that the secret nature of guild craftsmanship suppressed any attempt at public reporting. Perhaps, however, they did not have the verbal

categories for describing their skills. Lastly, perhaps also, certain domains of human complex functioning, as in the arts and scientific research, display progressively greater incommensurability between the descriptive words and the skills they try to describe. Concept behaviors in many cases will remain personal, or utterly subjective, until someone comes along with something equal to the task of describing them. Meanwhile, there is the conviction that there are processes that are important in the arts and the crafts which bear some very striking resemblances to those in scientific research and problem solving in the professions such as medicine and psychology.

The laboratory manuals of elementary physics, chemistry, and. biology are unabashed rule-specifications. What took ages of mental struggle in history now is child's play in the hands of the average high school or college student. What is the difference? The manuals contain or tend to indicate almost all of the necessary and sufficient conditions for arriving at the correct conclusions. To read the book of nature, man was never afforded all those props. It is easy enough if you know how; but in the beginning we did not know how. To duplicate the processes that were involved in the human struggle for achievement in scientific conceptualization would require you to display the available equipment of man himself for different periods of time, his perceptions, the social pressures that ran counter to other ways of looking at natural phenomena, which made successful prediction of his future experiences difficult, and so on. We try to recount the trying tests of science by going back to the documents that gave birth to new concepts; we dig into the ideas and circumstances of the times that made them possible. And yet all these have seldom been regarded properly as part of the logically-ordered system of propositions of physics, or chemistry and biology, etc. Maybe they should, for they really are presumed important components of the total structure of the scientific endeavor which, albeit, we know can never be fully transmitted to the younger generation of students, partly because of our attitudes towards these components and partly because the greater part of them can be transmitted only in a master-apprentice relationship, which in a prior age was the method par excellence for inducting the young learner into the arts, the crafts, and the learned professions.

Michael Polanyi calls the unspecified portion of the sciences as the personal element in human knowledge. He says: "...the articulate contents of science are successfully taught all over the world in hundreds of new universities, (but) the unspecifiable art of scientific research has not yet penetrated to many of these...An art which cannot be specified in detail cannot be transmitted by prescription, since no

prescription exists. It can be passed on only by example from master to apprentice....(and) . . . To learn by example is to submit to authority. You follow your master because you trust his manner of doing things even when you cannot analyze and account in detail for its effectiveness. By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art including those which are not explicitly known to the master himself. These hidden rules can be assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another. A society which wants to preserve a fund of personal knowledge must submit to tradition."(3)

The personal element in human knowledge seems very much like anything but those that satisfy the usual criteria for admissibility into the framework of science, such as, for example the public nature of scientific knowledge, reproducibility of the phenomena involved in such knowledge, and, above all, the test of workability. On the contrary, the nonverbal rules involved in personal knowledge, satisfy all these requirements. The expert, or master, judges in terms of the consequences of the personal rules. He can discriminate its presence or absence, though without knowing exactly how he does it. The resulting ability to discriminate from a constellation of circumstances can be checked by another who has been taught in a similar way. Consequently, we cannot help believing that the concept-behaviors involved in this nonverbal domain have an internal structure of its own which can be transmitted under appropriate exposure conditions.

The argument for a very close relationship between the best teachers of the university and its students hardly needs any elaboration from this point of view, and yet we are constrained to ask whether our teachers are wrestling hard enough and long enough with their work to accumulate a fund of personal experience that is worth transmitting to their pupils. There is much of unverbalized skills in research that the dedicated worker can transmit by example. We favor this approach when we give our students materials and opportunities for doing and thinking in situations that represent normal encounters in professional, biology, chemistry, or physics. There is likely to be that congruence in the internal structure of personal knowledge in both student and teacher, which is the requisite to excellence of performance in the discipline.

Let me summarize the main points of this brief exposition: To the articulate verbal domain of science belong the concepts or conceptualizations of the disciplines. The current practice is to teach mainly in terms of rules specified by this verbal domain whether the

materials are purely verbal only or they are made up also of environmental arrangements which constitute the sources for the data of science. Concepts, however, may be at a nonverbal level in the actual practice of science, such as in scientific research work. These cannot be taught by prescription since they are unspecified. Only by example can they be transmitted to the student.

NOTES

1 Skinner, B. F. And operant analysis of problem solving. In Kleinmuntz, B. *Problem Solving: Research, Method, and Theory.* N. Y., Wiley, 1966.

2 There are parallels to this problem at a uniformly verbal level: For example, the student may be skilled in manipulating mathematical structures, but may have difficulties in verbally formulated problems where the relevant abstract properties have to be teased out beforehand from the problems. In cases like this, it is often said that he does not really know mathematics until he has learned how to solve a wide variety of problems involving them.

3 Polanvi, M. *Personal Knowledge.* London: Routledge & Kegan Paul, 1958.

Experiments on Pacing under Fixed-Ratio and Variable-Interval Schedules of Reinforcements

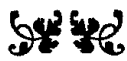
Dr.Lagmay' second article on pacing presents two experiments under two schedules of reinforcement, namely a fixed-ratio and a variable-interval schedule. The subjects of the experiments were pigeons who were trained to perform the target behavior of pecking at a response key.

The first experiment examined the effects of a fixed-ratio schedule of reinforcement with slow pacing on the performance of the target behavior. Previous studies have consistently shown that a fixed-ratio schedule generates responding which progressively increases towards faster rates until a stable value is reached. Further studies reveal that a pigeon responds as though it were able to estimate or count the specified ratio of responses, as indicated by short runs and breaks corresponding to said ratio. One factor which was thought to contribute to the seeming ability to count or estimate a particular number of ratio responses is the prevailing rate of responding at the time of reinforcement. In order to test this hypothesis, slow pacing of responses was added to the schedule, at the part in the ratio curve where a reinforcement occurs. Should the pigeon continue to respond at a rate faster than the reinforced rate, the inference is that the rate at reinforcement was not a decisive factor. In this initial experiment, the subjects were shaped up to pace at a specified rate and, subsequently, were exposed to a ratio schedule with added pacing. Results showed that, with said schedule, the subjects displayed pecking responses at high rates for which they had not been previously reinforced although variability was displayed with respect to whether the fast run, typically of about the ratio count, occurs before of after paced responding. One pigeon, however, presented an intermediate phase marked by progressively longer pauses after reinforcement culminating in a complete cessation of responding. This

was followed by a period of recovery and sustained responding although at a ratio lower than that which had initially stabilized.

In the second experiment, responding with the use of the variable-interval schedule with pacing was examined. Pecking performance under this schedule was characterized by: (1) the occurrence of longer pauses after reinforcement compared to a control performance without pacing. This finding suggests the aversive character of slowpaced behavior itself. (2) rapid runs or breakthroughs from pacing, despite the absence of a reinforcement history of past rates for these subjects. It is suggested that the result is indicative of the pigeons; escape from the earlier mentioned aversive condition by running at a preferred faster rate.

A final finding was that, under both forms of reinforcement schedules with pacing, fast runs are accompanied by shorter pauses after reinforcement or by the absence of pauses. When rapid runs after reinforcement do not occur, the pauses are longer.



Experiments on Pacing under Fixed-Ratio and Variable-Interval Schedules of Reinforcements

INTRODUCTION

In a previous paper, ([8]) a technique for the control of the free operant was described. By not reinforcing high rates, nor low rates, of responding, one has an experimental condition which we may call pacing; which is a very strict condition for reinforcement because, in effect, too "enthusiastic" responding as well as "sluggish" behavior will not be reinforced even if the animal is very highly motivated. It was suggested in that paper that perhaps, a pacing requirement such as was used in these experiments may generate an aversive condition in the behavior of the organism itself, so that when the pacing condition is removed, the rate of responding temporarily recovers to an "overshoot" level, a phenomenon suggestive of an "exhilarating" release from an aversive contingency imposed by an effortful task.

Since then many experiments [4, 5, 9, 14, 15] have been reported that show the effects of an effortful or aversive task on behavior. All of these researches, including those published before 1964, [1, 2, 3, 6, 7, 10, 11, 12, 13, 16] have shown the depressing or weakening of effortful or aversive contingencies on responding.

This paper reports on some experiments, which, while they were performed to resolve certain problems related to contingencies of reinforcement, are now dealt within the context of behavior under aversive conditions.

It should be noted that no investigator has so far ever reported on a pacing contingency such as the one used in these experiments, which is not a simple differential reinforcement of low rates nor of high rates.

In order to make this paper self-contained, the following descriptions as to basic experimental arrangements are taken from the previous report.

APPARATUS

Although most of the features of the experimental box, the recorder, and the programming apparatus are discussed in more detail elsewhere,(6) these will be briefly described here in order to make this account complete in itself. The pacing apparatus, however, is not described anywhere else.

EXPERIMENTAL BOX. This was a standard Skinner box for pigeons of the type being used in the Harvard Psychological Laboratories for the study of operant behavior. It was made from a picnic ice-box about 11" x 13" x 20". The insulation and thickness of its double walls afforded a considerable amount of sound-proofing from outside extraneous sounds. In order to further secure adequate masking of unwanted sounds, white noise was constantly delivered inside the experimental chamber.

The box was divided into two compartments by a panel. On one side was the pigeon chamber and on the other, the food magazine. The bird pecked at a plate of translucent plexiglas, which was mounted behind a circular opening in the panel about one inch in diameter at about the level of the bird's head when it was standing normally. When the bird pecked at this plate, a pair of metal contacts were separated from each other and a corresponding electrical circuit was broken. A relay operated by this circuit was used for programming the experiment and for recording. The plexiglas key was always lighted from the magazine side of the panel. When a response was reinforced, the key light went off almost simultaneously with that response and a light over the food-magazine, which was below the key, went on. For the duration of the reinforcement, which was about 3.5 secs., food was available and the magazine light was on. After 3.5 secs., food was no longer available, and the magazine light went off; at the same time, the light through the response key was turned on again.

A light of moderately low intensity was furnished by a 6-watt bulb in the bird compartment during the experiment. At the end of the experiment, this light as well as all other lights in the box were turned off, thus leaving the bird in complete darkness.

In one corner of the box was a cup where fresh water was always available.

In order to minimize grain-hunting behavior during the experiment, the cross-wire grid floor of the pigeon chamber was raised by about 1 inch from the metal bottom of the box. Any grain that might be thrown into this compartment from the food magazine was therefore completely out of reach of the bird.

Fresh air was constantly kept in circulation inside the experimental chamber by means of a motor ventilator.

THE PROGRAMMING APPARATUS AND CUMULATIVE RECORDER. The experiments were run through a system of switching circuits which arranged for the automatic delivery of critical stimuli and which, with timers and counters, made the programming of reinforcements possible. From the time the bird was put into the box up to the end of the experiment, there was no direct contact of any form between the experimenter and the subject. Responses as well as reinforcements were recorded through a cumulative recorder, which gave continuous records throughout the experiment.

THE PACING APPARATUS. The requirement of control of rate of responding at the moment of reinforcement, for which the experimental apparatus must provide, may be satisfied by the following conditions:

(1) Too *long* an inter-response time is not reinforced: a lower limit for rate of responding is imposed;
(2) Too *short* an inter-response time is not to be reinforced: an upper limit for rate of responding is required; and
(3) The animal must have emitted just before and at the moment of reinforcement an arbitrary *number* of successive responses at a rate the limits of which are set by (1) and (2) above.

The instrumentation of conditions (1) and (2) was achieved by means of two vacuum-tube timers each of which set the limits for inter-response times.

Condition (3) was met by making every pacing response step a counter which in turn determines the number of successive pacing responses that must be made before a reinforcement is delivered. If a non-pacing response is made before the full count is reached, the counter resets back to zero count and the bird has to start all over again.

ISOLATION OF PACING APPARATUS. Since the pacing response also required that there was to be no differential external stimulus control with respect to the reinforced and non-reinforced regions of the inter-response time spectrum, it was necessary to mask all critical sounds from the timers and the counter that had to do with marking those regions off. Clicks from the timer and relays connected to it were handled by the masking noise inside the experimental chamber. The pacing counter which made an unusually loud buzz when it reset for a non-pacing response or which clicked with some intensity when a successful pacing response was made, was set up in another room some distance away from the experimental box.

SUBJECTS

The subjects for this studies were male White Carneaux pigeons which were about one and a half years old at the start of the experiments, and, since the life span of these birds is at least 15 years, variation in behavior due to age is ruled out.

The weights of the birds were brought down to a little below 80% of their *ad lib* weights by almost completely depriving them of food for about a week. About 2 or 3 grams of grain per day were given during this deprivation period, which was sufficient to prevent digestive disturbances that usually attend complete deprivation. After this, the daily feeding schedule was merely a matter of giving them the balance of the ration that would bring their weights up to the 80% level, as described below.

The birds were tamed before the start of the experiments in order to minimize handling effects.

All birds were trained to eat from the magazine hopper of the experimental box and to peck at the key by reinforcing progressive approximations to contact of the beak with the response key.

CONTROL OF OTHER FACTORS

The birds were given a daily ration of a grain mixture consisting of about 40% vetch, 10% hemp seed, and 50% kaffir corn either in the experimental box or in their cages in the lofts. Their weight at the start of every experiment was always about 80% of the *ad lib* minus the ration for the day, part or all of which they worked for in the experimental chamber. Any unfed portion at the end of the experiment which was necessary to bring the weight up to the 80% level was given outside in the cages fifteen minutes after the bird was taken out of the box. This fifteen-minute delay for non-experimental feeding after the bird was taken out of the box was followed just to make sure that a relatively long period of non-responding in the experimental box was never correlated with the termination of the experiment and with a reinforcement immediately thereafter.

The room where the bird was located was lighted and darkened by an automatic switching timer which kept the light-dark cycle constant from day to day.

There were no provisions for the control of humidity, but the temperature, though variable, was kept within limits of indoor comfort for the people working in the laboratory. The performance of the White Carneaux, however, has been shown to be relatively insensitive to wide

variations in humidity and temperature of the range obtaining at the laboratory.

SOME OTHER GENERAL PROBLEMS

MEASUREMENTS AND REPLICATES. Data were obtained through a cumulative recorder which kept continuous records of responding as a function of time for the entire experimental session. Derivative data that were of any special interest could be obtained from this cumulative graph. Whenever a figure is given with respect to a day's performance by a single subject, it will be assumed to be typically replicated otherwise, it will be accordingly qualified.

Every experiment was run with at least two subjects, with repeated measurements taken of the performance over a period of time, usually covering both transitional developmental phases and steady states. Occasionally, an experiment was repeated on the same subject at some other value of the experimental variable, provided that the process under consideration was known to be reversible.

The results of some part of an experiment were sometimes also replicated in the study of other subjects which underwent a similar history for other purposes. Consequently, some observations that are reported for any particular experiment may apply to more than two subjects.

CONTROLS. The experiments were designed so that each subject was its own control. Before any experimental variable was introduced, baselines were usually first established by stabilizing the response of the bird over some schedules the properties of which were relatively better known. The time required to get such a baseline was arbitrarily determined by the nature of the experiment and the time course of the performance. The length of the experiment could usually not be specified in advance because the deciding criterion was the appearance of certain significant changes in the responding which could not be predicted ahead of time. Different birds took different times to stabilize or to arrive at important changes in their behavior. The choice was to allow each experiment to run its course, as against the alternative experimental design in which individual difference with respect to time might be emphasized.

EXPERIMENT A
FIXED RATIO SCHEDULE OF REINFORCEMENT WITH SLOW PACING

PROBLEM. A bird that is placed under a fixed-ratio schedule of reinforcement invariably shows a development course of responding which progressively increases towards faster rates until a terminal value is reached. From there on, the rate is stable at that value. Studies of pigeons placed on a mixed schedule of two fixed ratios with widely disparate values, e.g. 50 and 250, indicate that they respond *as though* they were able to estimate or count approximately 50 pecks. Records under this schedule show short runs and breaks appropriate to a ratio of 250. The rates of responding, however, are identical for both schedules and are taken to be at the upper limiting value for such ratio performances.

Of the various factors that may be dealt with in the investigation of this apparent ability of the bird to approximate a specified number of ratio responses is the prevailing rate of responding at the moment of reinforcement. In the above-mentioned studies, the initial rate of the bird, when it starts the ratio run, is the same as the terminal rate. If we were interested in finding out whether or not the rate at which the bird is reinforced is the crucial factor, or the only factor, that could possibly influence its performance in other portions of the ratio curve, then a means must be found to control for the terminal rate - to prevent the so-called ratio "end effect" from developing. This can be conveniently provided for by the slow pacing of responses at the region of the curve where a reinforcement occurs. If the bird still runs at a faster rate than the reinforced rate, then the determining factor for this run cannot be the rate at which it is reinforced.

PROCEDURE. Two of the subjects for this experiment were shaped up to pace at limits of 1.5 and 2.0 secs for three pacing responses. Then the birds were put on a tandem schedule consisting of a 1-min. variable-interval schedule with added pacing set at the above limiting values. For all practical purposes, these two birds may be considered to have had no history of reinforcement of inter-response times beyond the above-mentioned limits. After being stabilized on this tandem schedule, they were switched to a fixed-ratio schedule with added pacing at the same limits, but with the exception that if a bird did not perform very evenly in respect to the total ratio requirement, the number of pacing responses was reduced from three to two. This reduction was made in order to control for the size of the ratio from run to run, since the requirement of two pacing responses could be met within much less

variable limits in some birds than in others. Fortunately, we had to do this with only one out of the three subjects reported in this experiment.

The ratio that was used with the added pacing requirement was calculated in the following way: The number of responses for the 1-min. variable-interval schedule with added pacing was divided by the number of reinforcements occurring for the entire experimental period. The resulting figure minus the three paced responses was then set as the fixed ratio.

Another bird which had had an extensive history of variable-interval responding was added to this experiment. It underwent a shaping up process similar to that of the above birds, the only difference being that the latter were controlled for their entire experimental history at pacing limits of 1.5 and 2.0 secs.

RESULTS: Figure 1 at (A) shows the initial responding of S-106 on a fixed ratio of 35 with added pacing. The record is read as a cumulative graph where the line resets back to the zero point of the ordinate after every reinforcement. The ratio counts are relatively constant at this time. This bird never had any history of reinforcement above or below the specified pacing limits of 1.5 and 2.0 secs.

Figure 1 at (B) shows the responding of the same bird under identical experimental conditions two months later. From a relatively slow rate of about 0.6 responses per sec. in Record A, "runs" of about 2 or 3 responses per sec. have developed just before reinforcement, as indicated in Record C. These runs are well above and beyond that for which the pacing apparatus had ever reinforced the bird. The fast runs are variable in length, but the specified ratio count is pretty well approximated by many of these runs, such as in segment x and elsewhere. After each run, there is a tapering off to the pacing rate at which the responding is reinforced. The results for this bird are therefore positive: high rates develop which are different from any that had prevailed at the moment of reinforcement during practically the entire history of the bird with respect to the response key of the experimental chamber.

Compare Records A and C in Figure 1 and note that pauses are shorter or have disappeared where the fast runs have developed. Record B is an intermediate record and was taken 18 days after A. It shows an earlier stage of the development of rapid runs.

The results for another bird, S-66, which had been previously exposed to a variable-interval schedule of reinforcement, are represented

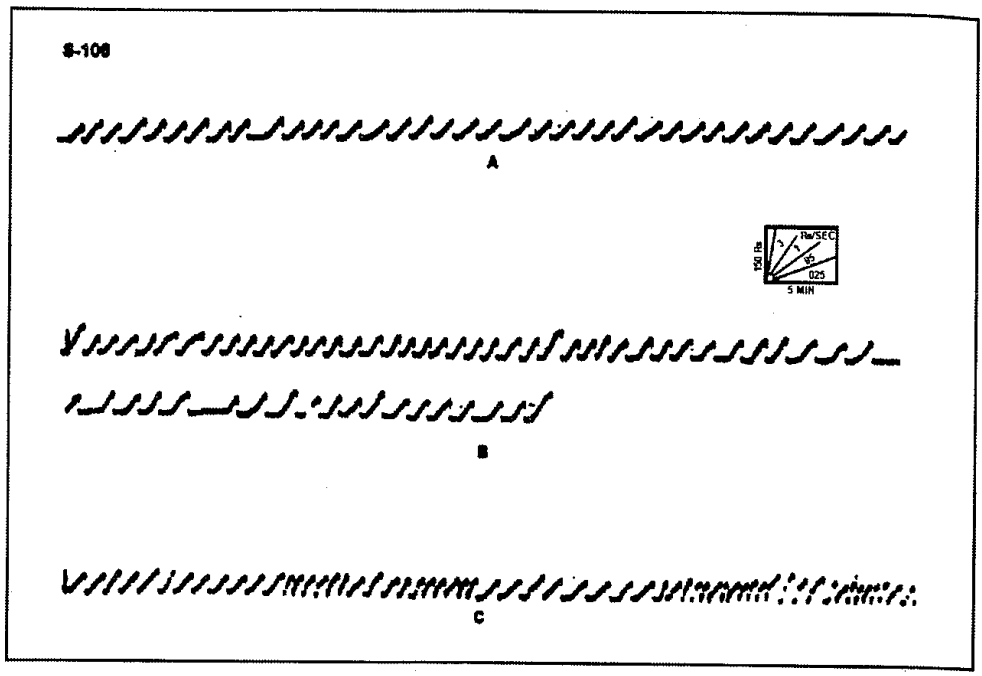


FIGURE 1

Showing various stages in the development of rapid "estimation runs under fixed ratio of 35 with added slow pacing for a bird without any experimental history of reinforcement at fast rates. (A) Initial fixed-ratio performance with pacing at limits 1.5" and 2.0". (B) An intermediate stage under the same condition 18 days after (A). (C) Under the same conditions 2 months after (A).

in Figure 1 -X. Record A reports an entire experimental session under a fixed-ratio schedule of 40 responses with added pacing at limits 1.3 and 1.6 secs. The schedule had just been shifted from a 1 -min. variable interval with added pacing. Four days afterwards, runs of approximately the size of the required ratio are already in evidence, as shown in *b* and *c* of Record B of Figure I-X. It should be noted in this record that instead of an initial run at a fast rate followed by paced responding, the pigeon starts with a pacing rate and then bursts into a fast run at about the completion of the ratio count required by the schedule. This is shown in *a* and *d* of this same Record B (Figure I-X). As a result, the bird's performance at this point becomes incompatible with the pacing condition. The bird executes another run approximately equal in magnitude to the required ratio value before it settles down to a pacing rate for which it gets reinforced. The absence of pauses after reinforcement in Figure I-X at A should be noted. It is characteristic of birds that have had a prolonged history of variable-interval responding that this pause should be absent when the pacing condition which is introduced is at moderately slow rate limits.

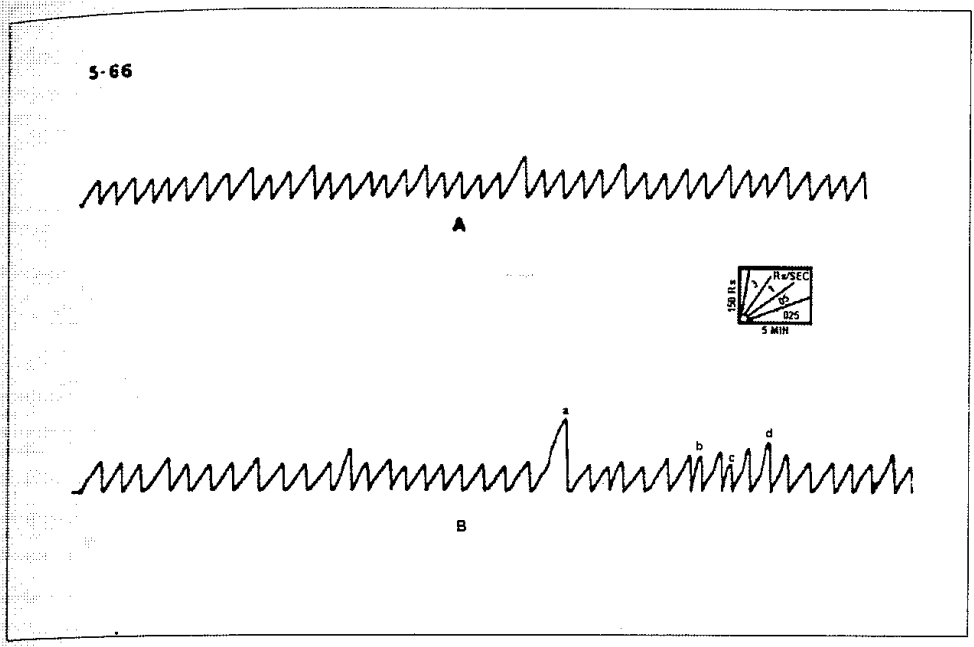


FIGURE 1-X

Showing the development of fixed-ratio "estimation" runs under moderately slow pacing conditions for a bird with an extensive history of variable-interval reinforcement. (A) Initial responding at fixed-ratio schedule of 40 with pacing at limits 1.3" and 1.6". (B) 4 days after (A), Note: how the ratio is 'measured' either by a rapid run, *b* and *c*, or in terms of pacing run, *a* and *d*.

S-105 was an exact duplicate of S-106 as to history and control conditions. Records of a typical performance are shown in Figure 2: Record A indicates a relatively even responding at about 0.6 response per sec. under a fixed ratio of 47 with added pacing. The bird had just been shifted from a 1-min. variable-interval schedule with added pacing. Then in succeeding experimental sessions, progressively longer pauses after reinforcement developed. Part of the record for the 12th day after that of Record A is shown in Figure 2 in B record. *Two days after this the bird simply ceased to respond to the key:* a very important finding!

The foregoing procedure was repeated for a fixed ratio value of 35 with added pacing and the results were similar: on the 17th day *the bird was reinforced only 8 times within a period of 5 hours*

The procedure was again repeated at a much lower ratio of 20 with added pacing. As indicated in Figure 2 in record C, the bird was able to sustain its responding. This is a typical record of the sessions on the 7th day and thereafter.

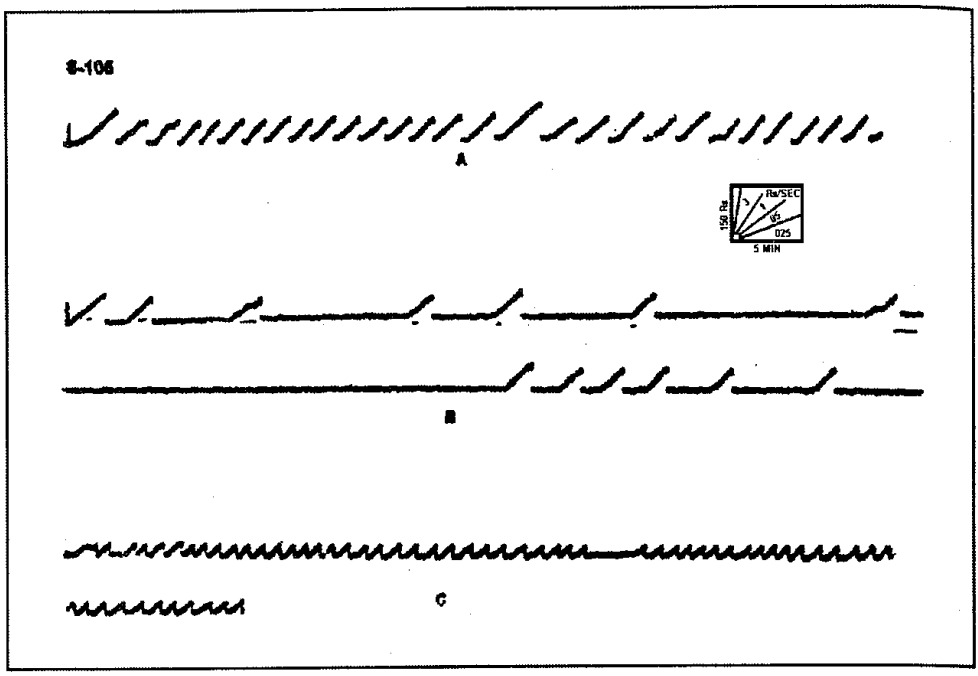


FIGURE 2

The development of very long pauses under a fixed-ratio schedule with slow pacing in a bird without any experimental history of reinforcement for rapid responding.

(A) Initial responding at fixed ratio of 47 with pacing at limits 1.5" and 2.0".

(B) 12 days afterwards under the same conditions. In 2 days more after this record, the bird ceased to respond completely.

(C) Recovery at fixed ratio of 20. Typical performance for 7th day and afterwards.

DISCUSSION. Pacing at slow rates was used as a method for assessing the role of what is happening at the time of reinforcement in relation to rapid runs in ratio responding. This method required a controlled history of reinforcement at a specified pacing rate before exposure to a ratio schedule with added pacing. Whatever may be the factors that account for the rapid runs which develop in ratio performance, this experiment demonstrates that they do not, or need not, include the rate at which the bird is reinforced. As indicated in *a* and *d*, Figure I-X at B, however, progress towards the fixed-ratio value is itself reinforcing.

As will be seen in Experiment B, rapid runs may also occur on a variable-interval schedule with pacing whether or not a bird has had a history of reinforcement at rapid rates. Figure 5 and Figure 6 at C illustrate these rapid rates under pacing. The size of these fast runs are highly variable and may occur after a short pause or after a pacing run. The

fast runs in the curves under fixed ratio, however, are distinctly of about the ratio count. The bird "estimates" the ratio under pacing and the variability of the estimate may be of responses occurring at a pacing rate rather than in rapid runs.

Since pacing behavior involves a rather well-defined topography of mediating response, a given number of pacing responses means a well defined amount of such behavior. As mentioned earlier, the behavior we are speaking of may be regarded as a chain the only reinforced portion of which is the peck at the key. A given pacing response which gets recorded represents a much greater amount of behavior under pacing than under fixed-ratio reinforcement without pacing. This chain, therefore, is such as to make the ratio a strenuous requirement, possibly equivalent to a large ratio without pacing. The relatively longer pauses at the end of the ratio curves in this experiment are consistent with this view. However, the restraining factor of pacing at the moment of reinforcement may even be the most formidable element responsible for these longer pauses, since it prevents the organism from entering into a natural gradient in strengthened behavior at the moment of reinforcement, i.e. heightened rates of responding. There would in effect be two sources of the indisposition to respond after completing the ratio: an augmented effortfulness in the performance of what amounts to large ratio requirement and the aversiveness of the task in being prevented from performing at high rates at the moment of reinforcement.

The preceding paragraph applies with special force to the subjects of this experiment that had never been reinforced at rapid rates. One of these birds eventually ceased to respond at a fixed ratio of 47 with added pacing, though the topography of the pacing response was intact up to the last reinforced run.

EXPERIMENT B
VARIABLE-INTERVAL SCHEDULE OF REINFORCEMENT WITH PACING

PROBLEM. The variable-interval schedule, with or without the added pacing condition, was used in the previous experiments as a baseline against which the effects of another variable may be assessed. Variable-interval responding could, however, be treated separately in its own right. The object of the following experiments was to investigate some of the properties of variable-interval performance under pacing conditions at slow rates.

PROCEDURE. A direct comparison of variable-interval curves, with and without pacing, where the performance under both conditions develop approximately concurrently, was made by using multiple-schedule techniques. Each of the two schedules was placed under stimulus control:. when the bird was on a variable-interval without pacing, the response key was illuminated white; when it was on a variable-interval schedule with pacing, the key was red. One-half of the experimental hour was under one schedule and the second half, under the other. In order to avoid any possible sequence bias in the allocation of the halves of the experimental session, the first half of the hour was assigned to a particular schedule in alternate sessions. In the intervening session it was assigned to the other schedule.

It was necessary to equate the number of reinforcements on the two schedules. This is especially important in a multiple schedule where the *change* from one condition to the other may give an important difference simply because the density of reinforcements had changed. When there is not such a relatively rapid shift from one schedule to another as in the single-schedule technique which was used in the previous experiments, this question may not be of any significance.

Observations of the prior performance of the birds indicated that by using a 2-min. variable-interval schedule without the pacing condition for comparison against a 1-min. variable-interval schedule with pacing, we could achieve approximately the same number of reinforcements per unit time. We therefore simply ran the motor for the 1-min. variable-interval half as fast as usual in order to get a 2-min. variable-interval schedule. This procedure had the added advantage that no reinforcements in the 2-mm. variable-interval schedule without pacing would come closer together than twice the shortest interval on the 1-min. variable-interval schedule. This made some provision, therefore, for the comparison and interpretation of pauses after reinforcement,

because in the pacing condition no reinforcement could possibly occur unless the bird had made at least four responses, which necessarily required time.

Preceding this experiment, two birds had undergone an extensive history of variable-interval responding, under pacing conditions and without pacing. The performance of these two birds on the multiple schedule were observed for 18 hours and 11 hours respectively, until a clear-cut difference between the two schedules could be seen. Then the pacing condition was removed and the birds were allowed to run under a 2-min. variable-interval schedule for both red and white keys.

In a second part of the experiment, no use was made of a 2-rnin. variable-interval schedule in order to equate for number of reinforcements. The subjects were two birds reported in earlier experiments and three others that were used for some other experiments. In these cases, the birds were simply put on a 1 -min. variable-interval schedule, allowed to stabilize, then put on a 1-min. variable interval with added pacing, and allowed to stabilize again.

RESULTS. Record A in Figure 3 shows a typical record for one of the subjects after 18 hours of exposure to the multiple schedule described above. The first half of this graph shows responding under a 1-min. variable-interval schedule with pacing, the schedule being under control of a red response key. The bird ran at approximately 0.4 response per second with relatively long pauses after reinforcement. The second half of this record is for a 2-min. variable-interval under the control of a white key. A rapid rate of about 2.0 responses per second, which is appropriate to the straight variable-interval schedule, comes out as soon as the color of the key is changed to white. The rate then subsides to a lower rate of about 1.3 responses per second with occasional short runs at approximately the pacing rate, as at *p* and q. The pauses after reinforcement in this half of the record have almost disappeared or, at least, are much shorter than in the earlier pacing condition. Figure 3 at B shows the loss of stimulus control with respect to the colors of the key eight hours after the pacing condition was removed. The loss was progressive over this interval of time.

The other bird's performance is indicated in Figure 4. Record A was taken 11 hours after the multiple schedule was started, and Record B was made 5 hours after the pacing was removed. All observations pertinent to the previous subject with respect to pauses after reinforcement, rate differences, and the occasional appearance of pacing rates under the non-pacing stimulus may also be made here. Note the runs at the

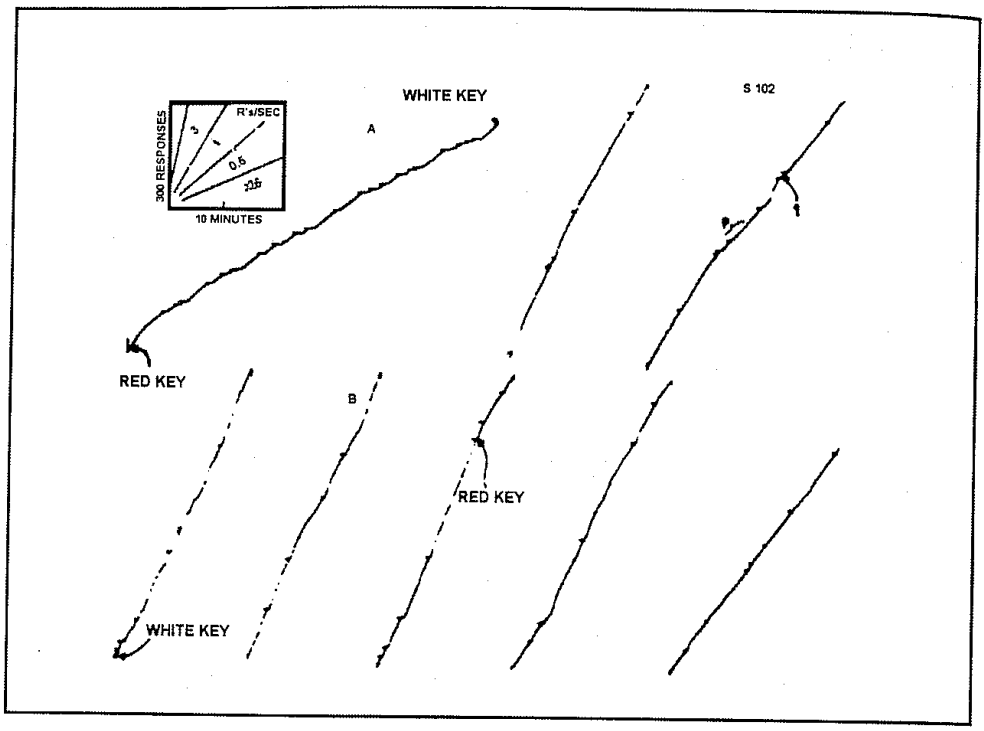


FIGURE 3

(A) Comparison curves for the 18th hour of a multiple schedule where the two parts of the schedule are under stimulus control: *red key* - 1 min. variable interval only. (B) Showing loss of stimulus control with respect to the key-colors in the multiple schedule on the 8th hour after the bird was put on a straight variable-interval schedule on both red and white.

pacing rate in the variable-interval schedule, as in *m* in Figure 4, Record A. and *n* in Figure 4, Record B. Before the state of the multiple-schedule in Figures 3 and 4, Record A, is reached, however, there is a relatively brief and occasional appearance of fast runs immediately after a reinforcement while under the pacing condition. This is indicated in Figure 5 in A. After these fast runs, the bird paces at a rate of about 0.5 response per second, which is somewhat higher than that at the stage where the longer pauses have made their appearance - about 0.4 response per second. A somewhat weaker version of this same phenomenon is seen in the curve for the other bird, as shown in Figure 5 in A. After a relatively short pause of about 1 or 2 seconds, there is a brief run of about 5 to 8 responses at a fast rate, after which the bird settles down to a pacing rate. This pacing rate is about 0.5 response per second and is again higher than that in Figure 3, record A, where, after a long pause, the rate is of the order of 0.4 response per second. It is left an open question at this point whether, where the pauses are short under the pacing condition, the runs are inductive effects from the variable-interval part of the multiple schedule.

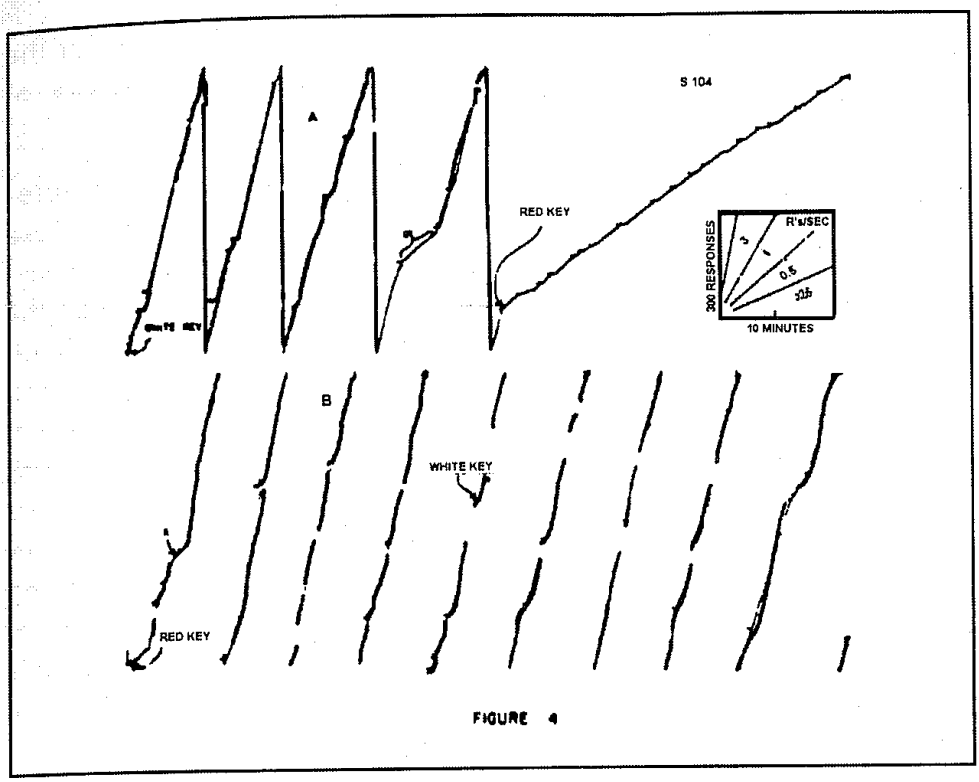


FIGURE 4

A set of curves for another bird, S-104, under the same experimental treatment as that of S-102 in Figure 3.

We may now examine the results of the single-schedule technique, where the birds were allowed to stabilize on a 1 -min. variable-interval schedule with added pacing. Five subjects used earlier in this study were subjected to this procedure for some purpose or other and all gave uniform results at stable states. A typical curve is shown in Figure 6, Record B. The responding is even, the pauses after reinforcement are quite marked, and the rate is the reinforced pacing rate. S-102 and S-104, which had been exposed previously to variable-interval contingencies, where there was opportunity to develop high rates of responding, show fast runs immediately after reinforcement under an added pacing condition. Figure 6, Record A, and 6, Record C show examples of this kind of run about 5 days after the birds were first subjected to the variable interval reinforcement schedule with added pacing.

These fast runs under a pacing condition are not confined to occasions where a short pause follows a reinforcement. They may occur while the bird has begun slow pacing - "breaking through" the paced responding, as it were. This is shown in *a* and *b* of Figure 6,

Record D, for two different birds. Curiously enough S-I 49 for the curve in Figure 6, Record D, had never had any history of reinforcement at high rates prior to this "breaking through".

DISCUSSION. Pauses after reinforcement under a variable-interval schedule with added pacing are markedly longer than those of the control situation where the pacing is absent. Steps were taken to rule out the possibility that such a difference might depend on the number of responses that have to be emitted before reinforcement. If, by making only one or two responses since the last reinforcement, another reinforcement occurs, as in the usual variable-interval schedule, then the bird is necessarily in a different situation in terms of this number from that in the pacing condition where the bird has to emit at least four responses before reinforcement. Since the only difference in the two parts of the multiple schedule was the pacing condition, the longer pauses in the variable interval with pacing must be due solely to this difference. The possibility of color preference is excluded by the fact that the birds on a straight variable-interval schedule alternately on red and white keys gave the same rates of responding on both colors, with identical characteristics of the curves immediately after reinforcement.

The above findings have its analogues in the preceding experiments on a fixed-ratio schedule with pacing, where the pauses are very much longer than those which hold for an equivalent straight ratio performance. The result also recalls the case of paced fixed-ratio responding at a ratio value of 47, where the bird progressively developed longer and longer breaks until it ceased to respond. These converging lines of evidence point to the possible aversive character of slow paced-behavior. Since there were no aversive stimuli in the external environment of the subject under the pacing condition, the aversive stimulus must have been the organism's own behavior.

The fact that a bird which has had no history of reinforcement at fast rates still shows rapid runs, i.e. "breaking through" the pacing, may similarly indicate that running at a preferred rate removes the organism from an aversive condition. These fast runs under a variable-interval schedule with slow pacing could not have been due to what had happened just before and at the moment of reinforcement because the rate at the moment of reinforcement was controlled at slow rates. Neither could it have been the immediate effect of a reinforcement since the run come only either after a short pause or after pacing had been started. Another possibility, of course, might lie in the pre-experimental history of the organism. But even if this

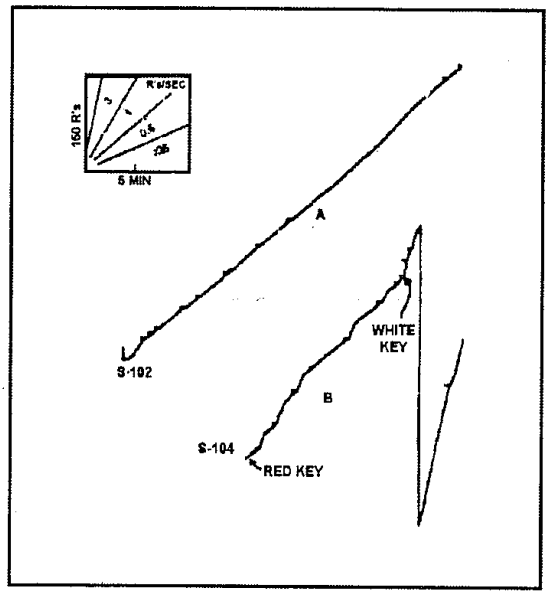


FIGURE 5

Showing rapid runs after a short pause following reinforcement before going down to a pacing rate, for birds under multiple-schedule procedure. (A) shows this effect only occasionally and in weak form. The stronger version in (B) for that part of the curve on the red key.

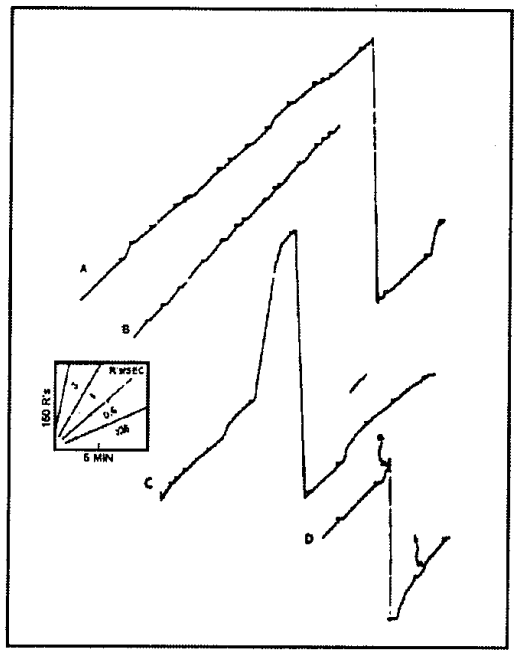


FIGURE 6

Variable-interval curves under slow pacing conditions obtained from different birds with the single-schedule technique. (A) and (C) show rapid runs after a short pause following reinforcement for S-102 and S-104, respectively. (B) shows a stable performance curve under 1-min. variable-interval schedule with slow pacing. Note the longer pauses. (S-149). (D) shows an example of "breaking through" at a fast rate from a pacing run (S-149).

were true, the argument is not in any way diminished under the circumstances.

It is significant that the presence of fast runs in fixed ratio with pacing is correlated with relatively shorter pauses or absence of pausing. In the variable-interval with pacing, fast runs are also accompanied by shorter pauses after reinforcement. Where there are no rapid runs the pauses are longer.

SUMMARY AND CONCLUSIONS

(1) The slow pacing technique applied to the study of fixed-ratio schedules shows that rapid rates may occur in fixed-ratio responding although the bird has never had any experimental history of reinforcement at such high rates. It is inferred that progress towards the fixed ratio value may be reinforcing and leads to such rapid rates as are not accounted for in terms of the usual ratio "end effect".

Furthermore, a relatively accurate estimation of the value of the ratio is found to be possible either in executing a slow pacing run or a rapid run. This "estimation" behavior of the pigeon in fixed-ratio responding, therefore, does not depend upon the rate at which it is running.

(2) The performance under a variable-interval schedule with slow pacing shows: (a) Relatively longer pauses after reinforcement than a control performance with no pacing. It was shown that these longer pauses were not due to the absence of a quick reinforcement since the last reinforced response. They are, it is suggested, due to the possible aversive character of slow-pacing behavior. q,) "Breaking through" at a rapid rate after a pacing run or, at some brief transitional stage, a rapid run after short pause, which are not explained in terms of progress towards a count as in the case of the fixed ratio with pacing.

(3) In both variable-interval and fixed-ratio schedules with pacing, fast runs are correlated with shorter pauses after reinforcement or with the absence of pauses. When there are no rapid runs after reinforcement, the pauses are relatively longer. Again, the possibility that pacing behavior has aversive properties may explain this. This also confirms (2) above.

A BRIEF RETROSPECTIVE ON A FEATURE OF THE EXPERIMENTAL RESULTS

The foregoing experiments, while difficult of execution and instrumentation, were rather simple and straightforward in design and in answering some questions in the laboratory investigation of contingencies of reinforcement, with special reference to what is happening to the

organism at the moment of reinforcement. The experiments tried to tease out the concept of "ratio end effect" and to throw some light on the capacity of the organism to estimate counts without actually counting, as part of the general problem of the organism effort at all times to maximize the results of its behavior.

However, there were results that were quite unexpected during the experiments, which were not really part of the original project. The most fundamental of these was that a slow-pacing contingency, as here defined, had repeatedly demonstrated its aversive character: when an animal is prevented running at optimum rates under the very strict conditions of pacing, even if the task be as simple as executing a ratio of less than 50 responses, the organism will develop a strong indisposition to respond. Almost like a profound extinction process seem to be set in motion, or that some aversive condition is generated in behavior of the animal itself such that the organism would rather starve than engage in paced behavior.

There are suitable analogues to this type of situation in human behavior, such as that of an aspiring writer who has all the elementary skills for turning out a good paper but who is kept from achieving a satisfactory output because of a self-imposed criteria of excellence that makes his task extremely difficult.

There are all manner of procedures for suppressing, depressing or in general, weakening any given behavior such as electric shock, verbal punishment, making tasks more physically effortful, and so forth, but a method that merely requires a much higher degree of precision in responding could be just as effective in knocking out the behavior. A pacing requirement is something of this method, with the added feature that a reinforcement is automatically more and more delayed if the individual manifests any behavior that denotes enthusiasm. The gradually lengthening pauses after such small ratios with the pacing requirement reminds us of profound extinction effects that go with extremely large ratios that are required for reinforcement.

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Differential Reinforcement of Rates with Pacing

When the rate of responding required for reinforcement is specified by the setting of an upper limit, as with drl, the bird has only to respond at any rate lower than the requirement to be reinforced. When a lower limit is specified, as in drh, reinforcements occur whenever the rate is at any higher value. However, both an upper and a lower limit can be specified. A response must occur at least *x* seconds since the preceding response, and not more than *y* seconds since the preceding response. The number of successive responses which must meet these specifications may also be specified. The technique is called "pacing. " A response meeting such requirements may be called a paced response.

A pacing contingency is made effective in the following way. The bird is put on VI 1 until its performance is stable. Every paced response is then reinforced until the rate almost always satisfies the contingency.

VI WITH PACING

The pacing contingency is added to VI 1 in a combined schedule. In one experiment the contingency required that 2 successive responses should not occur more than 2 seconds or less than 1. 5 seconds after the preceding response. This schedule may be written: VI 1 pacing (2) 1. 5-2. 0. Figures 613A and B show stable samples of paced behavior under VI 1 pacing (3) 0.8-1.3. when the pacing contingency was

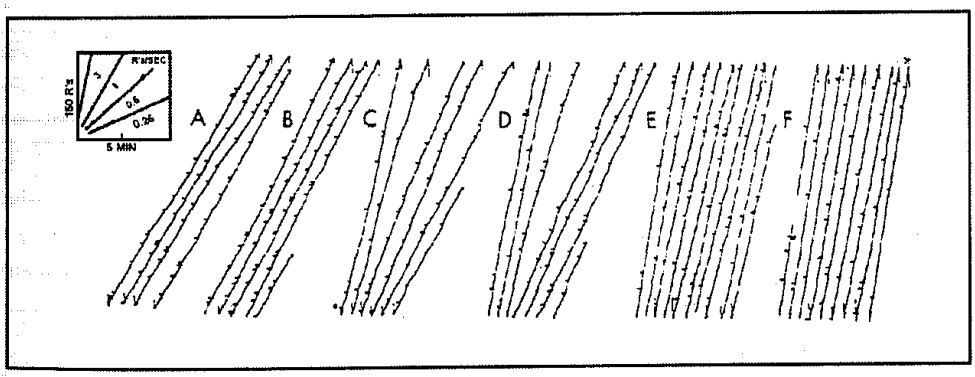

Fig. 613. Transition from VI pacing to VI

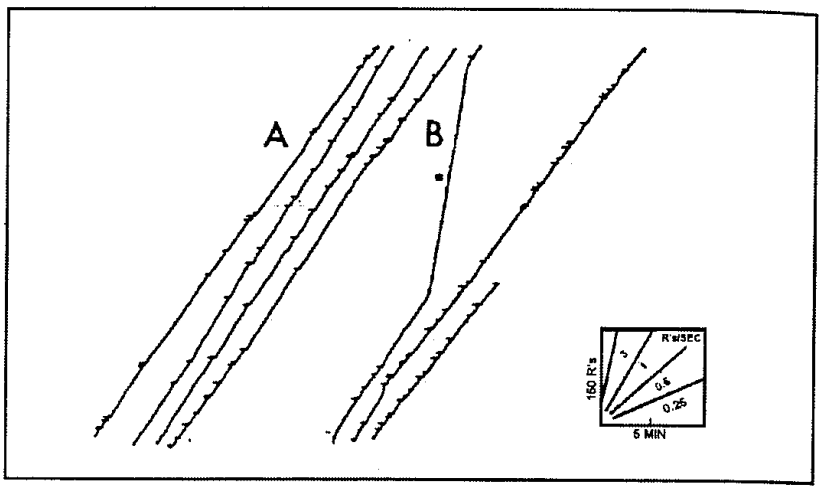

Fig. 614. Break-through of a high rate under

removed, its effect survived for several sessions. Figure 613C shows the 1st session without the pacing contingency. A 1st response, reinforced at a high rate at *a,* reinstates the VI performance, which is now reinforced on schedule. Nevertheless, before the short session is over , the rate has fallen to the value prevailing under the pacing contingency. This general character prevailed for several sessions. Record D in Fig. 613 is for the 4th session, and some slight survival may be seen in the 6th session Record E. The 7th session, in Record F, shows a stable high level of performance under VI 1.

The bird was then shaped to a lower pacing rate under conditions of VI 1 pacing (2) 1.5-2.0. Figure 614A shows a stable performance. As the rate is forced to lower values by pacing, high rates occasionally break through. An extreme instance of this is shown in Fig. 614B at *a.* The record is for the session immediately following Record A and shows, in general, the same type of performance. Nevertheless, at *a* several hundred responses are emitted at the rate appropriate to the original VI seen in Fig. 613F.

Figure 615A shows a still lower rate maintained under VI 1 pacing (3) 2.0-2.5. Reinforcements are characteristically followed by pausing, and occasional periods of a higher rate are apparent, as at *a, b,* and *c.* When the pacing contingency was removed, the return to a VI 1 performance was much slower than in Fig. 613. Figure 615B is for the session following that of Record A and shows a fairly smooth acceleration to a higher over-all rate. This curve is marked by conspicuous instances of the emergence of the VI rate, as at *d* and *e.* Records C and D are for the sessions immediately following Record B and show a progressive increase to a VI performance. The survival of the extreme pacing

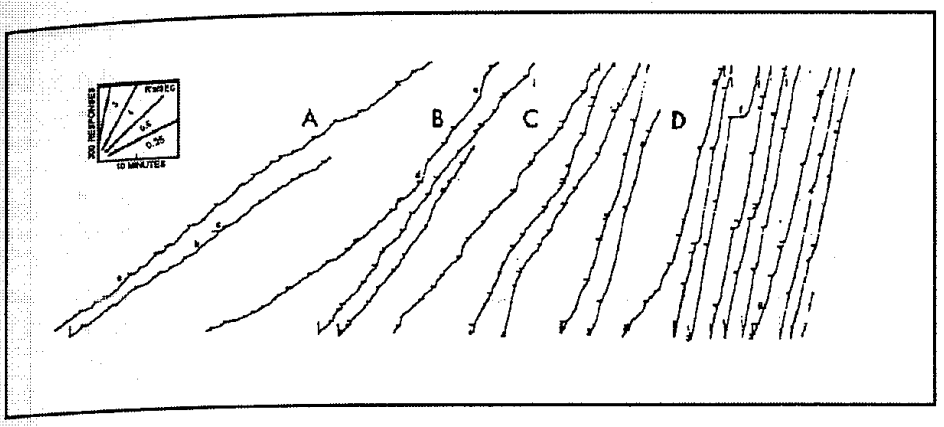

Fig. 615. Slow return to VI after VI pacing

contingency is nevertheless clear in irregularities, as at *f*, and periods of slower responding, as at *g*.

FIXED RATIO WITH PACING

A schedule of FR 35 pacing (2) 1.5-2.0 was substituted for a VI pacing schedule after a stable pacing performance had developed. The experiment was designed to see whether the constancy of number of responses at reinforcement and pacing conditions would begin to produce an effect by making the production of number reinforcing. Figure 616 shows the development from the 5th through the 50th session Record A is for the 5th session on FR 35 pacing after VI 1 pacing. Responding is still mainly at the paced rate, although some pausing or slow responding appears after reinforcement. This condition prevails through the 6th session (Record B), although the terminal rate is increasing

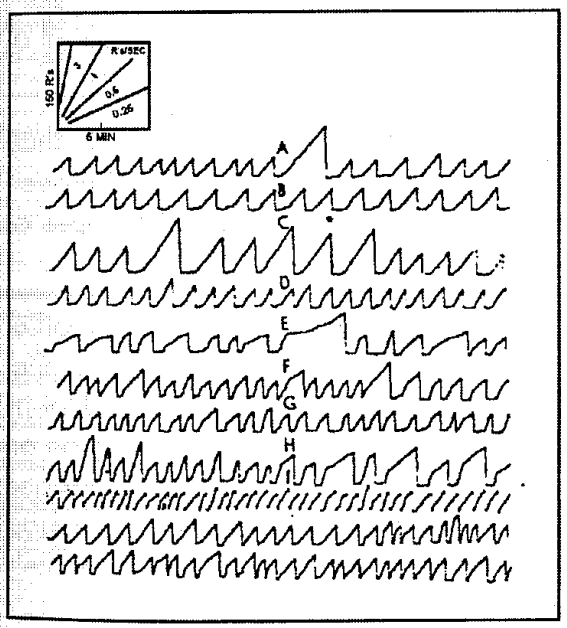

Fig. 616. Development of an FR performance with pacing

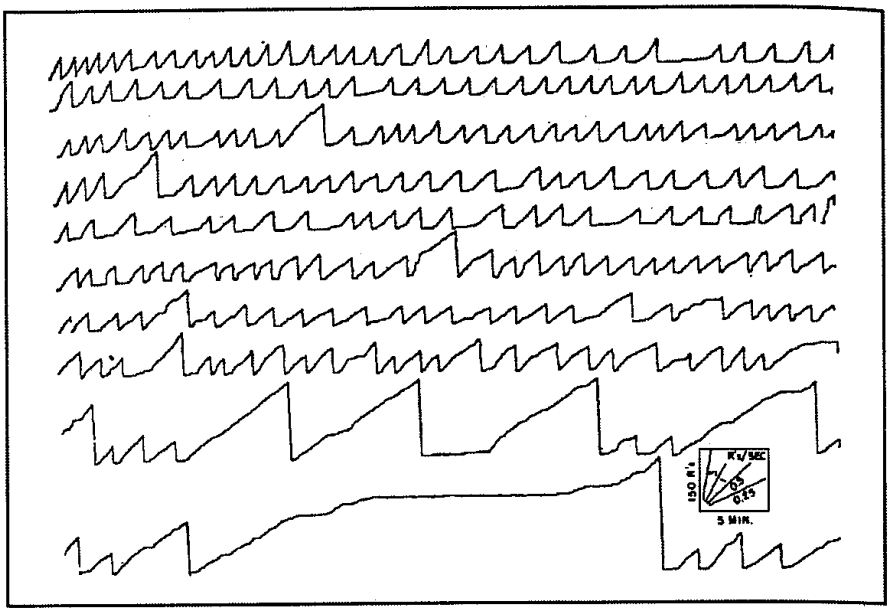

Fig. 617. Complete daily session on FR with pacing

slightly. Eventually, this condition makes it difficult to satisfy the pacing contingency and the number of responses at reinforcement increases greatly, as Record C shows for the 8th session. The increase in the number of responses per reinforcement eventually produces a reduction in rate which corrects this change, and by the 15th session (Record D) the number of responses at reinforcement has again become fairly constant. Slight negative curvature appears toward the end of many of these ratio segments, however, and by the 17th session, in Record E, the curves have come to resemble strongly those under FRdrl. (See the earlier section in this chapter.) The remaining records in the figure are from the 19th, 23rd, 29th, 33rd, and 50th sessions. The performance shows the same kind of instability seen under FRdrl.

Figure 617 shows a complete session (considerably longer than usual) from the series shown in Fig. 616. The session occurred between Records D and E in the earlier figure. As with FRdrl, various types of performance come and go throughout the session.

When VIpacing was again restored after FRpacing, the earlier performance was, in general, recovered. However, the pausing after reinforcement persists and is usually to some extent compensated for by a short period of rapid responding. Figure 618 shows a 3rd session on VI 1 pacing (3) 1.1-1.4 after the long series of experiments just described on FRpacing. Note the consistent pause after reinforcement and, in most cases, a compensatory run which restores the curve to approximately the extrapolation of the preceding segments.

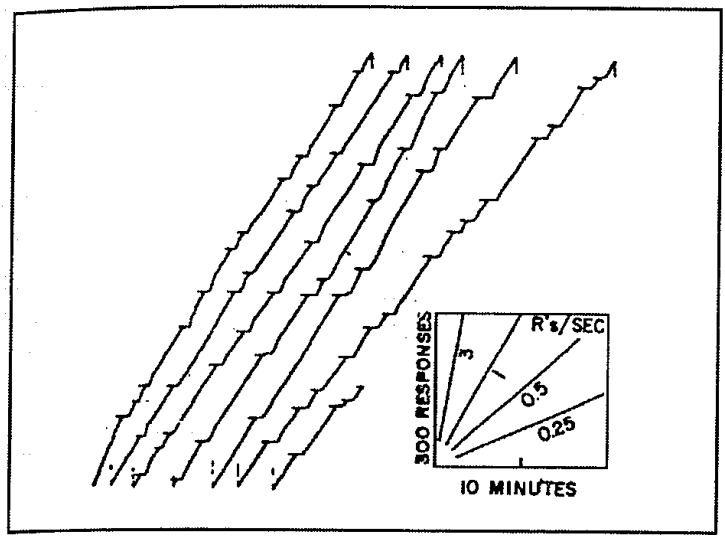

Fig. 618. Return to VI pacing after FR pacing

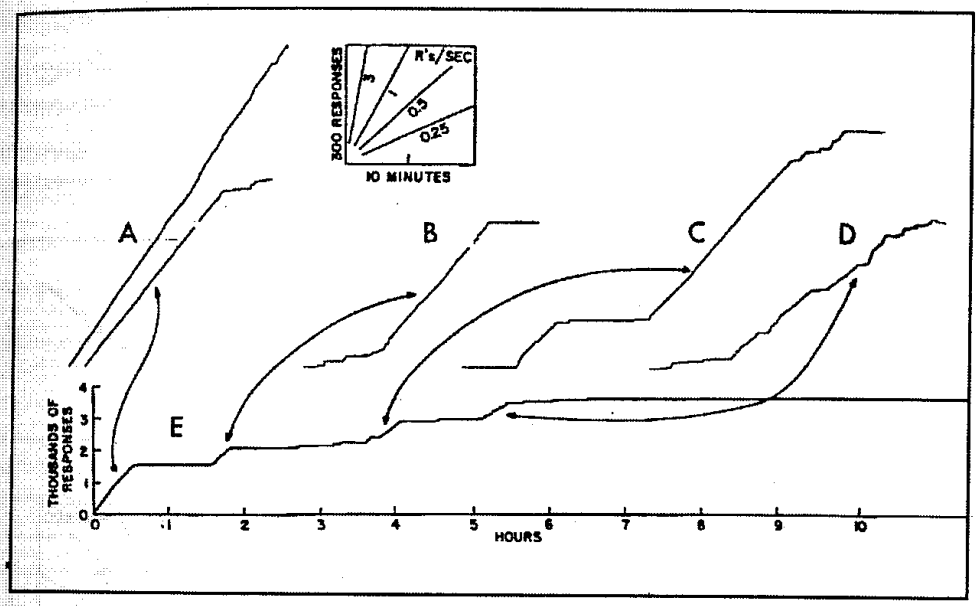

Fig. 619. Extinction after VI pacing

EXTINCTION AFTER VIPACING

Figure 619E shows an extinction curve taken after a well-established VIpacing. The principal portions of the curve during which the bird was responding are shown at A, B, C, and D for the segments indicated. If responding occurs at all, it occurs at approximately the earlier paced rates. Segment D contains some interesting pauses and compensatory increases in rate.

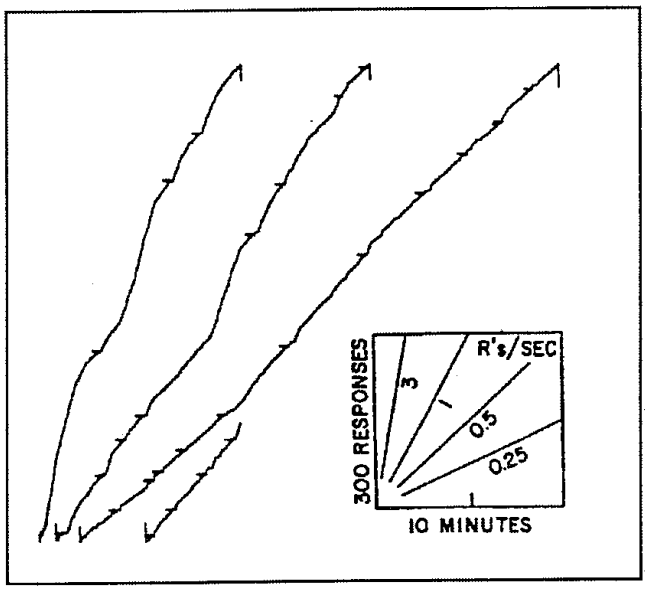

Fig. 688. Return to VI 1 pacing prior to mult VIVIpacing

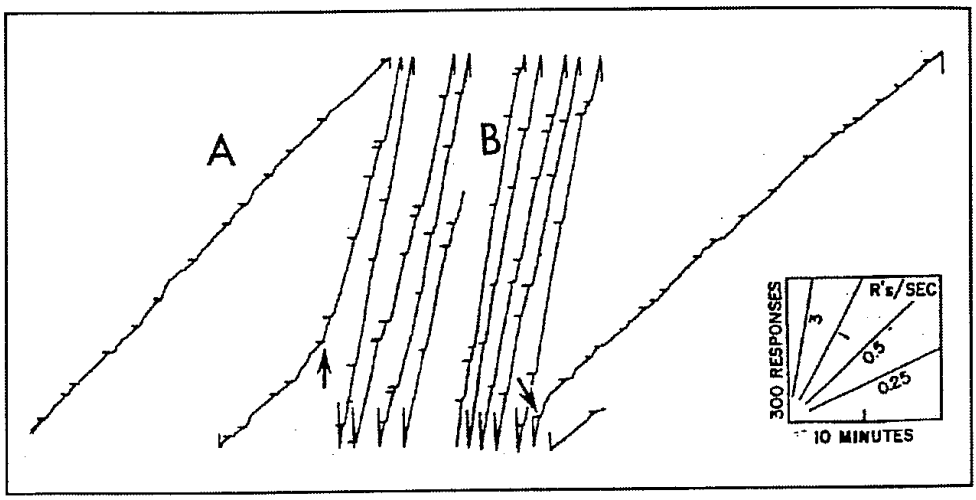

Fig. 689. First and second sessions on mult VIVIpacing

MULTIPLE VIVI PACING

Dr. Lagmay's experiments on pacing described in Chapter Nine included an exploratory attempt to establish multiple control. A bird which had been paced and then reinforced on VI 1 without pacing was again subjected to VI 1 pacing (3) 1.5-2.0. The key had previously been white, but it was red when the pacing contingency re-introduced. Figure 688 shows the effect. Possibly because of the color change, a pacing performance is quickly recaptured.

Multiple control was then attempted, with the white key controlling VI alone during one-half of the session and the red key controlling paced VI during the other half. Figure 689 describes the first 2 sessions on this multiple schedule. The 1st session (Record A) begins with the key red. The bird occasionally breaks through with the VI rate alone, but a fairly adequate paced performance appears. When the key changes color at the arrow, a high rate on VI is observed. The following session (Record B) begins on the white key on VI, and a change to the red key at the arrow leads almost immediately to a paced performance. In later sessions the multiple control is less effective. A marked break-through of the unpaced rate is apparent in Fig. 690A at *a*, and 2 similar break-throughs, in a later session, in Record B at *b* and *c*. A second bird gave very similar performances.

Experimental Desensitization to Anger-Producing Stimuli

In the following articles, the scientific rigor that marks the research activities and report writing of Dr. Lagmay is demonstrated and clearly reflects the quality of thinking borne of the experiences acquired while training to be an Experimental Psychologist and, afterwards, by immersion in research activities. These papers also show his concern for undertaking both basic and applied researches.

The first article reports the results of a study on the experimental desensitization of anger responses to anger-evoking stimuli. At the time of Dr. Lagmay's experiment, previous research work on systematic desensitization had clearly demonstrated its effectiveness in eliminating or reducing anxiety, specific fears or phobias and anger responses felt while driving a vehicle and those elicited in white males by black racial stimuli. His study cross-validates desensitization effects on anger responses to stimuli which were thematically different from those used in previous studies. Responses to the anger-arousing stimuli were measured in terms of the participant's skin conductance response (SCR deflections. The participant was also asked to rate the anger value of the stimuli presented. Three groups were formed by randomly assigning participants to a desensitization group, a placebo group and a non-treated control group. Participants in the desensitization group were given relaxation training. Dr. Lagmay's study also differed from earlier studies in utilizing cognitive relaxation training rather than the motor relaxation procedures employed previously. The course of the relaxation thus induced was carefully monitored with the use of biofeedback instruments. Results showed significant reduction control in post-test SCR deflections for the experimental group compared to the control groups thus clearly indicating the effectiveness of the desensitization treatment. Further support for this finding was revealed by the significant differences in subjective anger ratings of the stimuli which showed that the greatest average reduction in post-test ratings from pre-test levels was obtained for the desensitization group.

Experimental Desensitization to Anger-Producing Stimuli

Systematic desensitization has been widely used for eliminating or reducing anxiety as well as specific fears or phobias. Several methods have been employed to reduce anxiety by some variation of the counterconditioning procedure, but the most frequently employed technique has been that which was developed by Joseph Wolpe (1958), which uses relaxation as the counter-conditioning response to the anxiety-producing stimulus. The basic idea is that by pairing a high-arousal stimulus to relaxation, which is a low-arousal physiological response, the high-arousal stimulus loses or reduces its power to produce fear or anxiety. The research work that has been devoted to this phenomenon has been quite massive since Wolpe brought out his monograph on psychotherapy by reciprocal inhibition. This has been appropriately reviewed by Paul and Lang (Franks, 1969), while enthusiasm for this clinical method continues unabated to the present time.[1]

The central idea in systematic desensitization, however, has been carried over from the reduction of fear/phobia responses to that of anger along analogous principles. Since anger is tension bound, and since it involves activation of the autonomic system, as in anxiety/fear states, then some similar mechanism to that of fear desensitization has been assumed to be involved in the desensitization of anger, i.e., in pairing of an anger-producing stimulus situation with the relaxation response.

The earliest report of a successful utilization of the relaxation response in the reduction of anger in a non-experimental situation seems to have been that of Herrell (1971) who used it in a desensitization procedure to eliminate exaggerated anger in a patient to whom the stimulus to anger and violence was that of being ordered by a person in authority.

There followed a number of studies on the desensitization of the anger response, the most noteworthy of which has been by Rimm and his associates (1971), in which they demonstrated experimentally that a

desensitization anger group showed significant reduction in GSR responses and subjective anger scores over those of a placebo group and non-treated controls. Rimm used 20-minute deep muscle relaxation as the counterconditioning response for desensitizing anger felt in vehicle driving situations. In this experiment, however, there was no measure for depth of relaxation during the counterconditioning sessions for desensitization. The experimenters merely presumed there was deep muscle relaxation as a result of the 20-minute relaxation training procedure.

In a separate study by O'Donnell and Worell (1973) of desensitization of anger generated by black racial stimuli in white males, a distinction is made between motor relaxation and cognitive relaxation: motor relaxation being that obtained by the Jacobson progressive relaxation method, where the subject is trained to discriminate the feeling of tension and release from tension, in successive muscle groups; and cognitive relaxation being that obtained by merely thinking of relaxation without going through the tension and release procedure. This experiment reports a significant improvement of a desensitization group using Jacobson's method over that using cognitive relaxation and that of a non-treated control. They however make the very important point that the depth of relaxation, irrespective of the form of relaxation procedure, just before the presentation of the aversive-high-arousal imagery material, may be the critical factor in achieving desensitization effects.

The Rimm and O'Donnell studies are take off points for our experiment.

THE PROBLEM

While previous studies seem to have demonstrated the effectiveness of a desensitization procedure in the reduction of an anger response to an aversive stimulus presentation, a number of questions arise.

(1)If the high arousal state of the organism is the invariant target factor in the desensitization of the individual, a desensitization procedure should be valid irrespective of the topography, situation, or source of the anger response that is to be desensitized. The Rimm experiment made the anger response uniform with respect to a well defined situation, i.e. anger in driving situations. The O'Donnell study utilized black racial reactions of whites as the stimulus for anger arousal, also a narrowly defined stimulus for anger arousal. Since the GSR is a good measure of arousal whatever may be the source of arousal, it would be useful to experiment with anger arousal in terms of GSR solely as the

unidimensional dependent variable irrespective of source and content of anger, in order to see whether Rimm's and O'Donnell's findings could be *cross validated* across any anger situation other than the driving and black racial stimuli situations with which they experimented.

(2) The important point was made by O'Donnell that relaxation level at the moment of presentation of the aversive imagery material is crucial to an understanding of the nature of desensitization, which requires relaxation as a method for counterconditioning. No study in the literature so far reviewed by the author, has undertaken to obtain independent data on relaxation level during training. And since the O'Donnell study raised this question with respect to the negative results he obtained in desensitization by cognitive relaxation, it would be important to experimentally control the relaxation level for a cognitive relaxation experimental group.

(3) Cognitive relaxation as defined by the O'Donnell study involves listening to relaxation instructions which did not involve actual practice for learning the motor skill of relaxation. There are, however, a number of cognitive methods available for producing relaxation, any one of them may be some version or combination of suggestion methods, a meditational/paying-attention-to-various-parts of the-body procedure and imagining those parts as relaxing, etc. If any of these methods should be used for experimental purposes, it would still be necessary to monitor the relaxation state of the subject by electrophysiological methods. Almost all of the reported experiments on desensitization of anger responses have used relaxation by direct muscle motor relaxation training, not by cognitive methods. It would be of some theoretical interest to depart somewhat from the usual procedure of desensitization by relaxation through direct muscle relaxation. Instead one could utilize a cognitive relaxation method, say a combination of suggestion and meditational techniques, provided one monitored the relaxation state of the subject. An alternative method to that of the EMG, for monitoring directly this relaxation state would be EEG-alpha (8-13 Hz), which would describe more appropriately the state of repose or tranquillity of the subject rather than muscle relaxation. Although laboratory experience has taught us that EEG-alpha is generally correlated with low EMG potential readings, this is not by any means always the case. The literature reports of cases where low EMG readings are accompanied by predominantly EEG-beta activity, which means that even if the muscles are deeply relaxed, there is some degree of autonomic arousal present which EMG readings are not able to detect.

So that if one could proceed in terms of producing relaxation by another method than skeletal muscle training (motor relaxation training in the words of O'Donnell), provided the relaxation level was monitored also by another method, such as by EEG-alpha readings, one would be in a position to validate previous findings by a different relaxation method and, therefore, prove the generality of the desensitization effects thus obtained. One also could therefore determine whether the O'Donnell negative finding for cognitive relaxation was in fact due to the cognitive relaxation procedures that he used.

METHOD

SUBJECTS. - The 30 Ss for the experiment (10 males, 20 females) were students who participated as part of their course requirements in introductory psychology and were recruited on the basis that they had problems related to anger. All subjects were told of possible benefits from participation: that it might help them with respect to their anger problem besides enabling them to fulfill their course requirement for experience in a research setting.

Ss underwent a *fear-anger discrimination test:* they were asked to write down four experiences in which they were very angry and four in which they were extremely afraid. They were then asked to compare the four pairs of fear and anger experiences by indicating whether they could distinguish between their emotional feelings, a pair of anger-fear items at a time. All subjects who could not distinguish between the subjective feelings represented by a pair of anger-fear items were informed that they did not qualify for the study.

Those who passed the fear-anger discrimination test received a form containing three items designed to find out the intensity of his anger, the nature of his anger and the extent to which it bothered him. If the subject got angry to a greater degree than the average person, from his point of view, and was bothered by his anger, he was selected for the experiment.

APPARATUS & INSTRUMENTS. - An Autogen 70A Biofeedback Encephalograph gave data not to the S but to the experimenter who could then monitor brain activity, specifically, the relaxation state (EEG-alpha), of the S. The instrument was adjusted for feedback whenever the S emitted brain waves within alpha range.

The ASI standard electrode assembly was used for monitoring EEG activity, with two active electrodes set above the left ear Coordinate T3 of the Electrode Placement Coordinates as set forth by the International Federation of Societies for Electroencephalography and Clinical

Neurophysiology and the proximal left side of the occipital region (Coordinate 01). The ground electrode was set over the S's right forehead.

A digital summator, Autogen S100 Digital Integrator and Waveform Analyzer, gave information at 10-second intervals on the percent time the S was in EEG-alpha.

On the other hand, an Autogen 3000 Feedback Dermograph was used to give data on skin conductance responses (SCR). This apparatus was set at delta-CL so that both slow shifts and momentary rapid shifts in skin conductance responses of the S could be monitored. The sensitivity of the dermograph was set at scale factor X1. Any skin conductance deflection from given base levels, defined as zero in a -10-0-10 meter scale, could be read directly at any given time, specifically, immediately after S was presented a critical anger arousal stimulus.

The E normally used a standard set of electrodes, which consisted of three finger electrodes: one ground electrode which was attached to the forefinger and two active electrodes which were attached to the third and fourth fingers. All electrodes were attached to the S's dominant hand.

The E used the silver/silver chloride recessed electrode assembly in cases where the standard set of electrodes malfunctioned. This set consisted of two active electrodes which were attached to the palmar surface of the S's dominant hand with the ground electrode attached to the dorsal surface of the same hand.

An Autogen S100 Digital Integrator and Waveform Analyzer unit was used in conjunction with the feedback dermograph. It was used to provide the E with a means of monitoring the S's progress in terms of his absolute skin conductance level. This was provided for by setting the instrument to compute S's average skin-conductance level over intervals of 15 seconds with 0.1 second rest periods in between.

The 15.1 sec. recording periods were later utilized by the E as a cue for when a stimulus was to be given.

All sessions were conducted in an airconditioned room at constant temperature and humidity.

IDENTIFICATION OF SUBJECT ANGER RESPONSES/SITUATIONS. —Those who qualified were given fifteen 5 x 8 cards in which they were instructed to describe situations that made them angry but all situations of which related on one particular theme. For example, if riding in a bus were

distressful and made them angry in specific situations therein, then each of the 15 cards was to describe a different situation related to the theme of riding on a bus. They were at first requested to describe a situation that made them angry. These were the limits of the subject's anger. They were then asked to continue describing in the cards situations the instigation values to anger of which lay in the middle and between the three limiting points, until they had 15 different situations. The different descriptions were then transferred to the 15 index cards.

Each of the descriptions were written in the first person in sentences of not more than 20 words. They did these at home and the cards were collected the following day from them. The cards were then checked and screened; if the descriptions were too long or were lacking in specificity or involved several themes they were rechecked or corrected accordingly during the hierarchy construction sessions which followed.

There was a wide variety of anger themes/situations produced by the Ss: sibling problems, anger over imposition of authority, over non-fulfillment of obligations, anger over lack of resources caused by unconcerned or neglectful significant others, and a wide variety of other family and social situations that lead to intense anger arousal. All of these were the bases for hierarchy construction preparatory to desensitization proper.

HIERARCHY CONSTRUCTION

The hierarchy construction and pre-test were incorporated into a single session, which started with the construction of the hierarchy of anger-provoking situations. Each S was instructed to rank the content of the 15 cards from the least anger-provoking to the most anger-provoking situation. He was then to choose seven of the cards based upon the following criteria: that the seven situations to be chosen were recent and recurring, so they could easily be remembered and felt by the S; that the seven cards would have situations unique to each other to prevent the repetition of similar scenes; and that the interval of anger between cards be kept constant.

Then the S was again asked to rank the seven chosen situations in the cards from the least to the most anger-provoking. These situations were presented by the E to the S in one of two predetermined but random orders. The S was asked to rate the anger value of each of the situations according to a 5-point anger scale. The rating procedure was utilized to check the ranking of anger-provoking situations by the S. If a discrepancy was noted between rating a situation received with respect to its rank, the card was re-ranked or re-rated until the ratings of the situations correlated with their ranking ord--

For a Test Aversive Stimulus (TAS), the Ss were instructed to choose a situation whose anger value was halfway between that of the least and the most of the eight remaining cards.

The Ss were instructed to fill out two additional cards. One contained a description of a situation which was neutral in emotional value of the Ss. Neutral was defined for the S to be any situation which does not elicit any emotional response whatsoever. Examples of neutral scenes were then cited. One example is one where the S saw himself brushing his teeth or washing his hair.

The other card contained a description of a pleasant scene. Pleasant was defined for the S to be any situation which made him feel relaxed physically and mentally, leaving him feeling free and comfortable. Examples were given to the S. One example was a scene where the S saw himself lying down on a meadow watching the clouds float lazily overhead. Both situations were to be described in the first person point of view in not more than 20 words. Ss were later asked to describe 2 to 3 neutral scenes after the E noted that Ss tested during preliminary pilot sessions tended to tire and become restless from the use of a single neutral situation.

PRETEST

GENERAL PROCEDURE. —After the electrodes were attached and the connections checked for artifacts the S was asked to sit up straight with their eyes open for two minutes. This was followed by a 2-minute period when the S was asked to be as comfortable as they could. This was followed by 2-minute period where the TAS was presented. The whole procedure was repeated with the Ss' eyes closed. This procedure was undertaken to determine the baselines of the Ss across normal and relaxed conditions, and to give the E an idea of the S's latency and duration of anger responses. Also it was used to determine in which conditions, eyes open or close, the Ss could best relive or reexperience the anger situation.

The neutral stimulus was then presented to the S. The S was asked to rate the clarity of the scene on a 7-point clarity scale and its anger value on the 7-point subjective anger scale.

The S was told to keep his mind blank until his skin conductance returned to its previous baseline or had stabilized.

Upon reaching the baseline level, the E presented the first of 7 anger stimuli. The stimuli, which had been ranked from the least to the most anger-provoking in value, were presented in one of two predetermined but random orders. After a peak in the S's skin

conductance deflection was observed, he was asked to rate the anger value of the just-presented anger scene according to the 7-point subjective anger scale. He was then presented with a neutral stimulus until his skin conductance level reached the baseline level. Then the next stimulus was presented. The procedure was repeated for the remaining 6 stimuli.

Following the presentation of the last anger scene, the S was asked to visualize himself in a neutral scene until he reached and maintained his baseline levels for 2 minutes. The S was then informed that the session was over. The electrodes were removed, the areas of attachment on the skin cleaned. He was then dismissed after being told that he would be contacted for the next session.

PROCEDURE, DETAILS. - Practice sessions were conducted by the E in order to familiarize himself with the pre-test procedure and to test and modify if necessary, the procedures used in measuring the anger skin conductance deflections of the Ss.

The E patterned the pre-test procedure on that used by Rimm et.al (1971) to measure the S's skin conductance response (SCR) deflections in response to anger stimuli. This procedure incorporated the presentation of anger and neutral scenes in an alternate order. The presentation period of the anger stimulus was initially kept constant at 10 seconds during which the S's SCR deflection was taken. The S was then to give his rating of the anger value of the presented anger situation within two seconds after the end of the anger stimulus presentations. This was followed by the presentation of the neutral situation for a period of 30 seconds before presenting the next anger stimulus. All anger stimuli were presented by the E's reading the description of the anger scenes in the cards of the S. These random orders used for the presentation were different from those used in the hierarchy construction.

The initial practice sessions conducted in the above manner, however, revealed defects with regards to the applicability of Rimm's procedure to this study. It was noted that the latency and duration of the S's anger response as indicated by his skin conductance deflections often exceeded the 10-second presentation period. The duration and latency of the S's response varied. Thus, readings taken after the end of the 10-second presentation period represented a baseline reading in cases of a long latency or only the initial deflection of a response whose peak occurred after the 10-second presentation period. It was also noted that the rating of the aversive or anger situation was enough to cause a deflection in the skin conductance level of the S. When operating on a fixed-time schedule, the E could not be sure if the observed peak

deflection was due to a continuation of the S's anger responses or due to the act of subjective rating itself. These deficiencies necessitated the modification of the procedure.

The skin conductance deflection for a particular stimulus was derived from the observed maximum deflection of the needle from the zero mark of the 10-0-10 meter scale. The baseline was set before the presentation of each anger scene by depressing the auto button. The E presented the anger stimulus at the start of a 15-second recording interval and simply waited for the maximum deflection on the meter scale. The S was asked to rate the subjective anger value of the anger situation only after a decline in the SCR level was observed from the maximum level for two consecutive recording periods.

The initial period outlined by Rimm, et. al. called for the presentation of the neutral stimulus after the rating of the anger value of an anger situation. Any deflection due to the neutral scene was then to be subtracted from the deflection value of the anger stimulus.

The E utilized the neutral stimulus for another purpose. The neutral stimuli were administered, in order to allow the elevated skin conductance level to settle following the stimulus presentation and rating of the anger stimuli. It was further noted that the rating of the same neutral scene over the different stimuli tended to tire the S, which resulted in an increase in the basal skin conductance level (SCL) that was compounded by a sharp deflection due to the act itself of rating the neutral stimulus.

The E modified the procedure so that the Ss would rate the neutral scene once, before the presentation of the first anger situation. The anger deflection value for a particular stimulus was taken to be the simple difference between the baseline skin conductance level during the presentation of the stimulus and the maximum deflection level.

There was no time limit set for the lowering of the skin conductance level to the baseline. The E waited until the observed level had stabilized or had reached the level before the preceding anger scene was presented.

The E resorted to the use of a standard set of neutral stimuli to prevent the S from getting fidgety over having to use the same neutral scene over and over again.

DESIGN AND CONDITIONS. —Subjects were formed into three random groups: Desensitization Group, Placebo Group, and Non-Treated Control Group. There were 10 Ss per group.

The Desensitization Group was given relaxation training and regular desensitization sessions which utilized their relaxation skill.

The Placebo Group was given the opportunity to talk about the situations described in the anger cards they submitted. Every Placebo subject had a corresponding yoke in the Desensitization Group with respect to time spent in the desensitization session, in order to equalize between groups for time spent in exposure to the experimental situation.

The Non-Treated Group was merely given a Pre' and Post-Test, which were also given the other two groups.

DESENSITIZATION. —The Ss were briefed on what was to be done during the desensitization session: that the session would consist of two stages, an initial relaxation phase followed by a desensitization phase. The principle and the purpose of the desensitization procedure were explained to the Ss before they were brought to the rear end of the room where the electrodes from the biofeedback instruments were attached.

The first 20 minutes were spent relaxing the S as deeply as possible using a cognitive method. The S's relaxation progress was monitored through the biofeedback instruments. It should be noted here that the feedback was available only to the E and not to the Ss. A S was considered to be relaxed if he satisfied concurrently the criteria that his absolute skin conductance level be lower than 100 micromhos and that he maintains his percent time in the alpha frequency at 80-100%.

The present stimulus was then introduced after the S reached the relaxation criteria stated above. If no upward deflection in the S's conductance level was observed, or if a continued decrease in his skin conductance level was noted, the S was then presented with the first of the 7 anger stimuli. The anger stimuli were presented in an increasing order of anger-provoking values. The anger stimulus was presented during a 15-second interval and was maintained for another 30 seconds. The S was then instructed to forget the anger scene and to shift to a pleasant scene. These instructions were complemented by further suggestions for relaxing even more deeply. The S was then presented with the same anger stimulus for 15 seconds, one minute after the presentation of the pleasant stimulus.

In cases where the S signified the presence of anger or where an upward deflection in the S's skin conductance level was observed, the S was immediately instructed to forget the anger scene and to shift to a pleasant scene. This was always accompanied by instructions to deepen

the S's level of relaxation. The S was kept relaxed at the former or lower level of relaxation for 2 minutes before the next stimulus presentation. This procedure was repeated until no indications of anger nor skin conductance deflections was elicited by the anger stimulus. The anger stimulus was then presented with a pleasant stimulus before moving on to the next item in the hierarchy.

After the presentation of all the anger scenes, the S was asked to visualize the pleasant scene and to remain relaxed for 2 minutes. The S was "awakened" by the E and told that the session was over.

Prior to the treatment of the Desensitization Ss, four practice sessions were conducted. These were conducted to allow the E to familiarize themselves with the procedure and modify any part of the procedure if necessary. The initial presentation period of the anger stimuli was increased to 45 seconds because it took the E the full 15-second period to present the anger scene. The extra 15 seconds was added in order to visualize the anger scene more clearly and deeply while retaining his relaxed state. The subsequent presentation periods of an anger situation were kept down to 30 seconds since the S was already cued to the particular stimulus.

The other modification in the desensitization procedure involved the use of a standard set of pleasant stimuli to prevent the Ss from getting impatient over the repeated presentation of the same pleasant scene.

PLACEBO. —The placebo procedure involved the yoking of the Ss of the desensitization group with those of the placebo group such that placebo sessions depended upon the length of time it took to desensitize the yoked partner in the desensitization group. All placebo sessions were thus conducted after the conclusion of the desensitization sessions of the yoked Ss. The length of time required for desensitization was noted and marked down as the allotted time for the yoked placebo S.

The placebo session centered on a discussion of the anger situations written down by the S on the 3 x 5 index cards. The Ss were told that a thorough discussion of the anger situations could be of help to the E and the Ss themselves in trying to understand as well as control their anger problem. The Ss were asked to recall each of the anger incident as vividly as possible. The Ss were often urged to seek out for themselves the solutions to the problems which bothered them. The E throughout the session offered the minimum of advice and instead directed the discussion towards the S's being able to formulate his own solutions.

The procedure was repeated across as many scenes as possible within the allotted time. The Ss were then dismissed after being informed that they would be notified for their next session.

NON-TREATED CONTROLS. - The Ss in this group received only the pre and post-tests.

POST-TEST

The post-test procedures were identical to those of the pretest. The E did not take down the deflection for the TAS since the S's magnitude and duration of the anger response was known from the pre-test results. All the anger stimuli were presented in a predetermined but random order.

The Ss in both placebo and non-treated control groups were given relaxation training at the end of the post-test following the presentation of the last of the anger stimuli.

RESULTS

PRE-TEST (BASELINE) DATA. —Skin conductance level (SCL)* measures in micromhos for the three groups in the pre-tests (Table 1) do not show any significant differences as groups (Duncan's Range Test: Test: P .05 26 df Rp = 156.2). There is a trend towards higher levels of basal physiological arousal for the desensitization group, which means that this experimental group had to be desensitized against greater odds than either of the placebo or non-treated control groups.

Table 2 shows averaged measures of skin conductance response (SCR) to anger cards for three groups in the experiment, and there are also no significant differences between the three groups (Duncan's Range Test: P 0.01,27 df, Rp = 25.6).

As for the Subjective Anger Rating to the imagined anger situations (Table 3), there are no significant differences between the three groups (Kruscall-Wallis one way analysis of variance, 2 df, H=0.99)

One must note that the anger situations utilized in this experiment were thematically heterogeneous across individuals within a group and therefore also across groups.

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* SCL, sometimes known as "basal skin conductance", is considered to be a measure of generalized activation of the physiological system under observation and the absolute value of which one may use as the base along which momentary skin conductance deflections (due to arousal stimuli) may be measured.

POST-TEST (AFTER TREATMENT DATA). —Basal skin conductance levels (SCL) were not significantly different across desensitization, placebo and non-treated control groups, which means that general arousal levels in the post-test situation were relatively at equal levels for all groups. (Table 4)

But SCL levels for the desensitization group had gone down so dramatically that the reduction constituted a significant difference with respect to pre-test values. (Table 5) This means that this group learned to relax very well or that their physiological arousal level had been considerably reduced through EEG-alpha training.

Table 6 shows differences between post-test and pre-test measures of skin conductance response (SCR) to anger stimuli among the groups. The difference between the desensitization and placebo groups is significant at the 5 percent level by Duncan's Range test, but not between the desensitization and the non-treated control groups. By correcting for the possible loss of interest in the experiment by one S in the non-treated group, a recomputation (Table 7) shows a significant difference at the 1 percent level.

Tables 8-A and 8-B show the same significant effects of desensitization procedures on anger responses by analysis of Variance and by the Schefe Test for difference between groups.

Table 9 shows some confirmatory evidence of how better the desensitization group did over the placebo and non-treated control group controls. The differences are significant by the Mann-Whitney U Test. The placebo did better than the non-treated controls, and this difference is also significant at the .05 level.

DISCUSSION

This experiment was intended to find out whether the generality of the Rimm, et. al., proof of positive desensitization effects for anger responses could be extended by an experimental design that allowed for multi-thematic anger stimuli across individuals, provided the response measure, in this case, skin conductance response, was unequivocally unidimensional. This experimental design has confirmed identical positive desensitization effects on anger responses of a wide variety in non-clinical subjects.

There was the need also to give greater precision to relaxation levels utilized for desensitization, since O'Donnell and Worell posted that depth of relaxation might well be a critical factor in the effectiveness of desensitization procedures. By imposing criterion levels of repose, 80-100 percent time under EEG-alpha during relaxation training before

TABLE 1. PRE-TEST: SKIN CONDUCTANCE LEVELS (SCL)[a]

DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
739.9	126.3	
198.6	206.4	116.3
132.6	88.3	318.4
313.3	197.6	432.6
356.9	337.3	446.7
200.0	89.6	109.3
150.7	101.0	133.9
522.1	106.7	63.1
146.6	134.1	69.4
343.5	203.7	144.4
3154.1	1591.3	1834.1
315.4	159.1	203.7

—baseline of group D significantly different from baseline group P at $p < 0.05$, 26 df, $Rp = 156.2$, using the Duncan's Range Test

—no significant difference between baseline values of groups D and NT, and of groups P and NT at $p < 0.05$, 26 df, $Rp = 145.9$[a] The figures represent the absolute level of the Ss skin conductance across the seven anger stimuli. The baseline is the S's absolute skin conductance level at the moment immediately prior to the introduction of the anger stimuli.

the desensitization procedures that followed for the experimental group, it was possible to control for this particular factor that should leave no doubt as to its presence and therefore its effects. Also, the use of EEG-alpha instead of the EMG as the monitor for depth and stability of S relaxation state is a procedure that deserves attention, because the relaxation training method here utilized was mainly a cognitive relaxation method rather than the usual tension-and-release-of-tension method of Jacobson which usually requires the EMG for monitoring. The results of the experiments show that, under appropriate controls with respect to depth of relaxation, the negative findings of O'Donnell and Worell on the role of cognitive relaxation in the desensitization of anger need not be negative; the results here show positive effects. Future experiments in this area of work should, in fact, wherever possible, provide for quantification of relaxation levels utilized for desensitization by

TABLE 2. PRE-TEST SKIN CONDUCTANCE DEFLECTIONS VALUES (IN MICROMHOS)

Subject No.	DESENTIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
1	105.7	76.4	120.7
2	66.0	68.0	112.0
3	58.7	22.4	89.1
4	54.7	54.9	78.9
5	54.6	54.3	46.3
6	44.7	54.1	44.8
7	39.7	89.1	30.9
8	37.4	36.0	37.7
9	15.4	7.7	27.7
10	68.0	32.1	71.1
EX	544.9	495.1	659.3
$\bar{X}$	54.5	49.5	65.9

Least significant difference Rp = 25.6 (by Duncan's Range Test $\alpha < 0.01$, df = 27); the difference between extreme mean values (49.5 and 65.9) must at least be 25.6. The groups belong to the same population.

TABLE 3. PRE-TEST SUBJECTIVE ANGER SCALE (SAS) VALUES*

Subject No.	DESENTIZATION (D)	PLACEBO (P)	NON-TREATMENT (NT)
1	5.7	4.1	3.4
2	4.0	4.4	4.3
3	5.3	5.3	4.4
4	3.7	4.9	3.9
5	4.7	4.7	4.0
6	3.8	4.7	6.0
7	3.3	4.6	3.0
8	5.1	3.6	4.4
9	4.1	4.1	3.7
10	4.6	3.9	5.3
EX	44.4	44.4	42.4
$\bar{X}$	4.4	4.4	4.2
ER	148.5	139.5	177.0

$H \leq 0.99$ df=2, no significant difference between SAS values observed using Kruskall-Wallis one-way analysis of variance.

*Mean value of SAS judgement of each subject for 7 cards.

TABLE 4. POST-TEST SKIN CONDUCTANCE LEVEL (SCL) VALUE[a] (IN MICROMHOS)

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATMENT (NT)
	210.5	164	
	81.8	114.1	81.3
	179.8	73.7	118.7
	86.8	103.1	273.6
	122.2	90.6	157.8
	178.8	86	85.6
	68.7	166.4	171.6
	114.1	64.1	65.6
	78	83.1	110.4
	69.3	121.3	68.9
EX	1190.3	1066.6	1133.4
$\bar{X}$	119	106.6	113.3

—Differences between groups were not significant using Duncan's Multiple Range Test at $p < 0.05$, 26 df, $Rp = 58.3$.

a The Figures represent the absolute level of the Ss skin conductance level across the seven anger-stimuli. The baseline is the S's absolute skin conductance level immediately prior to introduction of the anger stimulus.

TABLE 5. SKIN CONDUCTANCE LEVEL (SCL) REDUCTION (PRE-TEST LESS POST-TEST)

GROUP	DIFFERENCE (in micromhos)	t
DESENSITIZATION	196.4	3.1*
PLACEBO	52.5	1.6
NON-TREATED	93.9	1.8

—The figures represent the average reduction in skin conductance levels per group. The reduction values was obtained by subtracting the post-test values from the pre-test values.

*Significant at $p < 0.01$, 18 df, using t-test

TABLE 6. DIFFERENCES IN SKIN CONDUCTANCE DEFLECTIONS (SCD)[a]
SKIN CONDUCTANCE DEFLECTION REDUCTION [b]
(IN MICROMHOS)

DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED CONTROL (NT)
103.1	12.1	114.4[c]
77.3	-18.0	8.6
53.7	3.3	8.7
58.8	39.3	38.0
58.3	32.0	-17.1
17.0	15.6	-11.7
34.3	19.0	29.4

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED CONTROL (NT)
	25.6	39.3	34.0
	12.9	14.8	11.7
	63.5	21.4	57.6
EX	504.4	178.9	274.6
$\bar{X}$	50.4	17.9	27.5

Difference between groups D and P significant at $p < 0.05$, 27 df, Rp = 26.8 using Duncan's Range Test.

Difference between groups D and NT not significant at $p < 0.05$, 27 df, Rp = 28.1 using Duncan's Range Test.

a The figures represent the average deflection for each S across the 7 anger stimuli

b Difference equal to SCD pretest less SCD posttest

c Possible deviance. S informed E that he was no longer bothered by anger problem at time of posttest and did not want to participate in the experiment

TABLE 7. DIFFERENCE IN SKIN CONDUCTANCE DEFLECTION (SCD)[a]
SCD REDUCTION (IN MICROMHOS)

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
	103.1	12.1	
	77.3	-18.0	8.6
	53.7	3.3	8.7
	58.8	39.3	38.0
	58.3	32.0	-17.1
	17.0	15.6	11.7
	34.3	19.0	29.4
	25.6	39.3	34.0
	12.9	14.8	11.7
	63.5	21.4	57.6
EX	504.4	178.9	160.1
$\bar{X}$	50.4	17.9	17.8

a The figures represent the average deflection for each S across the seven anger stimuli.

—Difference between group D and groups P and NT significant at $p < 0.01$, 28 df by Duncan's Range Test

—Difference between groups P and NT not significant

TABLE 8-A. ANALYSIS OF VARIANCE
SKIN CONDUCTANCE DEFLECTION REDUCTION

SOURCE OF VARIATION	df	Ss	Ms	F
Between groups	2	7087.1	3543.5	6.3*
Within groups	26	14566.2	560.2	

*Significant at $p < 0.01$

TABLE 8-B. SCHEFE TEST FOR DIFFERENCE BETWEEN GROUPS
SKIN CONDUCTANCE DEFLECTION REDUCTION

GROUP COMPARISON	F
Desensitization vs. Placebo	9.4*
Desensitization vs. Non-treated	9.0*
Placebo vs. Non-treated	.0001[a]

* Significant at $p < 0.05$

a Not Significant

TABLE 9. SUBJECTIVE ANGER SCALE RATING DIFFERENCES (PRE-TEST LESS POST-TEST)

	DESENSITIZATION (D)	PLACEBO (P)	NON-TREATED (NT)
	4.7	1.7	
	0.1	0.4	0.4
	3.7	2.0	0.4
	1.7	0.3	0.3
	1.8	0.3	0.4
	1.7	0.6	1.0
	1.4	1.4	0.4
	1.6	2.0	0.1
	2.4	2.4	0.7
	2.6	2.2	1.1
EX	21.5	13.3	2.8
$\bar{X}$	2.2	1.3	0.3

Each figure represents the average reduction in the subjective anger scale ratings over the seven anger stimuli.

GROUP COMPARISON*	U
D vs P	24.5[a]
D vs NT	7.0[b]
P vs MT	17.0[c]

*Using Mann-Whitney Test for difference between groups

a Significant at $p < 0.05$

b Significant at $p < 0.001$

c Significant at $p < 0.01$

electrophysiological methods in order to obviate a major source of unknown variation affecting the phenomenon being studied.

We come now to the original notion that brought about this experiment, which in part also explains the approach which placed some confidence in electing for a design that allowed for a heterogenous set of anger stimuli situations for one of the variables in the study. Long before the author came into contact with the Herell and Rimm studies, he thought that perhaps any tension/anxiety—bound response such as anger, fear, hate, greed, responses, could be desensitized through the now well-known procedures rediscovered for us by Wolpe. The author had already started to work on an experiment on the desensitization of aggression responses when he came upon the Herell and, later, the Rimm studies quite by accident. He came to the conclusion that their methods could be modified to achieve greater generality and precision in the results. We had just done that. But the greater promise of the

method, it seems, lies in its application to other tension/anxiety-related behaviors such as hate and greed, besides fear and violence-related responses. The concept of desensitization has lain far too long in the narrow confines of work on fear or phobic responses. It deserves exploration and extension into the classical human situations that have been associated with high physiological arousal.

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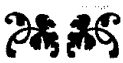
ATTENTION CONTROL FACTORS IN OCCIPITAL EEG-ALPHA ACTIVITY



In this article, Dr. Lagmay discusses his two-year research on Attention-Control Factors. The first year entailed the setting of the equipment and experimental situation, and the usual library research. The second year consisted of experiments which primarily aimed to produce alpha in a subject under conditions of stillness or movement.

In previous experiments, Mulholand found out that the necessary and sufficient condition for the alpha response is the loss of ocular accommodation and fixation. On the other hand, Dr. Lagmay further hypothesized that all relaxation/ quieting procedures involve the loss of ocular accommodation-convergence with the corresponding demobilization of muscle tension.

The first part of these experiments consisted of shaping alpha under condition of relative bodily quiet, i.e. no body movement except for the eye movement necessary for attending and non-attending to a visual field. The second part aimed to shape alpha under condition of body mobilization. It is a known fact that there is alpha blocking when a subject moves any part of his body other than the breathing apparatus. Therefore anyone who moves with eyes open will show alpha blocking, and beta waves will predominate. The unexpected result showed that the subject performed better with eyes open than closed and that alpha can be shaped and controlled even with eyes open.

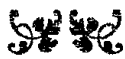
The more interesting result showed that the subject doing the tai-chi exercise under high alpha was the best! And that high alpha can be sustained not only while sitting but also while moving with eyes open, and without auditory feedback as in the tai-chi exercise The researcher further observed that this tai-chi exercise is characterized by a defocussing of the entire body, including the oculomotor mechanism of accommodation and convergence.

Moreover, defocussing of the ocular apparatus in the process of attending, which produces high alpha is just a part of a larger picture

of a general body defocussing. Such defocussing reflects a state of relative quiet of a system that is functioning smoothly. The report ends with the researcher's suggestion that listening to silence may also help greatly in this process of defocussing, and that this can be pursued by future researchers.

One important aspect of this report on the experimental procedure is how the experimenter as a scientist spent time reflecting on the process, instead of the usual manner that researchers do experiments- (one after the other with almost no breathing space in between)- when the biofeedback machine broke down, he had the idea of "listening to silence".

Scientists and experimenters may well take the cue from this and make time for reflection along their "experimental" journey.



Attention Control Factors in Occipital EEG-Alpha Activity

The previous first year was concerned primarily with setting up and studying the characteristics of equipment and the experimental situation. A continuing part of the project had to do with the usual and inevitable library research which went on through the year under review and brief interludes of which were conducted in the libraries of the University of California in Berkeley and the University of California in San Francisco Medical School, USA.

The objective of the second year of the project was to produce high amplitude, high percent time EEG-alpha (alpha for short) under conditions of stillness or of movement. That is to say, to produce high alpha that was durable and stable with the appropriate subject report of his oculomotor state or disposition under specific instructional variables which control the attention factors for the production of high alpha.

A very close study of the vast literature on alpha states has persuaded the undersigned to the notion that all relaxation or quieting procedures involve accommodation-convergence effects on the oculomotor apparatus. This is a generalization of Mulholland and his associates (see my Report for the first year of project No. H-1·00) who found out that the necessary and sufficient condition for the alpha response is the loss of ocular fixation and accomodation. The job of determining the many ways of securing this condition and identifying it in some simple instructional procedure for its rapid production (of alpha) was one of the proper objectives of the project in this second year of its operation.

During the year in review, we explored various ways of producing high-amplitude and high percent time alpha. This was very difficult to do, even under conditions of machine biofeedback, especially when the experimental subject was being tested under conditions of bodily motion, namely, when the subject was actively doing something

The project was able to produce high alpha (high percent time and high amplitude) in a subject who was performing a slow movement

exercise. The appearance of this phenomenon under laboratory conditions is something of a remarkable feat considering that reports of investigators having seen this were largely anecdotal, and no formal report is available in the literature which specify the conditions for obtaining observations on the phenomenon. This problem has precisely been the main burden of this study under review.

The compulsion to do more and more experiments when the study is experimental in nature is hard to resist, and the alternative of reverie and reflection on materials that have already been done, which requires time out from the laboratory, does not easily occur to many of us. Perhaps, by good fortune, the breakdown in the researcher's experimental equipment some time in the latter part of the year under consideration afforded this kind of thought and reflection and for a more intensive study of the existing literature on the subject. The replacement of parts for the apparatus could not be obtained in the local market and had to await replacement from the American manufacturers of the equipment. A good deal of time was spent to no avail in trying to identify the source of malfunction in the apparatus and the part that is to be replaced. We however hope that it will not be long before the appropriate remedy will be forthcoming, and, in the meantime, the reflective, non-instrumented part of the research proceeds well enough.

It has been hypothesized by Mulholland that loss of accommodation and convergence in the oculomotor orientation is necessary and sufficient condition for high occipital alpha. But, furthermore, I hypothesize that <u>all</u> relaxation / quieting procedures involve this loss of accommodation-convergence. With the corresponding demobilization of muscle tension and associated organ systems. During the period of equipment breakdown in my experiments and the ensuing study and reflection pointed out very clearly to me that one of the most powerful, if not the most powerful, possibility would be to listen or pay attention to <u>silence,</u> either as background or foreground source of the perceptual field of attention. I have been doing this procedure as a matter of Krishnamurti some nine years ago, but it never occurred to me until now that this kind of paying attention (to silence) could be related to a defocussing of the entire body, including the oculomotor mechanism of accommodation and convergence.

I decided therefore that the third year phase of the project would be devoted to this very serendipitous discovery of a defocussing procedure for obtaining high percent time, high amplitude EEG-alpha under conditions of movement or stillness of the body.

The advantages and specific features of silence as source for attention response are now obvious:

(1) It can be foreground or background; others can only be foreground, e.g., paying attention to the rising and falling of the diaphragm for breathing; or an imagined fixation point in space; etc., all of which can only be foreground.
(2) Silence is continuous and always present, either as background or foreground.
(3) It is a non-agitating, "quiet" source which is more compatible will the production of the alpha response.

Silence as a source of attention in the perceptual field will therefore be the pivot around which the research will hereafter be secured. This position will probably be more yielding of results to the primary objective of reconditioning the entire bodily system to a defocused state while active in a workaday world of motion and performance.

NOTE

A recent visit to the Berkeley Area in California where Autogenic Systems Inc. is located, where the original apparatus being used in the experiments were manufactured, just this December, 1987, gave information that Autogenic System Inc. no longer manufactures the equipment I have and the rights to do this and distribute these apparatuses have been transferred to Stoelting and Co. of Chicago USA. Our efforts at replacement of parts for the equipment that have malfunctioned will have to be directed to this company from here on.

PART II

This second part of the progress report contains typical data from experimental work which were interrupted by equipment breakdown.

It will be recalled that during the first year of the project, the object of the experiments was the shaping up of high percent time EEG-alpha (alpha, for short) under conditions of relative bodily quiet, with no ostensible movement of the eye in the act of attending or "non-attending" to a visual field. This time one important objective was to shape up high voltage alpha under conditions of bodily motion.

It is well known that there is alpha blocking when an experimental subject moves any part of his body, other than that which is being used for breathing. Furthermore, when he closes his eyes, in addition to being motionless, the production of high alpha is enhanced. Therefore, anyone who moves in almost all forms of physical exercise, with eyes open, will show alpha blocking and EEG-beta would surely predominate. The ideal of the serene, quiet response in motion with high alpha percent time has indeed constituted one of the more fascinating challenges in the practical application of alpha research.

The following graph shows the performance of a subject who happens to have been a practitioner for some four years now of a Chinese exercise called tai-chi, which is known to be a meditational form in motion of the entire body.

Figure 1 shows the subject's performance at the 40-microvolt criterion (which is difficult for many subjects even at the very low 20-microvolt level), with eyes open and the auditory feedback on in all of the following conditions:

(a) sitting still

(b) moving while exercising, and

(c) sitting still with dynamic tension exercise. Since this subject had a history of learning to produce alpha previously, it is not remarkable that percent time performance under (a) and (b) are almost identical, while being different from (c) significantly. Dynamic tension exercise, as a positive control, is muscular activity that is likely to produce EEG-beta (higher brain wave frequencies of 14 Hz and above) and therefore less alpha, while the subject is trying to enhance his alpha output.

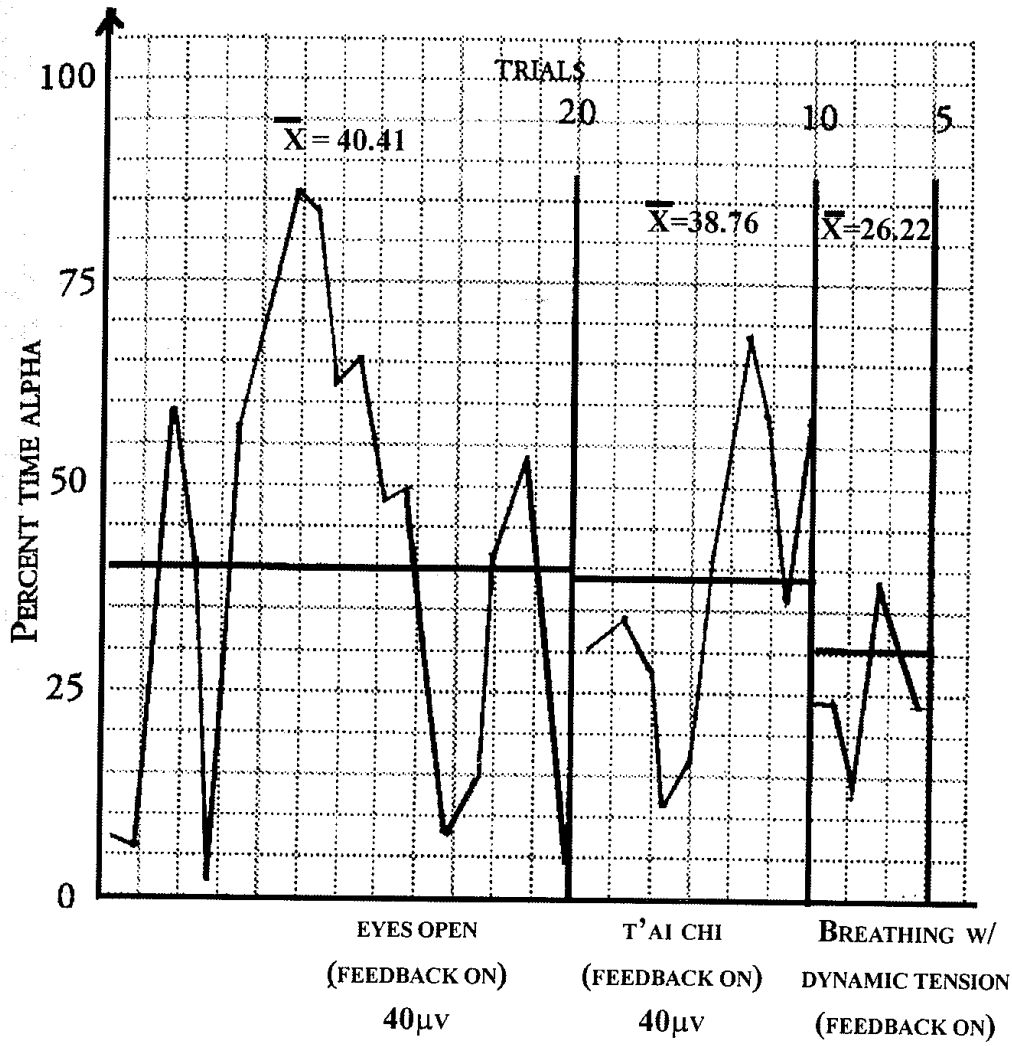


FIGURE 1

This performance shown in Figure 1, it was surmised, has possibilities of improvement, but first we had to compare our measures under eyes open and eyes closed, within the 40-microvolt criterion. Figure 2 shows that our subject can perform significantly better under eyes open condition than when in eyes closed, which is the inverse of what would be normally expected, i.e. that eyes closed condition should show better alpha performance. This is a noteworthy result in its own right, because it shows that the alpha response can be shaped up and controlled even during ocular activity, at least when the eyes are open in order toaccommodate a visual field. Furthermore, one may be permitted the inference that the psychological state of the individual could be more "noisy" (lower percent time in alpha) even when his eyes are closed.

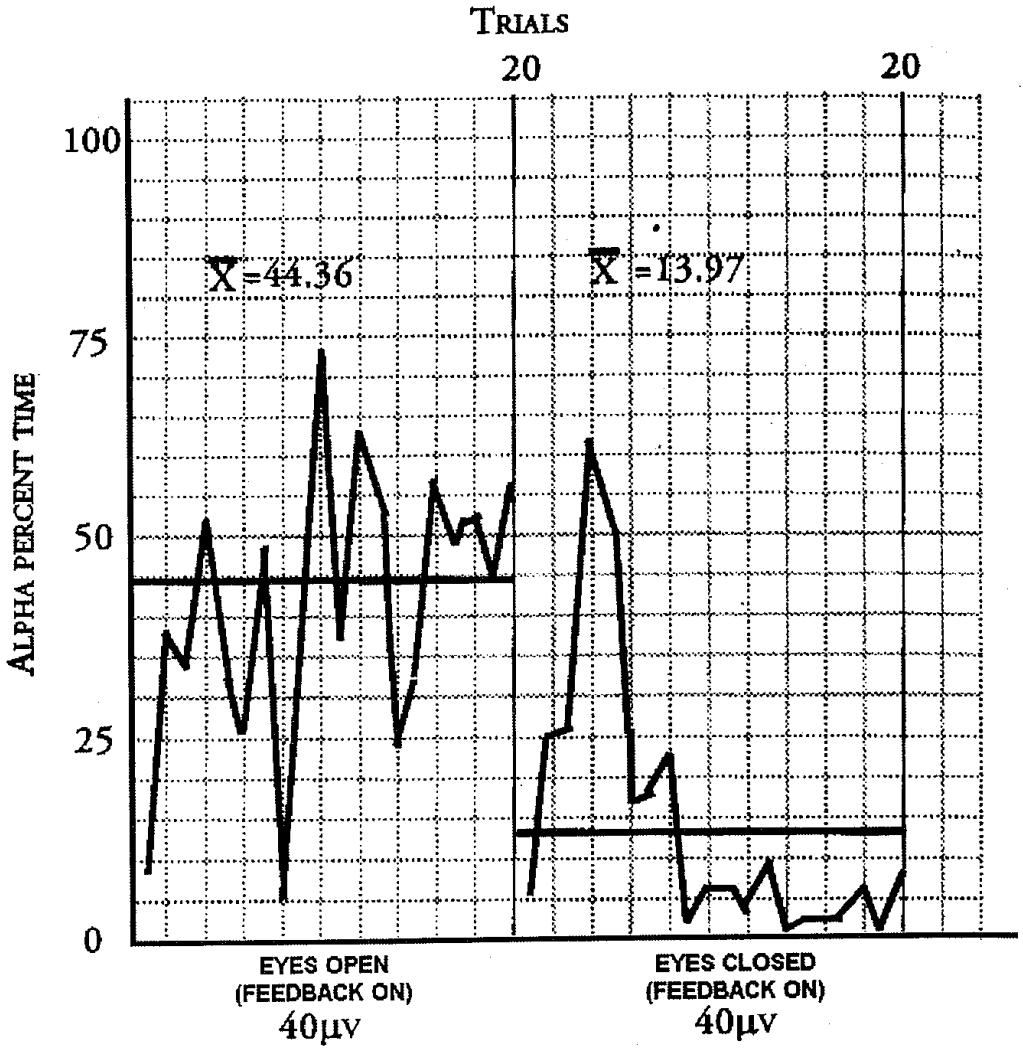


FIGURE 2

However, this inference is valid only if we could rule out the possibility that the subject was not sleeping when his eyes were closed, because if this sleeping actually occurred, there would be a high production of delta waves instead of the comparable beta waves of high frequency, either of which would lower the recorded alpha percent time. The behavior of the subject did not seem to show that he was sleeping, but still one could not be very sure because the equipment did not have the capability of recording independently at the same time other frequencies than alpha.

Figure 3 showns in very obvious terms that an individual moving in space can be taught to remarkably high serene style of activity. This tai-chi performance under high alpha is one of the best our subject had shown at the 40- microvolt criterion.

Moving on to a more difficult level of performance, at 50-microvolt alpha output, Figure 4 shows that high alpha can be sustained not only while sitting still but also while moving, at almost equal levels of effectiveness. This record is typical of many experimental sessions held under this condition for up to the 60-microvolt requirement.

The ability of the subject to sustain a 60-microvolt alpha output without any auditory biofeedback support over a longer period of time within a single session of over 1-1/2 hours may be seen in Figure 5 below. The same conditions are repeated this time at a 70- microvolt level and Figure 6 shows, upon comparison with the performance depicted in Figure 5, that the subject is having a more difficult time turning out higher alpha percent time at the higher microvolt requirement.

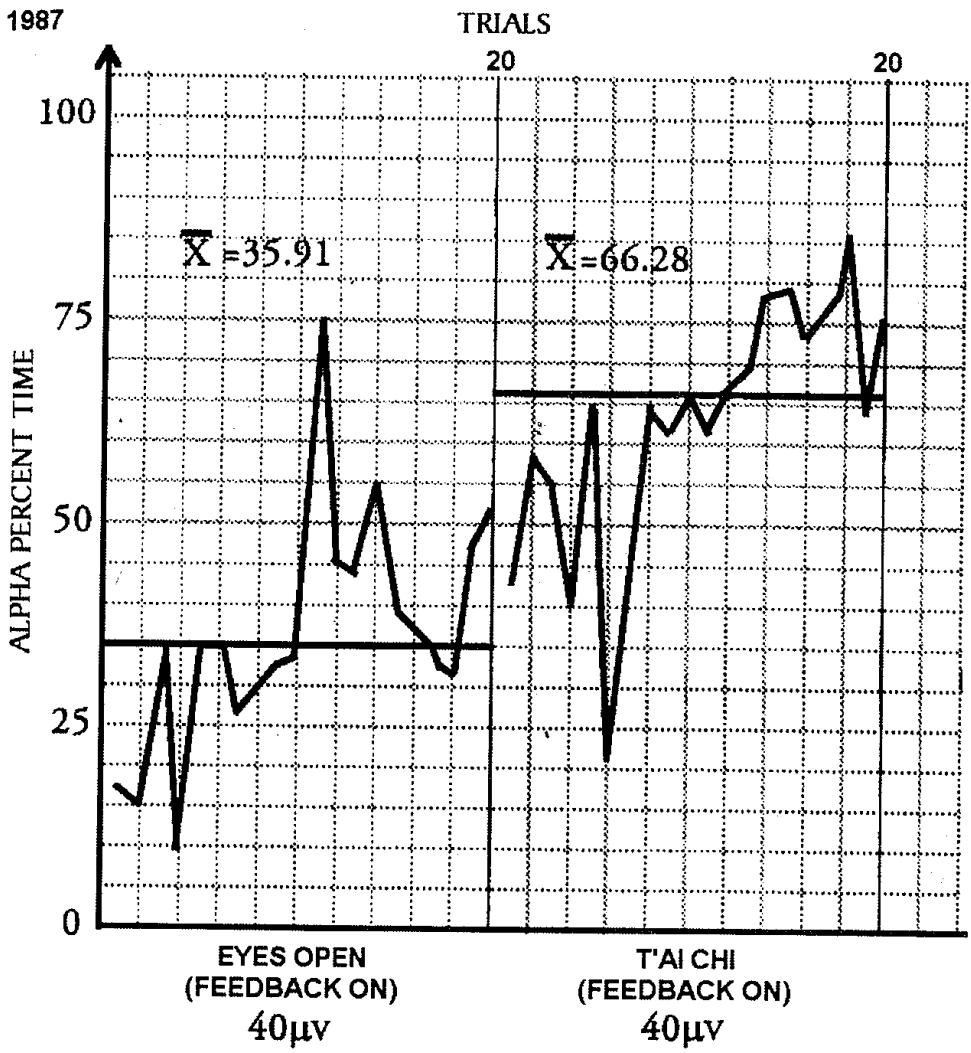


FIGURE 3

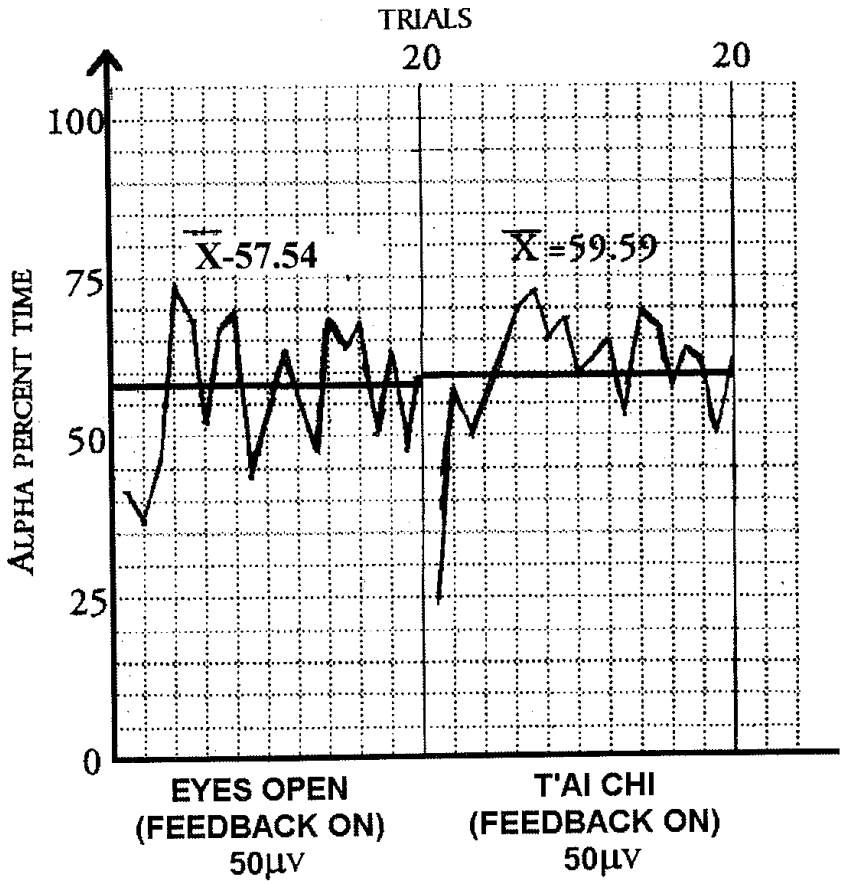


FIGURE 4

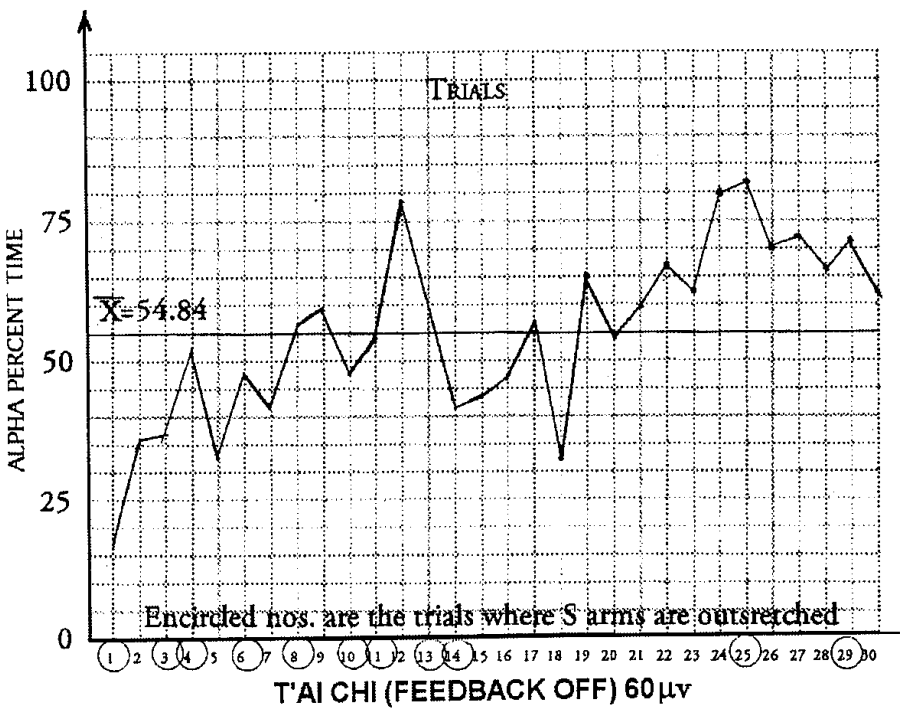


FIGURE 5

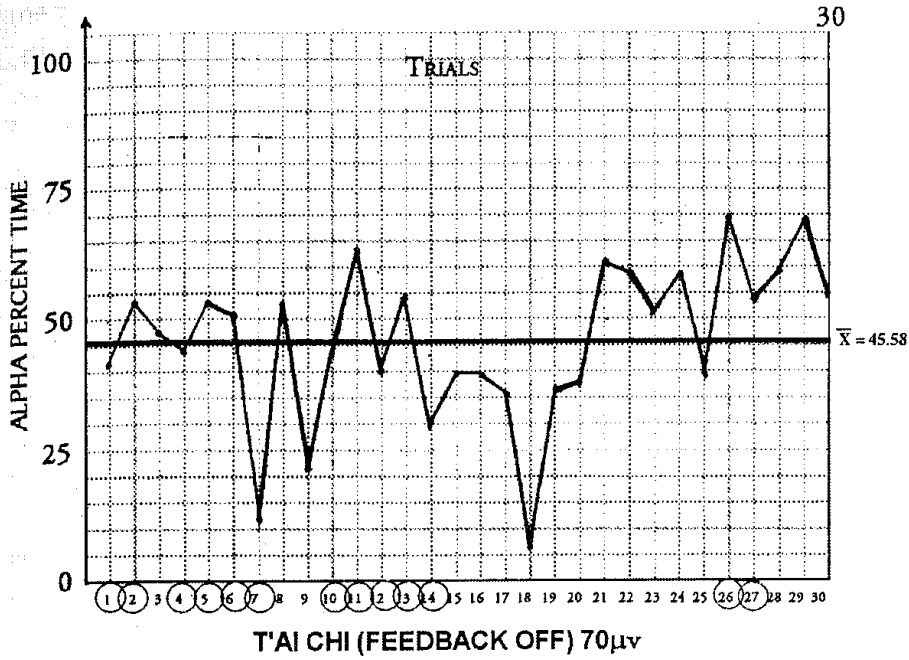


FIGURE 6

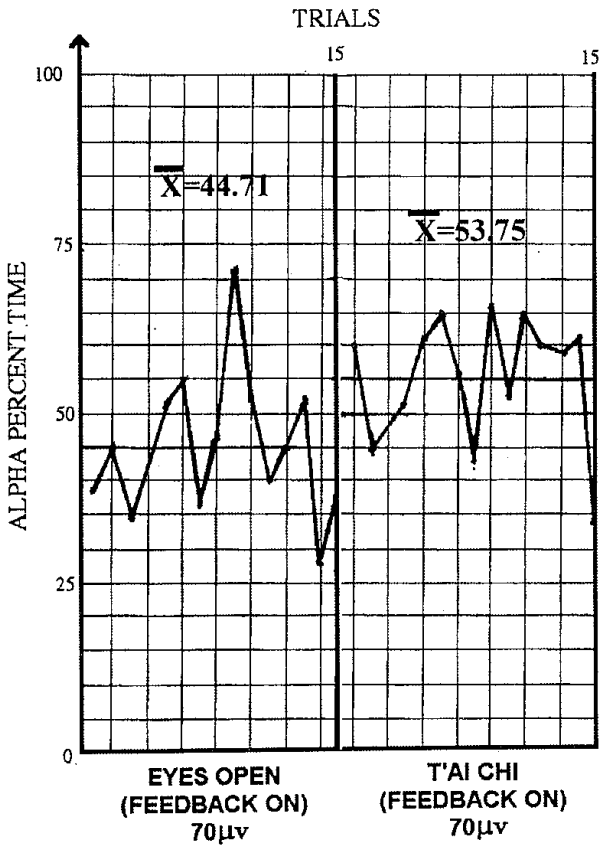
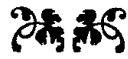


FIGURE 7

WESTERN PSYCHOLOGY IN THE PHILIPPINES:
IMPACT AND RESPONSE



Written in 1982 and published in 1984 in the International Journal of Psychology, Dr. Lagmay traces in this article, the development of Philippine Psychology from the American era to the present. The focus is primarily on academic psychology and the roles of the pioneer psychologists are described in detail. Only someone who has lived through most of the history of Philippine Psychology could provide the insights and assess the contributions of these pioneers. For himself, he notes the introduction of the ideas of B.F. Skinner and Carl Rogers (professors of Dr. Lagmay) as part of his contribution to academic psychology in the Philippines.

A comparison of sitting eyes open and tai-chi (also with eyes open) conditions of the experiment, with auditory feedback at 70 microvolts, shows in Figure 7 significant superiority of performance under tai- chi. This means that this method of bodily movement has properties of "defocussing the body". The fact that there is not very much of a difference between the two conditions in respect of output shows a generalization effect in the quieting response which was being developed in both of the conditions.

We worked on many subjects, but even with excellent biofeedback conditions for shaping up high-voltage alpha under mere sitting conditions with quiet and immobility, we found great difficulty in getting them to perform with high alpha percent time at the same level, or anywhere approaching similar levels, as that of our tai-chi experimental subject. This means possibly that it will require extra special training in other than biofeedback methods in order to achieve the desired level of alpha output under conditions of movement of the body. Tai-chi, as meditational form in motion is one of those special training procedures. Zen students are known to undergo training in a form of walking meditation known as sesshin, which in all probability has been developed in the same spirit as tai-chi exercises.

What seems to be in prospect, in view of our results, is to refine our observations of this exercise (tai-chi) to a point where it is possible to tease out the sources of the defocused psycho-physiological state of the subject which produces high alpha in motion. This is a worthwhile objective that we shall try to do within the limitations of our available instrumentation.

The defocussing of the ocular apparatus in the process of attending in a certain way, which produces high alpha, most likely is just part of the larger picture of a general bodily defocussing, wherein this defocussing reflects a state of relative quiet of a system that is functioning smoothly. This needs definition. It is not just muscular relaxation together with its attendant autonomic concomitant even if this relaxation contributes to a defocussing of the ocular apparatus.

Listening to silence, as I adverted in the first part of this report, may also aid considerably in this process of defocussing, but, as a procedure, this must be for the future to find out.

WESTERN PSYCHOLOGY IN THE PHILIPPINES: IMPACT AND RESPONSE*

ABSTRACT

The history of psychological science in the Philippines is considered as a case of cultural diffusion from the West through the English language and the institutions (educational and legal, business and industry, the media, government and the bureaucracy) which adopted the language. The development of academic and professional psychology and of psychology-related services has been phenomenal, particularly in the last decade. It has however, given rise to problems of (1) standards and validity in testing and research, and (2) applicability of concepts and methods in social psychology the roots of which are from another culture. Current trends and issues, as well the movement for indigenous Philippine social psychology, are briefly described.

*This paper is based on materials gathered with the assistance of a grant-in-aid from the Philippine Social Science Council which is hereby gratefully acknowledged.

INTRODUCTION

The history of psychological science in the Philippines is a case of cultural diffusion which started about the turn of the century, when the United States, as colonizer, came to this country and established an educational system based on the English language as the primary medium of instruction. All other formal institutions of the country developed concomitantly within the framework of this language: the legal system, the bureaucracy, business and industry, the professions and the media, and so forth.

But it was the educational system that constituted the monolithic achievement of the American colonial administration. Every library throughout the length and breadth of the Philippines is now almost entirely stacked with printed materials in English. The school system, from kindergarten to graduate school, runs its classes in this language. While it is true that the Ministry of Education and Culture has officially adopted a bilingual (Filipino and English) policy in the schools, the volume and number of English language books, journals, magazines and other materials are so massive that formal learning of about 16 million students (population, about 50 million) actually is almost entirely in the English language. Furthermore, the President of the Republic announced recently a determined policy of strengthening English language instruction in the schools.

Throughout all of its colonial history, the Philippines has learned much of western cultures mainly through its educational institutions. The Americans were much more efficient in the westernization of Philippine education within the brief period of less than 50 years of its administration than was Spain in over 300 years. Western science and cultural concepts became part of the educated speech and thinking of all who went through the schools.

On the other hand, even as the educational system has been one of the biggest factors responsible for the spread of American culture in the Philippines, there have been wide variations in the learning of the English language: the lower grades and the mass of the people, mainly in the rural areas, have been less "enculturated" in the language. It is believed that the preferred *lingua franca* in the country is Filipino, the national language, which is spoken by about 85% of the people, in addition to their local dialect. This means that the traditions, customs and folkways of the people have been

preserved more in the rural areas, relatively untouched by western concepts, theories and cognitive categories.

The language of research, interpretation and construction in the social sciences in the Philippines, however, has been definitely American and western. In psychology particularly, this has become a fundamental problem in that workers in Philippine social psychology have come to recognize the foreign roots of their tools of discovery and the framework of analysis that they use. A similar problem apparently exists in other Third World countries where academic-scientific psychology has been introduced. But in the Philippines, the language factor is a main feature of a cultural process which now pervades many questions of subject matter and methodology in psychology.

THE RECENT PAST

The history of modern psychology in the Philippines has in fact been parallel to that of the English language and the educational system in the culture. Scientific psychology began with the establishment of a comprehensive educational system by the American colonial administration. Teacher training institutions and the Department of Education were at the forefront in the utilization or psychological knowledge in education. The state-owned University of the Philippines, from 1918 onwards, modeled for the entire country an educational curriculum which was heavy in psychological courses.

In 1946, the Philippines won its independence from the United States, but literally all of the economic, governmental and educational institutions of the American colonial administration continued to flourish.

Filipino scholars, professionals, government functionaries, and leaders of business and industry trecked in great numbers for their advanced studies and doctoral degrees in American universities. Psychology was one discipline that drank deeply of this cultural process.

There were, however, stirrings of Filipino nationalist feelings in the newly-found sense of nationhood. The struggle for national identity had become a moving force in literature, politics, and historical writing. It was during this period that psychologists were

posing problems on the systematic study of Filipino national character and personality.

In 1948, Estefania Aldaba-Lim, holder of a Ph.D. degree in clinical psychology from the University of Michigan, founded the Institute of Human Relations, which was the first in the country to train on an extensive scale teachers in guidance and counseling in the schools. The teachings of B.F. Skinner and Carl Rogers were introduced in 1955 at the University of the Philippines by the writer who studied with both of these American psychologists.

The Psychological Association of the Philippines (PAP) was founded in 1962 and became a member of the International Union of Psychological Science in the mid 60's. With avowed objectives to be scientific, ethical and devoted to the welfare of man, the Association has since then become the main stimulus to scientific psychological research in Philippine universities.

Accounts of the state of psychology for this 20-year period immediately following the independence of the Philippines, as made by Santamaria (1961), Padilla and Aldaba-Lim (1961) and Guthrie and Bulatao (1963), revealed that the large increase in psychology course offerings in the universities were due to the burgeoning programs in education, commerce and business, and the social sciences. Psychological services had begun to expand in the Armed Forces of the Philippines, the National Mental Hospital, the Philippine Guidance and Personnel Association, the Philippine Mental Health Association, and the facilities of the religious orders throughout the country.

According to Guthrie and Bulatao (1963), "a major problem facing Filipino psychologists is the applicability of Western measures and concepts to Filipino behavior". The general issue of cultural specificity versus generality had already acquired a precision in the minds of Philippine psychologists so that now it could be considered independently of the identity problem and the nationalist movement.

The late 1960's and early 1970's saw the rise of the student activist movement all over the world and the Philippines was easily part of the rising tide. The students attacked the multinationals and the cultural vehicles of American imperialism, among others. The teaching of the national language became an important alternative

to English. Demonstrations and teach-ins on a nation-wide scale, together with violence and disorder within the context of a military campaign against communist elements and armed political groups, finally led to the declaration of martial law in September 1972.

TRENDS AND THE PRESENT STATE

In 1974, the University of the Philippines began its Ph.D. program with concentration in experimental, social or clinical psychology, and graduated its first Ph.D., an American, in 1979. In 1982 the University awarded five Ph.D. degrees in psychology.

The phenomenal increase of interest in psychology may be traced to the fact that many students turned to undergraduate psychology programs as a preparation for entry into medical schools, after the government abolished the two-year premedical curriculum and imposed a bachelor's degree requirement for admission to medical schools. This was a national requirement so that all universities were suddenly faced with an enormous influx of students into psychology. Many of these students found their way into graduate schools, but the greater number of them found employment in educational and research institutions and in business and industry (Vasquez-de Jesus 1980). The country apparently has developed to a stage that now permits their absorption into psychology-related employments.

Amor et al, (1981) list 146 public and private agencies throughout the country offering psychology-related services, including the regional chapters of the Philippine Mental Health Association. These do not include the many companies that have burgeoned during the last few years and which render psychological testing services to hundreds of thousands of technicians and laborers for employment in the Middle East. According to Bulatao (Psychological Association of the Philippines 1980), there are over 200 psychological testing companies now that offer this kind of service These do not include the numerous human resources development groups servicing professionals, businessmen and educated lay groups with transactional analysis, T-groups, meditational and relaxation sessions, group dynamics, and the like.

The Philippine Psychological Corporation now serves about 500 companies through its testing facilities and materials. The

Personnel and Managers Association of the Philippines has its own psychological service facilities for middle and top executive groups.

On the other hand, the Development Academy of the Philippines (DAP), which is the major development and training arm of the Philippine government and the president of which is also concurrently the Minister of Education and Culture, has adopted already for some five years now the Assessment Center Method of Development Dimensions (Asean) International for executives in the civil service system. Also, more recently, the DAP had considered introducing behavior modelling for productivity methods, which promises to become widespread among Philippine management and labor.

Meanwhile, the Psychological Association of the Philippines has grown apace in number, from the mere ten founders to something like 350 members.

Forming a distribution and network of cultural purveyors of an entire way of thinking about people, relationships and processes, psychology-related services in varying degrees of sophistication have become one of the most pervasive phenomena in Philippine society. The magnitude and variety available to the public has grown to such proportions that the PAP had taken the self-assessment of the state of psychology as the theme of at least two of its annual conventions: in 1978 during which the theme was "The Practice of Psychology in the Philippines: Current Trends and New Directions", and in 1980, "The Practice of Psychology in the 1980's".

Almost all of the research that has been published in psychology is in English. A cursory inspection of the references of the *Philippine Journal of Psychology* shows entries of American authors mostly, with a few references to local authors, who in turn use American sources. A survey of Philippine social scientists by Lauby et al. (1981) showed that local research studies were rated as the most useful followed by locally authored textbooks. But again an actual examination of sample texts and locally authored papers reveals predominantly American references.

The only notable exception is the new movement in Philippine psychology under the leadership of Enriquez who has published the proceedings of the *Pambansang Samahan sa Sikolohiyang Pilipino*

(National Association for Philippine Psychology) in the national language.

OTHER MAJOR DEVELOPMENTS

In the mid-1970's, Abraham I. Felipe, a social psychologist with a Ph.D. degree from Yale, became president of the Fund for Assistance to Private Education in the Philippines. He initiated a series of studies on a national scale for the purpose of constructing a college entrance examination to distinguish those who were fit to pursue higher academic degree programs from those who would be better advised to take vocational training. This national examination project was subsequently transferred to the Ministry of Education and Culture, under Dr. Mona Valisno, who has been the Director of the National Testing Center. The Center now annually gives the National College Entrance Examination, which is primarily a scholastic aptitude test patterned after American tests. It is in English, not in Filipino. There were about 745,000 high school graduates who took this test in 1981.

Another significant development of a somewhat more general nature has been referred to previously. The President and the Minister of Education have announced an official policy of the government to improve instruction in the English language in the schools. Another grade to the six-grade ladder will be added for this purpose. In a separate development program of the government which will emphasize science and technology, the Minister has announced additionally that technical English will be taught in order to keep the country abreast of developments in the industrial world.

Finally, in psychology itself, the most important development in the decade of the 1970's was the founding in January 1976 of the *Pambansang Samahan sa Sikolohiyang Pilipino* by Virgilio G. Enriquez, a Ph.D. in social psychology from Northwestern University. This movement deserves a separate detailed treatment, but for our purposes we note that its constitution, written in Filipino, has objectives of inquiry and clarification of the value and nature of Filipino personality and consciousness and the development of studies towards a more scientific universal psychology. The association has sought a much wider base for its membership of academics and professionals beyond psychology, such as anthropologists, historians, philosophers, educators, poets,

dramatists, novelists, and sociologists; in fact, all intellectuals who have some interest in Filipino psychology and national character. The annual proceedings of the *Samahan* are published in the seventh regular bound volume all the papers and discussions of which are in Filipino, although Enriquez himself has also written some of his papers in English in order to reach a wider audience for his ideas. The Philippine Psychology Research and Training House, which he heads, has published a volume of his collected writings entitled *Towards a Filipino Psychology: Essays and Studies on Language and Culture* (1982) which spells out his theories and empirical studies on the concept and bases of Philippine psychology, the distinction between exogenous and endogenous indigenization in social psychology, and his long-term commitments to a cause which apparently already had a significant degree of attention even by Western psychologists. (See, for example, Strickland 1979: Gergen 1973, 1976; and Journal of Social Issues 1967.)

The productive output of the *Samahan* and generality of its influence may be partly gauged by an examination of the published proceedings of its annual conferences (*Sikolohiyang Pilipino* 1976 to 1982), which are regular book-bound volumes, and the range of its many activities in the universities, the educators' groups and other professionally-related organizations. The participation in its annual conferences has spread but into all the tertiary level of teachers and has been supported by the Philippine Social Science Council, the National Science Development Board (now the National Science and Technology Authority), and the National Research Council of the Philippines. The roster of speakers, whose papers have been published in Filipino in the proceedings, now up to seven volumes, include some of the leading intellectuals and leaders in the disciplines, the professions, and legal and industrial administration. The *Samahan*, through the Philippine Psychology Research and Training House and in cooperation with the Institute for Southeast Asian Studies in Singapore, sponsored a major symposium on Philippine world views (Enriquez 1980) in languages, literature, popular culture, the visual arts and other fields. It has participated in conferences of the educational system on problems of translation, bilingualism, the teaching of the national language, and the development of Pilipino in the writing of technical materials, including those of psychology.

And finally, in testimony to the organizational creativity with which the concept or *sikolohiyang Pilipino* has been pursued by Enriquez and his colleagues, the *Samahang Pilipino sa Sikolohiyang Wika* (Philippine Association for the Psychology of Language) was organized some years ago. In 1982, the *Samahang Pilipino sa Sikolohiyang ng Bata* (Philippine Association for Child Psychology) was founded as an affiliate of the *Samahan* with one of the original founders of the *Samahan* as its first president.

For eminence in psychology and, in particular, his achievements in *sikolohiyang Filipino*, Virgilio G. Enriquez was chosen by the National Academy of Science and Technology to receive one of the most distinguished awards of the Republic of the Philippines: as Outstanding Young Scientist in Social Science for 1982.

The *Samahan* has found many interested members across groups outside psychology itself because Philippine scholarship in almost all fields has already become quite clearly more sophisticated and mature and because the nationalist movement has spread out more intensely during the last fifteen years into arts and letters and the social sciences. This movement received very supportive encouragement just last month when the ASEAN Interparliamentary Organization which convened in Manila adopted a resolution "to strengthen the cultural value system in the region" in order that the ASEAN peoples can resist "the erosion of their cultural heritage as a result of Western cultural influence".

SOME FUNDAMENTAL ISSUES IN PHILIPPINE PSYCHOLOGY

With the very rapid development of psychology as a field of activity, there has been necessarily a continuing concern for quality, standardization and adequacy in the education and training of those who teach and render service in the discipline. The last three annual conventions of the PAP devoted much time and effort to these problems.

VALIDITY PROBLEMS: TESTING AND RESEARCH

American tests that were brought over for use in the Philippines were perceived earlier as problems merely of norms. Target groups were rank ordered in aptitude and intelligence tests scores, but with personality inventories and similar tests with high culture-specific loadings, this maneuver obviously was not feasible. Furthermore,

most practitioners soon realized that when one went out to test people who did not have a good comprehension of the English language, such as lower socio-economic or rural groups, the instruments were not interpretable for purposes of classification, diagnosis or counselling. There had been attempts at translations into Filipino of the Wechsler Bellevue, the Stanford-Binet, and even the MMPI, but no one was really sure if he was measuring validly.

The most important of these problems in the area of testing of course, has been the National College Entrance Examination (NCEE) which is administered by the National Testing Center every year to nearly 745,000 high school graduates. The NCEE is in English, and, considering the rather wide variations in levels of student English mastery in the different regions of the country, this test has posed quite a problem for some educators who see in this testing requirement a possible violation of the rights of the student in having his future determined by a test that is flawed by essential validity problems due to the language factor. I posed this question on various occasions with responsible officials of the National Testing Center and the Fund for Assistance to Private Education, and they recognize the problem, which is complex and difficult. But it must await future resolution when there are more resources for a concerted attack on this basic issue.

PSYCHOANALYSIS, BEHAVIOR MODIFICATION AND CLIENT-CENTERED COUNSELLING

The psychiatrists are the main practitioners of psychoanalysis, but psychiatric nurses and social workers themselves have been enthusiastic participants in its spread in the Philippines. For a time, educational psychology textbooks devoted generous space to discussions on defense mechanisms and Freudian developmental concepts, but it was only lately that educators have turned to other approaches such as behavior modification and client-centered counselling. A good part of Freudian psychoanalysis has been perceived as culture-bound and even incomprehensible by a number of students in psychology. The extended requirement in time and effort for qualifying as therapist has also been perceived as a fundamental obstacle.

Behavior modification and client-centered counselling, however, seem to fit well the needs of therapists, with some modification into

the local ways. The attitudes of Rogerian therapy have become familiar training principles in guidance and counselling programs throughout the country and Filipinos apparently are very receptive to behavior modification for its simplicity and clarity.

Of over 4,000 members in the Philippine Guidance and Personnel Association throughout the country, the great majority of counsellors follow mainly a client-centered approach (80%), while some prefer behavior modification (10%), according to the Association's president, Lily Rosqueta-Rosales (1982). It is interesting to note that the Program for Decentralized Educational Development (PRODED) of the Ministry of Education and Culture, which is funded primarily by the World Bank, is now training about one-third of a million teachers in the public elementary schools of the country, using an approach that could be oriented towards either behavior modification principles or humanistic psychology. The Development Academy of the Philippines has undertaken to accomplish this herculean task in a crash program which will start the educational system on PRODED very soon.

INDIGENIZATION OF PHILIPPINE PSYCHOLOGY OR IN SEARCH OF A FILIPINO PSYCHOLOGY

Filipinos, just as any other nationality, seek to understand themselves: their own character, the ways and special characteristics that differentiate them from other people. Scholars from other countries, in the main, are similarly motivated to understand us, although often businessmen, administrators and politicians have had other reasons. For some time now this has been the work of cultural or psychological anthropologists, who have sought some universal way of characterizing diverse mankind. I agree that social psychological concepts may be viewed in terms of their historical roots, and this problem has been dealt with previously in a number or conferences already.

The search for validity of psychological concepts across cultures has been a continuing task. One approach that has been frequently followed by researchers, whether by foreigners or by culture-bearers, is to design a research project, implement its field execution and interpret the data through the help of indigenous participants. This has been done in the Philippines so extensively by both foreign and local scholars that it is almost a trite truism.

For added sophistication in methodology, they also propose that the study be exploratory and that the concepts be generated from the data instead of utilizing ready-made concepts from the literature, which for many in social psychology are ordinarily suspect when applied to another culture. Hypothesis-testing types of research, according to this view, would not be preferred.

However, the foregoing approaches have a basic difficulty of their own. In almost all of the research work that has been done in the Philippines in these ways, the culture bearer participants were university educated in Western social science. There presumably would be a local or indigenous contribution, but the interpretative and even the data-gathering phases of the work would necessarily be affected by the Western education of the participants. This would still be true even if the problem were diminished by using the local or national language.

One may understand therefore why I have endeavored to describe some historical features of the English language and the institutions it has affected. Enriquez (1981) once posed the question whether English constitutes a danger for *sikolohiyang Pilipino* and his answer is that it does not, because it is only in the universities where western education, and therefore the concepts and categories of analysis are to be found.

This is only partly true, I think. One must consider the rather very massive institutional penetration of the English language in our culture, and this seems to be progressing even very much more extensively as we enter into the industrial phases of our development. This will continue to accelerate unless our national language, by some radical change of policy in our government, could be elevated to a complete ascendancy over English in the entire country.

Lastly, among the possible methods that may be adopted in the cause of indigenization, one may follow all lines of research by method, sample, investigator, background, situations, in all their variations in the hope that by a "triangulation approach" applied on all data and conclusions available, one could infer the truth beyond the individual results. No method, investigator, nor theoretical framework would be excluded. Everything is material for constructing the ultimate reality from various perceptions and arrangements in time, place and circumstance.

CONCLUSIONS

American colonial administration from the turn of the century up to 1946 saw to a steady development of western institutions in the Philippines, in its legal, educational, bureaucratic and industrial systems, through the medium of the English language. These have grown into a very widespread, stable cultural influence of which the transfer of psychological knowledge from the West forms but a part.

The teaching and utilization of psychology in Philippine education have been the most important single area of cultural diffusion for the discipline; but clinical, governmental, business and industrial uses of psychological knowledge have also become widespread in recent years.

Educators, scholars and researchers, professional practitioners and others in psychology-related services have become profoundly concerned with various problems that have come from the utilization of western psychological materials and concepts, especially as regards the limits of their validity, applicability and value assumptions relative to Philippine culture. However, the sheer volume and momentum of this transfer of psychological science and technology already seem to have created a situation that has a life of its own and which may not await the settlement of issues that are important to the scholar and professional. The current practice is one of adoption and assimilation, with revision, modification and translation, wherever it is feasible, of concepts and tools even as they are in English and of western origin.

There is however a vigorous new awakening in Philippine social science, especially in social psychology, which hopes to redress an initial disadvantage and to contribute its own to scientific and universal psychology.

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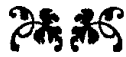
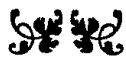
BAHALA NA!



In this article, Dr. Lagmay refutes the interpretation of *bahala na* as fatalism. In his analysis, he shows that *bahala na* involves a form of psychological ascendancy which implies commitment, acceptance, tolerance of ambiguity, implicit trust in oneself and an open attitude toward the future. Thus, the individual improvises his behavior to make it attuned to changing situations. *Bahala na* is perhaps behind the resiliency shown by Filipinos even in the most adverse circumstances. His conceptualization of *bahala na* is based on a thematic analysis derived from retelling of stories by his respondents about their experiences involving *bahala na*. He also tackles the issue of interpretation from the viewpoint of the culture bearer.



BAHALA NA![1]

A paper by Bostrom(1968) was the initial motivation for this inquiry, while the more immediate occasion was a fortunate access to data from an undergraduate student of anthropology.

Bostrom offers a fair review of the available literature on *bahala na* up to about 1967. She worked on the hypothesis that the *bahala na* attitude of Filipinos has a counterpart in American fatalism. She observed that this fatalistic attitude permeates the daily life and habitual existence of Filipinos and that it is more prevalent in the Philippines than in America.

One notes, however, a lack of data on *bahala na* not only in the Bostrom paper but also in practically all of the references cited by her. On the other hand, data has now been made available for our inquiry, and, though modest in terms of range and sample size, were obtained by a method intended to give materials in story form well suited to analysis and interpretation not very much unlike those of the thematic apperception test[2]. The purpose here is simply to make a preliminary exploration of possible conceptual elements in the *bahala na* attitude as a basis for fuller research entry into this area of work.

THE PROBLEM

The study of *bahala na* may be regarded as an empirical problem of meaning as defined by relevant situational and contextual conditions of experience.[3] An approximation to this kind of definition would be to ask the individual of his experience in concrete situations wherein he uttered *bahala na*. The resulting data could then be distinguished from the more interpretative, inferential, or speculative meanings variously attributed to *bahala na*. The view is that a systematic classification of the facts would be a better foundation on which any construction or inference may be made.

PROCEDURE

Fifteen subjects living in the greater Manila area, were instructed to tell the interviewer a story of some concrete experience where *bahala na* was said. The objective was to obtain data similar to those of the thematic apperception test in psychological assessment work. There were no picture cards involved, unlike in the standard test where stories are told about pictures presented in the cards.

Using some key concepts from clinical and social psychology, the resulting materials were then coded in terms of meanings directly extracted from the data. This procedure assumes that the framework for classification and interpretation is a significant factor for understanding *bahala na.*

RESULTS

Typical examples were as follows:

Here is one man, in deep throes of suffering, who could not turn to anyone for help. He had been in the midst of life's confusing network of problems, such as being in conflict with his spouse. *Bahala na!*

Another, without any plans, had to respond immediately to the gang *(barkada)* who came over to fetch him; but he had to oblige his friends *(makisama). Bahala na!*

An individual with nothing worthwhile to do; yet he has to do something and must look for a way. He has enough information, but he wishes to find out what his limitations are, as well as his deficiencies and weaknesses. He is ready to take a chance. *Bahala na!*

A photographer says that he will take some pictures but has only one camera; and he may run out of film, he says, or that the camera may fail to function, and he does not know where all these will lead to, even as he brings all his materials and whatever else. *Bahala na!*

When one has something to be carried out and the means are not adequate for instance, lack of money when going out on a date. Still he decides to make do with what he has. *Bahala na!*

A student says that he was going to take an examination and there was no more time for any form of preparation. Though unprepared ... *Bahala na!*

One was caught extorting money from someone; a serious offense; no way out, and he was being handcuffed. He cried like a child, saying *"Basta, bahala na!"*

The stories were all very tersely worded, and small as the sample was, even their quality was not quite the ideal protocols that otherwise could be obtained by a skilled clinician doing the psychological test. Still, for a

preliminary exploratory step, they are useful as a starting point for parsing out some elements in the *bahala-na* situation.

Bahala-na response is evoked when:

The prospective results or consequences of a situation cannot be determined in advance;

There is a personal deficiency or lack in means, material resources or funding, information or knowledge, and strength, ability or capacity;

The situation is serious or delicate *(maselan);*

There is no plan or preparation for any reason at all, e.g. a time factor constraint;

There is no help at the moment for a serious difficulty; and/or

One wishes to find out his limits, his strengths or weaknesses.

In all of the foregoing, one could say that the prospective future, whether distant or near, because of some deficiency or other, is basically uncertain. This uncertainty is a common essential feature of the *bahala-na* situation. We may consider this very obvious generalization as a first-order coding (categorization) of our data.

Staying yet close to the data, we extract some of the characteristics of the *bahala-na* response, properties which are not so obvious from the vocabulary of the stories but the sense of which may easily be recognized by the native culture bearer. These properties translate into categories of a somewhat abstract nature and describe the dynamics of *bahala na* in a way that is significant for psychological theory. The descriptive categories in effect give us a convenient second-order coding of the materials, which are as follows:

The speaker of *bahala na* remains with the problem on hand. *Bahala na* does not indicate avoidance of the problem; the person stays committed to an encounter yet to be;

This committed throwness into the future permits him to extemporize on information and events as they come along the way, which is improvisation by definition;

The speaker accepts his situation and things as they are for the moment within his existing perception of present deficiencies and uncertainty as to the future;

There is tolerance for ambiguity in his present situation and his perception of the future; and

There is trust in his capacity to meet any contingency, a fleetingly emboldened self-confidence in the face of uncertainty.

The foregoing descriptive categories lead to the generalization that *bahala na,* as an organic response to unknown outcomes, expresses a psychologically ascendant attitude; not one of surrender or submission.

DISCUSSION

Considering that historically there has been a notable lack of systematically-obtained data on *bahala na,* the materials for this study afforded some range and variety in features which allowed for the application of concepts from contemporary psychology. The main advantage of this procedure over previous speculations on the meaning of *bahala na* is that now there is a somewhat clearer region of separation of the data from any further interpretative constructions.

The method used for obtaining the raw data was one of the many variations of the thematic apperception technique: in this case the subject is instructed to tell a story on *bahala na,* thus approximating the experience in context. The resulting story consequently enables one to identify directly some of the prominence features in the structure and dynamics of *bahala na* directly. The technique also affords the subject some measure of spontaneous behavior wherein he has little or no opportunity to engage in extraneous behavior, e.g. trying to figure out how the story is going to be analyzed. More importantly, however, is that, at this level, the meaning of *bahala na* may be found in the circumstances and personal context of its occurrence in the story. This inquiry adopted this perspective for understanding the immediate controlling conditions of the *bahala na* response.

As a first step, the data were classified by recourse to a few common ideas arising from the stories themselves. The first-order coding reveals that *bahala* na usually is a response to an uncertain distant, or not too distant, future, arising from a perceived sense of personal incapacity for the moment, or deficiency in knowledge, information, or material means for determining the outcome of a situation or course of action.

The second-order coding of the stories, however, is different from the first in that it utilizes some concepts usually regarded as essential to the understanding of psychological functioning. These concepts may even be "read out" of the protocols themselves, since there is a recognizable "fit" in their application to the data. For instance, the speaker is still within the domain of the problem, a very likely unconscious statement that it is not an escape or retreat from, nor a surrender or submission to his difficulty. He remains within the circle of the problem and, therefore, committed to an encounter yet to be. His possibilities naturally would be different were he not so committed.

Other conceptual features in *bahala na* are that the speaker is accepting of things as they are, of a situation as it is for the moment; has a tolerance for ambiguity; an implicit trust in himself and, therefore, makes the tacit declaration of self confidence in meeting any future contingency.

All these, as an integral posture, point to a psychological ascendancy in *bahala na,* an entirely contrasted picture to that of fatalism presented in the Bostrom paper.

Beyond the refutation of fatalism, however, has been an unexpected finding, namely, that of a tacitly-induced situational structure for improvisation, which generates an open attitude toward the future. The attitude holds that only the actual event will tell one what can be done, for extemporization is a continuous thread of moments the next one of which may bear new information of its own. One follows the lead of the moment and action shapes itself into the molds of the changing situation. *Bahala na* therefore becomes unconscious practice in the improvisatory, extemporaneous mode.

Still on the same point, in the study of Filipino character, there is the widely-held impression among Filipino native culture bearers that Filipinos are given to improvisation in moments of difficulty or stress. This apparent improvisatory attitude, as opposed to rigid action styles, should perhaps be a good occasion to consider a major hypothesis: that Filipino culture has indeed a built-in mechanism of flexibility and resiliency in *bahala* na for dealing with the pervasively uncertain contingencies of daily living.

Hereabouts, another significant thread in the discussion is the relevance of the culture bearer in the analysis of the data. The culture bearer, as the locus of convergent forces in personal history, the habit system of society and the environment, is possessed of a rich mosaic of experiential processes which can be triggered by word and situation into a patterned response. *Bahala na* is one such trigger for an experience very much shared by other members of the culture. A good part of the experience or response thus triggered and set into motion will likely be spontaneous and unconscious, and, even as it draws essentially from the fertile matrix of the culture bearer's sensibility, much of the dynamics of the *bahala-na* response will remain hidden from him because they are societal automatisms that may be understood oftentimes only through effort at another level of analysis.

The non-culture bearer, on the other hand, probably would be hard put to understand an experience to which he has not been

enculturated. For example, a native Japanese who had been some four years in one of our Philippine universities said once that he could not understand what *bahala na* means with all the explanations and reading materials proferred him by his Filipino mentors. A necessary condition for understanding *bahala na* would, in all likelihood, be a prolonged exposure to the culture in the various contexts of its occurrence. The experiential base is the intuitive framework by which this Japanese could have put the verbal materials furnished him altogether into a single grasp of the substantive meaning of *bahala na.*

And finally, one needs reminding sometimes about an appropriate theoretical frame-work for interpreting the experience of *bahala na.* Many cultural processes are sensitive to ideological appropriation through interpretation, and this is a hazard that must be avoided in research work. The concepts to be utilized must consider very seriously the possibility of attributions to *bahala na* of meanings that are not really there. For purposes of this inquiry, concepts were chosen from mainstream psychology for coding and analyzing the experience of *bahala na.*

CONCLUSION

Using a variation of the thematic apperception technique for obtaining data approximating the experience of *bahala na,* one finds this idiom a psychologically ascendant, functionally positive response to uncertainly. This is in sharp contrast to the widely held view that *bahala na* has strains of fatalism in it and that the individual saying it surrenders his initiative and commitment to his problem.

The culture bearer is a significant factor for reconstructing the experience of *bahala na.* A suitable theoretical framework for interpreting the data should be carefully considered. Also, an adequate data base should be able to distinguish itself from speculative or inferential levels of discourse about the subject. And lastly, the problem of understanding *bahala na* includes a prior decision on how to define the meaning of words and verbal expressions. In this study, it was arbitrarily decided to define the meaning of words, for the most part, in terms of the controlling situation and personal circumstances of the expression.

NOTES

[1] Originally published in *Ulat ng Ikalawang Pambansang Kumperensiya sa Sikolohiyang Pilipino*, Antonio, Lilia F., et al, (eds.) Quezon City: Pambansang Samahan ng Sikolohiyang Pilipino, 1977. This original publication is a transalation into Filipino from the English text which was a transcription of the lecture delivered by the author on November 11, 1976, at the Paulino Garcia Auditorium, NSDB Bldg. at Herran-Taft Avenue, Manila. This paper, now in English, is a formalization

of that lecture. The spirit and content of that lecture have been preserved in this paper, which is actually closer to the notes I had then when I delivered it.

[2] The Thematic Apperception Test is a technique which requires the subject to tell a story around each of ten ambiguously constructed pictures. The resulting stories are then analyzed as to how the characters, particularly the central figure, handle their situations in the stories. The stories are assumed to project the personal psychological functioning of the storyteller.

[3] Meaning in terms of contextual conditions of usage represents the view that meaning is to be found in the controlling circumstances of the speech act, part of which is, of course, in the history of the individual. This is to be distinguished from formal linguistics analysis which, at times, may be useful but which may have little to do with what is going on in the actual verbal situation.

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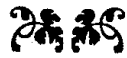
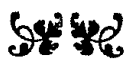
ACKNOWLEDGMENTS

Thanks are due Ms. Cristina del Carmen for her original data which were the basis for this analysis; to Professor Leticia A. Lagmay who persuaded Ms. del Carmen, then a student in her course in culture and personality, to conduct the interviews in accordance with the requirements of a thematic apperception test without pictures; to Professors Lilia F. Antonio and Jesus Ramos who arranged for the translation of the tape recorded lecture from English into Filipino, so that the lecture could be published in the 1976 Proceedings of the Second Conference on Philippine Psychology.

Government Support of the Social Sciences



In his characteristically analytic way, Dr. Lagmay traces in this article, the reasons for the meager government support of the social sciences. He looks at the Philippine Constitution, the Science Act of 1958 and the charter of the National Research Council of the Philippines as well as the operationalization of the term science in the country's two oldest science institutions. He concludes that the Philippine Constitution needs to be rewritten so as to encompass the social sciences. Like a true visionary, he writes about the increasing social and behavioral problems that go with the advances in technology and makes an appeal for the nurturance of the finest minds in the social sciences. Written in the 60s this article anticipates the recognition of the social sciences in the scientific career system by more than thirty years.



GOVERNMENT SUPPORT OF THE SOCIAL SCIENCES

The Science Act of 1958 was passed by Congress of the Philippines in order to integrate, coordinate, and intensify scientific and technological research and development and to foster invention, in effect, to carry out the provisions of Section four, Article IV of the Constitution. It thus declared it "to be a policy of the state to promote scientific and technological research and development, foster invention, and utilize scientific knowledge as an effective instrument for the promotion of national progress. "[1] The comprehensive nature of this Act, in pursuance of a constitutional mandate no less, seemed to have provided the major impetus and support to the role of science in the national life, in addition to that already being provided since 1933 by the National Research Council of the Philippines, also a creation of the national government.[2] The Act of 1958 provided funds in pursuit of its objectives and for a National Science Development Board with functions, powers, and duties which, since recently, has been charged with the administration of a sizable outlay called the Special Science Fund.[3] The Board's enormous responsibility of directing the course of scientific development of the country and for supporting the vast human resources available in educational institutions, agencies and professional scientific groups, has become so conspicuous that it becomes necessary to examine its role relative to the place of the social sciences in the over all program of government support to science and technology in the Philippines.

The government "shall stimulate and guide scientific, engineering, and technological efforts towards filling the basic and immediate needs of the people; (and) ..... survey the scientific, engineering and technological resources of the country and formulate a comprehensive program for the development and maximum utilization of such resources in the solution of the country's problems,[1] thus the Science Act of 1958 provides the words *scientific, engineering, technological/technology* appear many times in several pages of Sections 2 and 3 of this Act, and one basic question therefore that arises is what are the appropriate interpretations of these terms.

The terms *engineering* and *technological* do not need very much elaboration, being concerned substantially with the applications of science for wholly utilitarian or practical purposes. *Science/scientific,* however, constitutes the prior problem. There are at least two ways of regarding these terms: (1) One would be to examine the diverse ways by which the terms have been employed in practice by scientists, and the other is (2) to examine the ways in which the terms have been implemented operationally in the organization and activities of the National Science Development Board.

Science as a human endeavor refers basically to a set of practices which are characterized by the rigorous application of methods and concepts satisfying certain criteria: (1) that the findings arising therefrom be susceptible of empirical confirmation, that they be reproducible, if possible under controlled conditions; and that (2) there should be some degree of economy in the conceptual apparatus used, it must be systematic and unambiguous. Definitely, the traditional sciences such as chemistry, physics, biology and the technologies that have been derived from them, satisfy these criteria; it should, therefore, be no cause for concern in any way that they are immediately accorded complete recognition in terms of the above definition.

However, it must also be recognized that some of the social sciences have already adopted the rigorous methodology of the traditional sciences. There is no doubt that anthropology uses methods of the physical and biological sciences, and the same thing holds true for psychology. On the other hand, social psychology and sociology, and, to a certain extent, economics and education, have become quite experimental or have come to utilize methods of controlled measurement. Our understanding of social phenomena has been enhanced considerably by the application of experimental techniques which compare very well in precision and, perhaps, significance to some of those in the physical and biological sciences. Political science, which used to be the playground of theoreticians and armchair scientists, now has become quite empirical in many areas, e. g. in political behavior and decision-making and in risk and strategy problems. If the foregoing argument then be true, the term *scientific* covers actually a broad spectrum of disciplines which should include the social sciences together with the life and physical sciences.

Let us now consider the operational meaning of *science/scientific* in terms of the activities and organization of the National Science Development Board.

Firstly, take the composition of the Governing Board, which is entrusted with powers and prerogatives of a Board of Directors and, therefore, to allocate funds and determine policies, in pursuance of the broad objectives defined by the Science Act of 1958. "It is made up of a chairman; a Vice-Chairman and the following members: the Chairman of the National Research Council of the Philippines, the Commissioner of National Institute of Science and Technology, the Commissioner of the Philippine Atomic Energy Commission, the Director of the Office of National Planning of the National Economic Council, a representative from the University of the Philippines to be designated by the President of the University, one member representing industry, one member representing scientific and/or technological associations or societies, one member representing agriculture, and one member representing education. As presently constituted, therefore, it would seem that the Governing Board is weighted heavily in representation from the life and physical sciences, with none, or possibly only one, from the social sciences. The basic social sciences which come quite near to the traditions of the natural sciences in methodology such as anthropology, psychology and sociology are not represented. As I shall point out later on, this imbalance in the composition of the Board has significant consequences for the development of the social sciences in the Philippines, since at this time, the National Science Development Board has the largest single financial resource in the country for science development.

Consider, furthermore, one of the several programs currently now being undertaken by the Board, that of undergraduate scholarship financing. For the Fiscal Year 1968-1969, there was not a single scholar in the social sciences out of the 114 awards from 1963 to 1968. They were all in chemistry, physics, mathematics, biology, metallurgy, botany, electronics, food technology, and mining.

For graduate scholarships, almost all of the awards were in the natural sciences. There were several awards in anthropology and experimental psychology, but there seemed to have been none in the other social sciences.

Another important program of the NSDB had been in training and education for scientific and technical manpower other than through scholarships. For example, the NSDB has sponsored summer institutes and training projects for science and mathematics teachers all over the country, and science here, of course, meant only either physics, chemistry, or biology.

These are only a few examples of the operational meaning of any choice of definitions as to what constitutes science and there is not much point in multiplying them beyond this. The main thrust of what I have been trying to say thus far has been that the level of government support of the social sciences has been rather low and this in greater part is due, it would seem, to an inadvertent defect in the original law in not being more explicit about the importance of the social sciences in the total scientific endeavour. On the assumption that scholarship and teacher training programs are in the nature of investments in the future man-power reservoir of professional scientists and teachers of science, I must invite your attention to the seriousness of the problem. The situation clearly informs us that the weak governmental support for the social sciences is bound to have long-term effects in the future of science in this area which we cannot afford in view of the many pressing social problems in our country which have been created by the rise of technology itself. We shall need to develop the finest minds available in the behavioral sciences in order to give meaning and support to our growing achievements in science and technology so that the years to come we may not be accused of having fostered a situation where ability to create wealth and abundance is only matched by our incapacity to manage ourselves.

In the long time that saw man dealing with his social problems, it has been rather obvious that there is no substitute for the scientific approach to their solution. It is very surprising how even scientists in many occasions will accept the scientific method for describing nature and man but render only the most peripheral attention to the scientific description and control of the social and psychological phenomena. On the contrary, the evolution of our culture, as we begin to harness the achievements of science in increasingly massive proportions, cannot be understood and guided properly without using the methods of science in the study of the sociocultural processes.

I should like to pass on to the consideration of a much older scientific organization in which has been vested the responsibility of promoting basic, as distinguished from applied science, namely, the National Research Council of the Philippines.

This venerable institution of scientists was established in 1933 through Public Act No. 4120 "for the primotion of research work along scientific lines. " The roster of its membership reads like the history of Philippine science in the last half century, a real credit to the vision and high purpose of the men who drafted the enabling Act and organized the Council.

It must be said at the outset that this eminent piece of legislation is truly a product of its times. The main purpose of the National Research Council is embodied in first of four enumerated objectives: namely, "In general, to stimulate research in the mathematical, physical, and biological sciences, and in the application of these sciences to engineering, agriculture, medicine, and other useful arts, with the object of increasing knowledge, starting studies of problems of the national defense, and of contributing in other ways to the public welfare. " The membership of the National Research Council is therefore quite large in the mathematical, physical, biological, agricultural, medical sciences, in accordance with the mandate that established its corporate status. It is even more fortunate that the Board of Directors of the Council saw it fit to establish the Division of Social Sciences in the course of its little less than four decades of existence.

On the other hand, the situation for the National Research Council is to a large extent still very similar to that of the National Science Development Board. Its programs, which is funded additionally from the Special Science Fund in no small measure, still bear the conspicuous outlines of its earlier history. The share of social science research truly is proportionately very much less for some reason that probably needs very careful analysis.

The very eminence with which the National Research Council administered and guided the course of science in our country is by no means, lessened in any way by this observation. But, it must be noted, it could have exerted a very much more decisive influence on the growth of social science in our country, especially since after the Second World War, when the technological applications of social science to problems of developed as well as developing countries have accelerated considerably in range and number, something which is very relevant to the crises that our country has been going through. In the field of mental health alone the social scientists are waiting to be mobilized in research as well as in the conduct of extensive social amelioration programs. We need a deeper scientific analysis of the social structures that have emerged in the course of our progress towards a different form of economy and political experience. I am almost certain that the problems of social unrest in our country today is infinitely much more than those of the economy, the budget, employment, and the exploitation of our natural resources. We need the help of the finest minds that we have in the country whose interests are in the understanding of social problems from the scientific point of view, we need to encourage them in the same way that we have encouraged our natural scientists, engineers, doctors, and technologists.

What must we do in order to develop a sustained and decisive program of support for the social sciences? I propose that in any extensive governmental support of science through such agencies such as the National Science Development Board and the National Research Council, the Governing Boards should be constituted in such as a way as to represent the social sciences in greater number. This will have the immediate consequence of emphasizing the place of social scientists in decision-making, fiscal policy, development programs, and personnel support relative to their disciplines, and, therefore, their role in the solution of the country's problems wherever social science has anything to say about them.

Another suggestion, and this might have something much more direct relative to the Constitution of the Philippines which will be revised, would be to be more explicit in stating out the entire range of the scientific pursuit, namely, *life sciences, social sciences,* and *physical sciences,* instead of using just the single word *science.* This will leave no doubts as to the proper interpretation of the term science; and from the strictly pragmatic point of view, in any massive government support to science and technology, it should call attention to the relevance and importance of social factors in the consideration of the nation's problems.

Thus, Section Four, Article XIV of the present Constitution of the Philippines, in terms of the present suggestion, should read something like this:

> THE STATE SHALL PROMOTE RESEARCH IN THE LIFE, SOCIAL, AND PHYSICAL SCIENCES. IT SHALL ENCOURAGE INVENTION. ARTS AND LETTERS SHALL BE UNDER ITS PATRONAGE.

I am not by any means suggesting that the provisions in the revised Constitution should be the above. What I am trying merely to show is how the term *science* in one context may be translated unambiguously into an expanded locution which carries the full intent of our message.

NOTES

[1] Section 2, R. A. No. 2067, approved June 13, 1958.

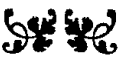
[2] R. A. 4120, effective December 8, 1933.

[3] R. A. 5448

EQUALITARIAN VS. AUTHORITARIAN RELATIONS IN TEACHING:

ITS BEARING ON CURRICULUM IMPROVEMENT

Focusing this time on teaching as a major undertaking of a University, Dr. Lagmay advocates for a more egalitarian relationship between teacher and student. Arguing that an egalitarian relationship enhances the teaching-learning process, he demonstrates how an authoritarian relationship decreases the reinforcing properties of the classroom situation. He points out that the single most important variable in the educational set up is the teacher himself/herself and his/her philosophy of values. For him the basic notion behind effective teaching is that "a human relationship can be sustaining and really satisfying only if there is a genuine respect for the individual as a person and for his own ideas."



Equalitarian vs. Authoritarian Relations in Teaching:

Its Bearing on Curriculum Improvement

One of the most significant remarks I heard the other day was from our friend Dr. Harold Drummond. He said that if we wish to change our curriculum or make any improvements thereto, we have to change the teacher. Present-day education, indeed, is coming to realize more and more the obvious fact that the most important single variable in the teaching situation is the teacher himself. The character of the changes that transpire in the student depends very much on the teacher's philosophy, his values, and, above all, the techniques by which he implements these values. Today, I wish to present to my colleagues the following thesis: the nature of the educative process hinges in a very crucial way on the teacher's conception of his relation with the student; whether the teacher will deal with him on an equalitarian, and not on an authoritarian, basis, and on whether the teacher is trained and prepared to pursue this kind of thinking consistently in a face-to-face situation.

The subject, however, of our discussion this morning is ostensibly about the learner's needs and interests in relation to curriculum improvement. The point of emphasis seems to be the student and not the teacher. Actually this is not what we want to do. It is because the real teaching situation is a two-term relation where both terms are important. It is an interaction between the teacher and the student; between the student and his colleagues; or more generally, between the student and the totality of his material and social environment. In short, the educator's mission has to deal with the full plenum of surrounding conditions in the environment which sustains, supports, or punishes the behavior of the student on the one hand and of his own as a teacher on the other. The teacher-student relation is, indeed, a special instance of the human situation: both of them enter into the process with his own special history. Each of them will be vulnerable at one point or another, through which the mainsprings of action may be touched or through which the natural enthusiasm for learning may perish.

The secondary school student comes to class with a relatively much more developed repertoire than the elementary child. The average age of the high school student is about fifteen or sixteen years: there is a transition development to the full stature of adulthood and there are many obvious differences that may distinguish him from his smaller and younger counterpart of the elementary school. Interests pertaining to responsibilities and experiences appropriate to adults are now, for the first time, taking on a new and special meaning. Everybody knows that. His orientations are proportioned and determined by this developing initiation into a new world. But this information, as any high school teacher also knows, most often does not help very much. The problem still remains as to how responding in a face-to-face situation may be generated.

One solution is to take an inventory of the things that children of his age are interested in and use this as a point of departure, as a center around which the learning situation may be organized. If they are interested in the movies, in parties, in basketball, in learning skills that will enable them to earn a living, or in painting and sculpture, these materials are included in the courses of study. It would be some matter of skill to introduce the appropriate topics when the occasion arises. This inventory, however, can be a very exhausting endeavor, because students' likes and dislikes, their interests and needs are very highly variable and numerous, to say nothing of their unpredictability. One may find some difficulty in organizing a clear-cut course of study on the basis of such an inventory for the reason that it is likely to be arbitrary from one student to another. Furthermore, such an inventory does not insure enthusiasm and interest. You may come up with a complete list of a person's needs and interests obtained from information furnished by friends and parents, or through systematic surveys, only to discover that the whole enterprise falls flop on its fact. Rapport, a high level of responding, seems to depend on some other set of variables, on some arrangement in human relationship the ingredients of which are momentary and constantly shifting. Its determinants are not easily identified or fixed, as in some list or schedule the teacher may improvise.

One possibility which we generally overlook is that the pupil is a more reliable indication of his own momentary as well as more stable needs and interests. If we give him an opportunity to express these needs in an atmosphere of freedom and respect, in an environment free from arbitrary imposition, either in terms of the teacher's authority or some other systematic organizational requirement, he will in long run measure up to his classroom responsibilities with a responding level that is truly reflective of his human potential.

Now, there are quite a number of factors in the usual high school classroom procedure that militate against the student coming out spontaneously with the things that interest him most. One of these, of course, is the fact that the usual recitation method places the behavior of the student under control of the book and the teacher. His responses are oriented towards a person in a position of authority to whom he is responsible for the contents of the book. This authority is the dispenser of rewards and punishments in terms of which his repertoire is shaped up towards greater and greater efficiency in reproducing the materials of the course. I think personally that the testing movement, principally, as well as the inevitable grading system, have contributed considerably to this unfortunate state of affairs. I am not advocating any particular method at this point as an alternative; I wish merely to suggest one way of describing the situation and to raise some problems with you in the hope that we may be able to explore possible answers to them. To continue, if the orientation of the pupil is with respect to what the teacher dictates and pays off with his pencil and grading card, one of the determinants of the student's behavior then must be some external source of authority—not himself and the things that are interesting to himself. We, therefore, in a way of speaking dispossess him of that potential to follow the roads of his inner being. to explore the rich possibilities of its own self freed from the constraints of arbitrary requisites and requirements imposed by some external agent.

These constraints may not be in the form of a blunt imposition but may be some subtle arrangement that uses the group as a means of social coercion. The main component of this arrangement is that there are pressures to conformity through the manipulation of social rewards and punishments by the same people who are interested in the education of these youngsters. These apparently well-meant educators, however, are interested only in so far as teaching is carried on in terms of their own personal standards or in terms of the norms of the special group to which they belong. The same mechanism is operative here as in the case of open dictation; the philosophy of education is similar. Actually, they are instances of a single idea: so long as an arbitrarily imposed source of external authority makes itself effective in pre-empting the behavior of the individual, his own resources for creative growth are stultified. There is no participation that is genuinely satisfying and self-sustaining.

In the enterprise of teaching, learning, and working, the teacher will not find it easy to renounce authoritarian methods. It is because they come in many subtle forms which are not easy to identify. The authoritarian mode of operating is so deeply conditioned in our family,

religious, and educational as well as political life that it becomes difficult to disentangle their manner of occurrence in our own thinking. However, we know that if we wish to create an atmosphere of respect, acceptance, and spontaneity, we must be able to recognize them first before we can effectively do anything about them. Training for recognition of authoritarian modes of relating to other people in order to be able to avoid them, is one of the outstanding baselines for work in psychotherapy. This is, at the present time, in other parts of the world, being applied very fruitfully to industry, administration, and education.

So who is going to say what is interesting and important to the student? Who shall speak for whom? I submit that the only one who can speak for that student is himself; what he will do and say will apply to him, will validate itself in terms of his own history, his own internal frame of reference. The real job is to find a method, to formulate an approach and some constellation of techniques, the nature of which will enable the person to come out of himself, in terms of himself, and be given an opportunity to feel and experience what it means to do so in a human setting.

But why is it so important that the learning processes be in terms of pupil's own system of experienced needs? It is because psychology has taught us that, if we respect and allow complete acceptance of the person's own organization of feeling and thinking, he will come up to the responsibility required by such an acceptance. Eventually he behaves appropriately to and commensurately with the requirements of such a responsibility. It also teaches us that the learning processes are facilitated through such an acceptance, because the contingencies furnished by the circumstances of his own life and needs, as he himself sees and feels it, will be sharper, stronger than anything someone else may supply for him.

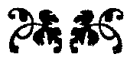
There are various methods now available in that field of group leadership psychology which are supposed to release human resources in a group situation or in organizational set ups. They range all the way from, what seems to me, Machiavellian techniques where knowledge is used "to get people to do things," manipulate situations in order to persuade, dissuade, and convince individuals or groups, down to completely benign systems where there is just the barest trace of an interest in changing people one way or the other. The chief difference between these methods, however, is simply in respect to the degree in which there is an inclination to "push" people around or "to get them to do things." What I wish to suggest by this is that there are modes of operation in groups that can appear under the guise of democratic

leadership but the basic assumption of which is inconsistent with such a kind of leadership. There are subtle forms of "pushing around" in the way people are dealt with and these can be identified by whether or not there is teaching in terms of someone's own ends or some vested standard. In the classroom, as in any human situation, one tenable and consistent philosophy of teaching, which effectively unleashes the potential strength of the student with amazing results, is that which gives him an opportunity to make decisions only after exploring every possibility in terms of his own internal frame of reference. In terms of this criterion, every requirement in school, or in any course of study, is merely a proposal to the student; not a condition in terms of which he is to be rewarded or punished.

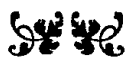
The change in the teacher therefore, may take the form of a change in his technique as a group leader in the classroom. This also involves a change in the philosophy of values that he applies to the teaching situation. Technique and philosophy go together.

Group techniques of the type that you are now developing in your own workshop, I think, are applicable to the high school. The principles of these methods have been so generalized that we may even be permitted to state that they have applicability to the elementary and kindergarten stage of education. Its effectiveness, however, springs from the fundamental notion that a human relation can be sustaining and really satisfying only if there is a genuine respect for the individual as a person and for his own ideas irrespective of whether you happen to agree with them or not. There are ways of translating this philosophical assumption into behavioral terms, but that is not crucial at the moment. Suffice it to say that I have met men who consistently carried this assumption in their thinking and feeling and who changed the lives of other people in ways which pales the usual results of the classical teaching methods.

Research Organization and Strategy in the Arts and Sciences Unit of the University of the Philippines



Writing in 1962 about research in the college of Arts and Sciences, Dr. Lagrnay notes that "the most important academic unit of the University had never really been fully mobilized for research." He argues that "if the University of the Philippines must retain its leadership in the country as a higher institution of learning...it will hinge on "the kind and volume of research work performed by its faculty", this being the "most valid stamp of its maturity as a university." He notes that the professional colleges have been more prolific than the College of Arts and Sciences and proceeds to analyze why this is the case. He points out specific needs such as a clearly defined institution for research, the availabily of time to do research and the space to conduct this as well as the assignment of regular personnel for research.



Research Organization and Strategy in the Arts and Sciences Unit of the University of the Philippines

The organization of research in the fundamental disciplines of the arts and sciences unit of the University of the Philippines seems to have followed some loose pattern of development for almost well-nigh half a century since its founding. Basically pivoted around the departments, research proceeded only whenever time allowed it from the professor's teaching duties. The most important academic unit of the University had never really been fully mobilized for research, since its primary emphasis had been its teaching functions. Perhaps this was necessarily so in the earlier years of its history. But now this state of affairs is no longer tenable, if the University of the Philippines must retain its leadership in the country as a higher institution of learning. For the kind and volume of research work performed by its faculty are probably its most valid stamp of maturity as a university.

A rough survey of the total research achievement in the various colleges of the University of the Philippines shows a comparatively heavier output in the professional colleges than in the arts and sciences disciplines. The Colleges of Agriculture, Medicine, Pharmacy, and Veterinary Medicine have turned out many more research publications than the College of Arts and Sciences. The recognition of the research productivity is very well reflected in the structure of the National Research Council of the Philippines. The fundamental disciplines, excepting chemistry and physics and allied departments in the natural sciences, have been relegated to subordinate positions. The social sciences are practically without any recognizable departmental classification, in contrast to the wider recognition that are accorded them in national research councils of other countries. A survey of the papers read in the last two Pacific Science Congresses shows a remarkable, predominance of the applied natural sciences and almost the negligible role of the social sciences.

A CLEARLY DEFINED INSTITUTION FOR RESEARCH

There apparently has been a very determined effort to emphasize the importance of research in the University of the Philippines within the last decade. But it is not sufficient merely to say that the University is interested in research. For the University is many things: its activities range over a wide variety of fronts. Oftentimes, as in the College of Arts and Sciences, the same faculty and personnel are spread over such functions as teaching, community service, administration, and research. There is not a clearly-defined focus of sustained behaviors and expectations which we call research simply because the faculty members are of many divided allegiances and purposes. And yet if there is any emphasis at all that we can identify as requiring the professor's primary allegiance, that would be teaching, because it exacts from him the heaviest toll in terms of time expenditure.

Graduate Schools have been traditionally taken to be the main focus of research activities in the University, apart from research institutions especially established for that purpose. But under the present set-up of the University of the Philippines, the Graduate School of Arts and Sciences cannot properly perform this function. It has no budget nor a separate faculty which are the only bases for effectively carrying out any program of research of whatever scale.

THE FOCUS OF RESEARCH BEHAVIORS AROUND LABORATORIES

The natural sciences unit of the University of the Philippines have been able to sustain research work in volume over a long period of times, because, by the obvious demands of subject matter, they have been able to develop their physical plants and laboratory equipment. The laboratory sciences have had a long early start in research, because the laboratory is a stable site around which day-to-day behaviors may be organized and scheduled. This has been true of the Colleges of Agriculture, Medicine, and Pharmacy. Research work could be carried on with a good deal less difficulty in a place which is properly equipped than in one where there is none.

Even a properly-equipped department, on the other hand, may have its own limitations. A department, supported within the limited budget of a college, would certainly not be in a position to build expensive fixtures for a larger equipment which would be possible only in an institute which is geared for "organized research." This is one of the fundamental weaknesses of research work organized merely at a departmental level,

even if its faculty members might possibly receive grants-in-aid from outside sources.

THE REQUIREMENT OF A STABLE PERSONNEL FOR RESEARCH

Apart from the consideration of a physical plant around which the schedules of faculty members are organized, there still is a necessity for developing a relatively permanent group of men, a nucleus at least, who will administer the affairs of research on a full-time basis. This group of men should have specialized knowledge in the development of laboratories, the organization for processing facilities, for requisitioning and ordering of specialized equipment and supplies, and especially for the programming of the operational aspects of field research. This cannot be done at the departmental level and certainly impossible at the level of the individual faculty researcher. The proper execution of these functions requires an organization, appropriate financial support, and the accumulated experience afforded by a center for research.

Many research projects can be carried out individually and independently of any research organization. It is equally true, however, that far more numerous researches could be done more efficiently and effectively through the facilities of a well-organized research institute. The conception and definition of some research problems could be utterly different because of an awareness of the presence of the tools and facilities a research center can afford. Thus the sampling procedure of a social operational assumptions, if the researcher knew that a research center had the experience and the appropriate personnel for drawing up an adequate national sampling frame for the survey of certain social categories. Or a method for controlling the gathering of data might change radically if a sound-recording technique is made available by the technician of a research laboratory.

FACULTY DEVELOPMENT PROGRAM; INCREASING MAN-HOURS AVAILABLE FOR RESEARCH

It is often said that the faculty-to-student ratio of the University of the Philippines is about 1:15 on the average, and this appears to be a very excellent ratio. It is very impressive compared to those of other schools in the country. If one is thinking only of the teaching functions of the University, all is well with this figure. If one, however, thinks of the requirements of research, this ratio needs to go down about 1:7. This means that the staff of the various departments in the arts and sciences could double their size, maintain the man-hours allocation for teaching

at present levels, and really sustain research in full gear because the extra man-hours now available can be scheduled for research without difficulty. At the present time the man-hours available for research is exceedingly low, since almost all of the efforts of the faculty are devoted to teaching. I do not have any exact figures on this, but I am certain that much improvement may be expected in the research output of the faculty if more of them could be assigned to full-time research. This move should form part of the effort to define clearly an institution for research in the University.

The Graduate School of Arts and Sciences has been making an effort in this direction during the last three years, but for lack of separate budget and faculty it has not made any appreciable headway. The present arrangement of making a faculty member free of six units of teaching load is not satisfactory. There will be many cases where nothing less than complete freedom from teaching for longer periods of time would be an absolute necessity. There will also be cases where the department at best can release only one or two staff members for this privilege of six units because of the pressure of teaching obligation. In many others none may be spared for research even. These indeed are very severe limitations. They make for a lack of a real atmosphere in research, and no matter how much we may speak of its importance to the faculty, these unverbalized obstacles will continue to hem them all around, especially since they are not within control of the individual desiring to do research work. These are matters of University policy that can in reality be manipulated only at higher levels of decision-making.

ESTABLISHING A RESEARCH CENTER FOR THE SOCIAL SCIENCES AND HUMANITIES

A research institute or center for the social sciences and the humanities, and for the natural sciences perhaps, might fill the need for a well defined agency for research within the arts and sciences unit of the University. The concept of a research institute or center involves a physical plant and personnel devoted primarily, but not exclusively, to research, just as the tradition departments have been the foci primarily of teaching activities. These centers should not take away already existing research activities going on in the departments. Rather, they should be complementary to these departments, but at a level where the accumulated experience of a research center, functioning in much more far-reaching scope is made available to our scholars. Because its name and function is clearly defined, it presents an image which generates a system of expectations the consequences of which should be equally clear to research participants as well as to its various publics as audience.

I think that this kind of center is an obvious necessity for the social sciences and the humanities, probably less so for the natural sciences at the moment, because of an already existing momentum for the latter which followed from the well-developed state of their laboratories and physical plants. Furthermore, the technical libraries of the social sciences and the humanities do not have as long a history in this country as those of the technologies and the natural sciences. The experiences of organized research in the social sciences, if not completely lacking in this country, is just in its inceptive stages. The Institute of Public Administration is a recent example of successful execution of organized research on a limited scale. On a similar basis would be that of the Community Development Research Council of the University.

QUALITY CONTROL OF RESEARCH SCHOLARSHIP AND THE INTERNATIONAL COMMUNITY OF RESEARCHERS

Oftentimes, our limitations are never more evident, and our aspirations more understandable, than when our work is placed against the backdrop of the international effort in the sciences. The importation of foreign visiting scholars in the country has been considerable over the last decade, but many of them, I believe, have not had too satisfactory experiences with our own researchers. They frequently had been relegated to teaching functions, a role which is not ordinarily sought after with much interest. The password in our age among scholars across cultures is research.

The visibility of the University of the Philippines in the academic world could be considerably enhanced by the establishment of a research center which can compete on an equal footing with those of foreign institutes. The problem of attracting foreign research scholars is no mere question of a device to increase our prestige in the eyes of others. The presence of other nationals among our own researchers at the University is a form of social control over the quality of our own research efforts. We should be ready for the creation of research associateships for foreign scholars in our University and this is most appropriately implemented through the facilities of a research institute or center. The strength and vigor of local scientific work may, by this means, now reach out to its international frontiers, so long as the common consciousness is kept alive by men from different lands living and working together for some length of time in some definite place.

THE STRATEGY OF SCIENCES DISTINCT FROM THE INDIVIDUAL EFFORT OF SCIENTISTS

In much of what I have discussed in the foregoing, although quite briefly, considerations of space and of time in the organization of research

were dealt with. Space within which suitable objects like equipment and people may be put together and organized, and time in terms of which behaviors may be allocated—these in short constitute the essential items required for the strategy of science. The old view was fundamentally the moralizing attitude. They used to say that the faculty was inept, or that they were lazy or that they were made up of old foggies. But the manipulation of the appropriate conditions do make the appropriate response possible. While low strategy of research insures the inevitable occurrence of research behaviours in any particular individual, it does increase the chances that they are going to happen. The conceptions are simple and yet they are most easily overlooked, because it is easier to blame the faculty rather than to ascribe it to our own lack of foresight in providing for their needs.

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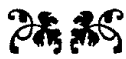
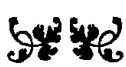
Of Textbooks, Our Scholars and the School System



Dr. Lagmay, in this article, argues eloquently for the need to produce textbooks authored by local writers, for all levels of the school system, as alternatives to those of foreign writers. He writes thus: "The texbooks problem is not just that of putting books in the hands of every youth and child but also of conversation between thinkers and an entire generation of young people who will soon come to their own and who will take over from them. The quality of this conversation through the medium of textbooks, in the little that is going on already is, I believe, not altogether satisfactory." Dr. Lagmay expresses the view that the textbook, especially when written in or translated to the national language, is a most powerful medium that can be utilized to explain the scholarly work produced in the university, to make this more understandable and, thus, more meaningful to the Filipino people. He decries the fact that the university, despite having a veritable mine of scholarly capabilities that can be mobilized to produce textbooks that will meet the needs of the university itself and those of the nation's school system, has barely contributed to the solution of the textbook problem. One reason for this is the pervading attitude among the faculty and others within the university that "texbook writings belongs somewhat to the lesser categories of our academic pursuits' - an attitude that need re-examination and critical reflection. The article ends with specific recommendations to help solve the textbook problem, foremost of which is the creation of a special office under the President that will fund and administer a project on textbook writing and production. It is encouraging to note that now, the university finally institutionalized support for textbook production through its Textbook Writing Program.



Of Textbooks, Our Scholars and the School System

THE PROBLEM

Recent turn of events in the history of our country, perhaps during the last decade or so, has made it all too painfully clear to us the almost complete and total dependence of our educational and cultural facilities on the United States of America. The economic squeeze that arose from the devaluation of the peso about a couple of years ago did not only have its effect in the industrial and business sectors of the country. Everything that could be transacted through our monetary system was affected by this squeeze and this was especially true of books from abroad, which now have become very difficult to obtain.

The question, perhaps, has not been a sheer undiluted problem of economics, where a constriction in the available quantity of books was bound to have an impact on the instructional programs of the schools, all the way from elementary to university level. The complaint has been long and persistent that even the books authored by local writers are oftentimes largely mere imitations, in content and language, of American textbooks, with little regard for the cultural or environmental supports of what is being communicated. Most of them, if not all, have been unabashedly Western-oriented. The patch-up work of altering some allusions here and there, of changing names of objects and places in the text do not resolve the more basic problems of language and communication in English to the Filipino student.

The University to my mind has not as yet taken full and direct responsibility for the kind and quality of books being used in our school system, because if it did, the situation perhaps would not be as bad as it has become. There have been, of course, very successful attempts in the University at textbook production, in science, which have even achieved international reputation, such as those of the Science Education Center of the College of Education. But these are still quite far from utilizing the full potential of the University in scholarship and manpower resources for meeting what amounts to almost a national emergency in the field of education.

An alternative way of describing the present state of affairs of textbook production in the country is that our scholars have been unaware of some real meaningful understanding of the instructional problems of our youth in relation to their specialties, because they have, as a whole, not made any effort to address them through their works. They write and talk mainly to fellow scholars. While there is a genuine place for high level scholarship, there is equally the genuine one of disseminating knowledge at lower levels of instruction. The textbook problem of the schools is not just that of putting books in the hands of every youth and child but also of *conversation between thinkers and an entire generation of young people who will soon come to their own and who will take over from them.* The quality of this conversation through the medium of the textbooks, in the little that is going on already, is, I believe, not altogether satisfactory.

THE SITUATION IN THE ELEMENTARY AND SECONDARY SCHOOLS

In terms of quality of scholarship, in content as well as language, the textbooks now being offered for the use of our children in the elementary and secondary schools leave very much to be desired. You get the feeling of something haphazard about the whole thing and, of course, you know that it is not intentional and that the available resources of scholarship and technical skills were not utilized because the people responsible for it either were not aware of them or simply because the educational environment was not structured to make it possible.

And so the conviction becomes even stronger that the University has been remiss on this particular obligation to the national educational effort, except for the special case of the Science Education Center which, it must be admitted, mobilizes but a very small portion of the total scholarly capabilities of the University for serving the textbook needs of our educational system. Should the scholar be looking for points of relevance or areas of application for what ails Philippine society, he might examine some of the textbooks that are prescribed in Philippine schools today. In this he will realize that here, in this particular field, there exist challenges to service that could be of lasting significance.

THE SITUATION IN THE UNIVERSITY OF THE PHILIPPINES

A rough survey of the departments in the University of the Philippines indicates that most of them do not have textbooks for the introductory course in their disciplines that are written by their own faculty. For the basic senior courses, there is hardly any textbook by a local author. One may well imagine what could be of other schools and colleges, if this were true

of the University of the Philippines. And yet, as against all these observations, we believe that our scholars have the capacity and maturity which are required to produce these books.

SOME PROBLEMS IN TEXTBOOK WRITING

One easily recognizes some of the more serious difficulties of communicating to a large readership with specified characteristics, beginners or children, as soon as he writes a book for them. This activity is completely different from that of writing for a journal or for fellow scholars who have learned a special language and who have been exposed to pretty much the same educational history. When a scholar has to spell out what he knows for a high school or freshman student, he discovers that he has to learn new ways of expressing himself. He has to take very careful stock of what he has to say in simpler, clearer language that does not assume too much of his reader. His science and his art is put to a new test. Technical knowledge must be communicated in non-technical terms, without sacrifice of accuracy or scholarship—a very complicated activity, more so in some respects than technical writing itself, because there are many other requirements that he has to consider simultaneously. If he has to write, for instance, as an additional requirement, in the national language, he meets with a formidable task because of the lack of a technical vocabulary and a tradition of University writing in that language.

TEXTBOOK WRITING AND THE NATIONAL LANGUAGE

Many of our colleagues are of the belief that English as a language of instruction in higher education is here to stay for a long time. Until we can develop our national language for expressing ourselves in science, art and philosophy, law, engineering, and the other technologies, it would be too radical a requirement to insist that the entire school system function exclusively, or even mainly, on the basis of the national language. It seems so much more practical to use some method with obviously clear cut but massive multiplier effects and which could be carried out through an institution that has considerable influence in education. This method involves the use of textbook writing in the national language which should make use of the entire University.

Textbook writing in the national language, or textbook translation into the national language, at the university level should stimulate our scholars to consider the lexical problems of their discipline relative to their audience or readership. They, together with their students could become participants in the developing of a national language through

actual usage and practice. By encouraging our scholars in the University to work out the problems of expressing their work in the national language, you generate the accelerating conditions of development of the language for advance instruction. In any event, the University is expected to lead in resolving our language problem and clearly it would be necessary to formally promulgate policies that will enable us to map out long-range textbook writing programs for our colleges and departments.

POLICY ON TEXTBOOK WRITING: ORGANIZATION AND FISCAL SUPPORT

Charity should begin at home: the University should show some real concern for the national problem on the matter of textbook writing and production, but only after it has seen to the needs of its own students. The University should, as a matter of policy, require every department, college or school to write and produce its own textbooks, whether in English or in the national language. Our community of scholars can then move as a group to implement this policy, as a symbol of the educational and cultural independence of our country.

The textbook problem is that of distributing the best that scholarship is capable of proferring to the entire nation and policy must state this clearly within the accepted objectives of the University. In order that our work may acquire a deeper, larger and more meaningful significance for our people, we must make an effort to communicate with them directly and systematically in terms which they can comprehend. The textbook would be one of the most powerful ways of reaching out towards them, in the elementary and secondary schools of the entire educational system.

Every department, college, school and institute should form the organization that will be oriented towards the production of textbooks. A special office under the President will have to administer this project and monitor the course of its work, feed data and information to the University constituency and the public so that it becomes a continuous learning process for everyone participating.

This special office, which should be run by a Board, shall take responsibility for developing the facilities for textbook production, for establishing working relations with the Department of Education and the National Board of Textbooks. It shall keep records and a collection of textbook publications from the various units of the University. It shall also take responsibility for advising on typographical, artistic, graphical and many other technical problems on book writing so as to insure quality of the productions. Lastly, this office shall disburse funds and coordinate

all procedures for applying an incentive system to the participants in the project, so that the University can properly underline the importance of the effort to national development.

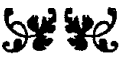
A special fund must be laid out to support this project. This is necessary in order that it can sustain its operations on a permanent basis and program the appropriate contingencies for functioning in the required direction.

A FINAL WORD

In my long association with University life here, for thirty-three years or thereabouts, I have been impressed by one outstanding observation about scholars which to me is quite important: that textbook writing belongs somewhat to the lesser categories of our academic pursuits and that the way to make one's mark is to write the learned paper or that signal contribution which, of course, the general run of the people will find very difficult to understand. And yet, I have been equally impressed by an overwhelming conviction that our scholars do not, if at all, talk to the general run of people often enough so that they may share with them that gift of light and comprehension about the work around us. These behaviors and attitudes need re-examination and perhaps some radical change in frame of reference. I think that our intellectual elite has in some real sense been a thing apart from the people.

Validation and Development of Philippine Culture in Educational Testing

Dr. Lagmay defines the erosion of indigenous values as rooted in the medium of instruction, which is English. He sees the school system as the principal agent in propagating English and a western-oriented culture. He then focuses on testing as a culture-formation instrument and raises questions about the validity of inferences concerning students' performance based on tests using the English language. He calls for a comitment to "value what is good in our culture". We should be committed, according to him, to the idea that the "center of gravity of our educational system and of our culture is the indigenous heritage in tradition practice, experience and language." He proposes that the starting point should be the development and administration of tests in Flipino.



VALIDATION AND DEVELOPMENT OF PHILIPPINE CULTURE IN EDUCATIONAL TESTING

THE PROBLEM*

The search for a good accelerator for developing our own indigenous culture addresses a wide range of problems that have interested social scientists and educators for some time now. One of those problems has been the erosion of our national indigenous values thru the westernization of our basic institutions, such as the family, the educational system. The erosion, or transformation, to use an alternative concept, has taken a very well-defined path: the English language, which was instituted by the Americans as the medium of instruction in the school system at the turn of the century, has been the chief vehicle for the flow of western culture into the national life. This is not to say that the educational process as such has not been fruitful of many progressive consequences. But it has also generated very serious side effects. For one, education now has become an agent for a continuing western point of view in our culture, and the struggle to discover ourselves and to shape our own endoganous perspective, to genuinely feel the creative force of native speech and thought, has been a difficulty of no small proportion. This, I am convinced, is because the work place and its projects and programs, the gauges of performance, and material and facilities; are conducted, arranged and identified thru the English language. And the school system is the chief agent of this process. The national testing program of the government in its present form and objectives, indeed the whole tradition of educational testing in all the schools, has served to validate western culture more than our own, colored an entire way of life, and relegated the development of a living national language to a secondary position of importance.

Testing as culture concept. There are tests of passage thru critical points in life, the transition from boyhood to manhood with its trials of endurance, sacrifice and courage. Many cultures throughout all

* This paper was discussed during the Roundtable Conference on "Language, Education and Democratization" during the Second National Congress on Social Science, May 14, 1988, De La Salle University.

of history have had this. There are trials of courtship before marriage, tests of competence or skills in the guild of artisans and craftsmen; every bullfight is a test in which the spectators participate—the list is endless. Every test or trial mobilizes an entire personal history, together with the social support system in which it is embedded, to a peak in effort and experience. Every major test defines the being, the personhood of the individual within the institutions of his community.

This paper was discussed during the Roundtable Conference on "Language, Education and Democratization," 2nd National Congress on Social Science, May 14, 1988, De La Salle University.

TESTING AS CULTURE FORMATION INSTRUMENT

The test is a primary device for measuring the outcome of the learning process in the largest single organization of the Republic. The test score is assumed to be the measure of student performance; it is also indirectly a measure of teacher effectiveness; in fact, it is a measure of an entire process which includes everyone engaged in the educational enterprise. And the most outstanding parameter of this enterprise is the language of thought and action—in English. The mobilization of aspiration, disposition and energy is directed with intensity of focus on periodic quizzes, midterms, finals and entrance examinations in the English language. The summing up, the moment of truth, the hour of trial is almost always in the English language. The institutional inculcation of American culture in our educational system therefore constitutes one of the really monumental achievements of the Americans from the historical point of view. A great blessing perhaps in many ways, but also not without its none too salutary spin-offs. Our command of the English language as an organic cultural experience has been found wanting, particularly in those areas too depressed to learn anything at all. Language policy is hard put in actual practice. The full force of native intelligence could not be unleashed because the tools of human expression, of thought and action, have been learned all too poorly. And English, the language of attack and defense in every re-enactment of the moment of truth, the trial, the test, really does not have the full support of social or cultural infrastructure and tradition, and more importantly, the deep structures of native language.

ENGLISH LANGUAGE CULTURE AS VALIDATING CRITERION

The concept of external criterion validity of tests, especially of high school and college entrance tests, is significant for understanding why

tests actually perpetuate the existing culture of schools in the English language. Grades in the schools are assumed to be the best available predictors of success in school work, and if the test scores correlate well with these grades, it is valid measure of ability to perform in that system. We could regard the scores in the tests as indicators of the long-term distribution of energy, effort and capacity for English language performance. While this kind of performance is the validating criterion for the test itself, the test in turn acquires a symmetrical function of being the validating factor for school performance in English. This reflexive property of the tests actually now insures the continued existence of English language culture by its utilization in that form. It then comes as no surprise to us now that the development of the national language has been adrift at snails pace thru the decades. It is not that we have not been teaching the national language; only the learning has been very much less than there should be, because the center piece has been the English language in our tests and examinations. And when one considers the libraries and facilities of the schools, which are almost entirely in English, the conclusions are not difficult to follow thru. Not only have we had great difficulty in learning the national language; also there has been much opposition to the development of that language, because the driving power in educational testing has clearly been on the side of the English language. All facilities, every training program and educational process cumulate in great density around this driving power. And as we stumble and plod thru learning the English language, we find the seeming low grade intelligence of our population not really enough to equal that of the native American and Englishmen in the command of their own language. The development of our own skills in the Filipino language has been stunted, but in spite of the schools, Filipino as a language has gained some strength of its own thru the movies, television and radio, and the mobility of populations in recent times.

DECISION AND COMMITMENT

In order to develop an indigenous culture, we must decide to protect it. We must above all learn to value what is good in our own culture, and surely our own language is the most precious of all these. We should not put it aside or even think that a foreign language could possibly be more important, or rich, or more expressive, or more resourceful than the native tongue. Having thus made up our minds, this commitment entails the decision on policy that the center of gravity of our educational system and of our culture is the indigenous heritage in tradition, practice, experience and language. The organic experience of our culture is lodged in our language; Filipino as deep structure in the blood, the guts and organ systems—it is the idiom of mind and

movement in daily life. The Japanese, Americans, Frenchmen, Thais, Chinese, Indonesians and many, many more of them have already made their decision to express their living cultures in their own language in their educational system. The plan adopts a simple device, a simple decisions; to develop examinations at all levels in the system of the Filipino language. *Testing should be in Filipino.* Thus college entrance tests in Filipino will naturally change the educational process in very dramatic ways. Teachers who find it difficult to express themselves in Filipino will have to learn something new together with their students. One could regard this proposition as an accelerator device for the development of a national language, as an element in culture change.

PRELIMINARY EXPERIMENTATION, SPADE WORK AND DEVELOPMENT

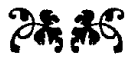
This accelerator key device, that all examinations and tests must be in Filipino is really a statement of policy of major proportions. But, while it is a statement of will and decision, it should also be an expression of enlightened tolerance for how things are in the present system. No one should be asked to give up what they have already learned, or wish to learn, or wish to learn, in the English language. They will be asked to learn something new: to read, write, speak and listen in Filipino, so that they can express themselves in Filipino, teachers and students alike. Where are the materials? They make, improvise, invent, arrange for and develop the materials as they go along. On top of, in addition to, in place of or supplementary to the materials they have in English. But the fundamental constant will be the test and examination in Filipino. They may or may not be examined or tested in English. There should be great flexibility in approach and manner of attack on the problem at the classroom level. Experimentation and trial and error as creative activity will be the adventure of accomplishing an objective in non-formal ways and should be interesting to everyone. And then experimental work very similar in spirit to the Aguilar experiments in Iloilo on learning through the dialects for the first two years of elementary schooling, could be planned in the Department. The National Testing Center would acquire a fresh outlook on a festering problem and have a new mandate for attack on a project of fundamental and substantial dimensions. The development work on this project should be planned and executed with attention to technical details as research work in the long term. The baseline data afforded us by NCEE examinations in the past and other information in its possession will be very useful in this task. We should try out the examinations (entrance, final, quizz, etc.) on some selected participating high schools and colleges, but

these examinations will be in Filipino and may involve learning in English as an option. The examination in Filipino will be the determining factor, not the other way around.

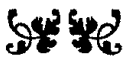
CONCLUDING REMARKS

A persistent problem in Philippine social science has been the discovery and development of indigenous concepts in the culture of our society. We have traced some of our major difficulties in the fact that many of the concepts and descriptions of our own perceptions and experiences utilize meanings and cognitive codes from another culture which is not quite congruent with our own. The educational system of the Republic is the major surveyor of those meanings and cultural codes. Thru the English Language, which is almost entirely the medium of instruction in the system, the culture of the west remains stable in the continuing experience of our people, in our forms of recognition, the categories of our perceptions, which conflict with those of the native culture. Therefore, the educational system as an institution, in its present state, may be regarded as in some great difficulty in the task of projecting and emphasizing the best features of our own indigenous culture through the national language. Perhaps, a solution that ties together many educational processes that gives expression to our unique character as a people may be found in the testing movement. This will need the support of policy stated by the highest levels of government and a determination to protect, conserve and develop our own cultural heritage and potential.

The Philippine Thematic Apperception Test



In the late sixties, Dr. Lagmay embarked on research to develop the Philippine Thematic Apperception Test (PTAT) a projective test designed to assess personality through the analysis of stories told about the pictures included in the test. The development of the test itself demonstrates Dr. Lagmay's keen appreciation of Filipino culture and well-considered application of psychometric principles of reliability and validity. He worked closely with an artist who drew the pictures based on Dr. Lagmay's ideas of situations which would best elicit personality-revealing responses among Filipinos. His research design included normal and pathognomic samples with varying age groups both male and female coming from rural and urban communities. Three research assistants scored the stories as well as the responses to the Rorschaeh and Sentence Completion test—the latter two serving as validation instruments. Inter-rater and intra-rater reliability indices were obtained. After the administration and scoring of the original pool of 64 pictures, Dr. Lagmay chose the final 24 which discriminated most among the various groups included in his validation sample. The PTAT is used extensively in research and clinical practice.



The Philippine Thematic Apperception Test

The Philippine Thematic Apperception Test (PTAT), with objective descriptions of each card, in the order of their presentation:

Card 1 BM (for young and adult male): a backview of a man standing in front of a railroad station, near the railroad track.

Card 1 GF (for young and adult female): a young woman, standing on tiptoe, looking out of the window.

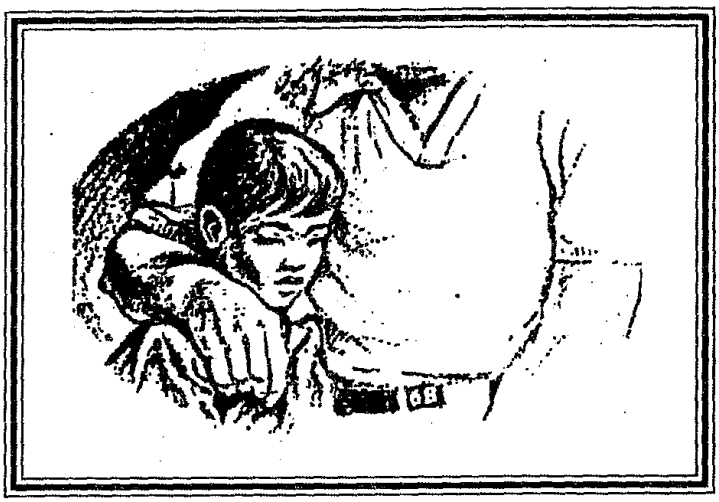
Card 2BM (for young and adult male): a boy turning his head to face a man who is tapping his right shoulder.

Card 2GF (for young and adult female): an older woman and a young girl facing each other.

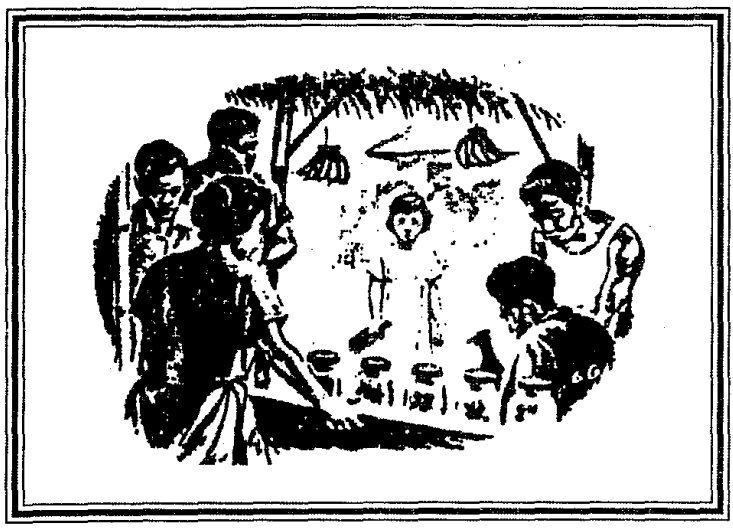
Card 3: a man clutching his middle. He is sitting in a downcast position on a pavement beside a post. In the background can be seen legs of people—men and women.

Card 4: a girl standing on top of a chair while reaching out for something on top of a cabinet. A man who is passing by glances at her.

Card 5: a distant solitary figure walking along a narrow country path.

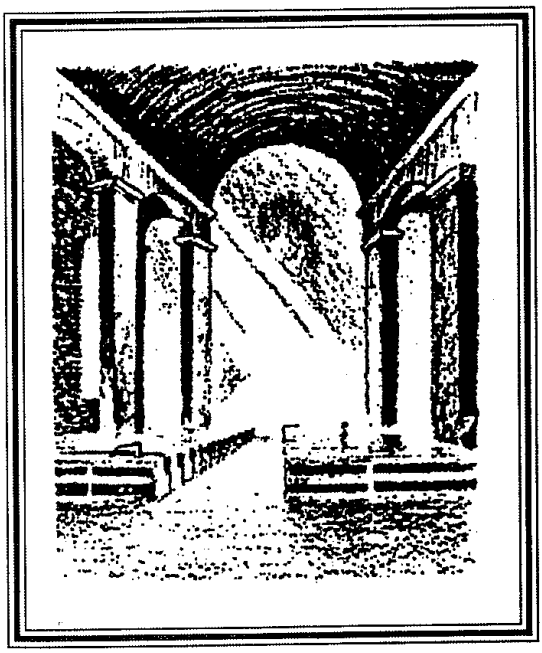


Card 6B (for young male): a man with his right arm placed around the shoulder of a young boy.

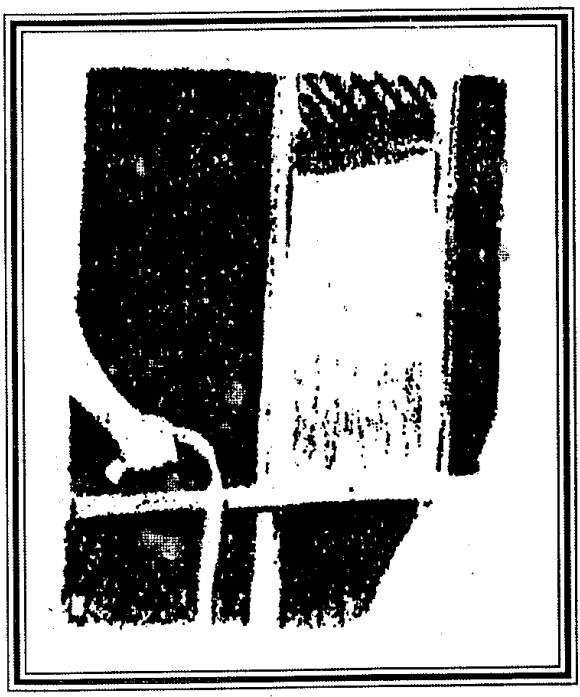


Card 6G (for young female): a little girl with bottle in her hand approaching a village store. A woman is tending the store while three men and a man with a rooster are milling around it.

Card 6FM (for adult female and male): a young woman in the foreground and two young men at the back looking at her.



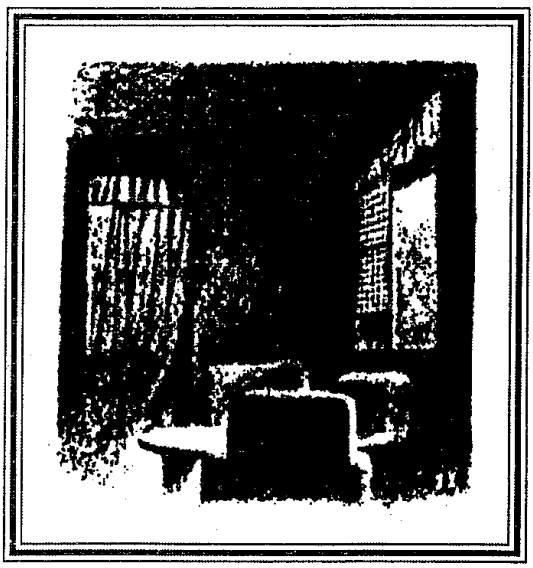
Card 7: the inside of a church-like hall with ambiguous figures in the pews.



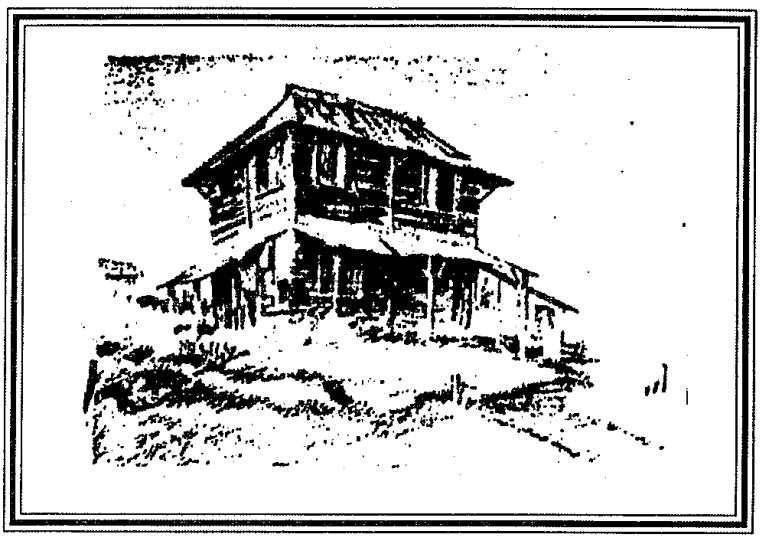
Card 8: a picture of a room with a single window. In the left foreground is a hand holding an object

Card 9: a man sitting with clasped hands on his knees. Nearby is a little girl looking at him.

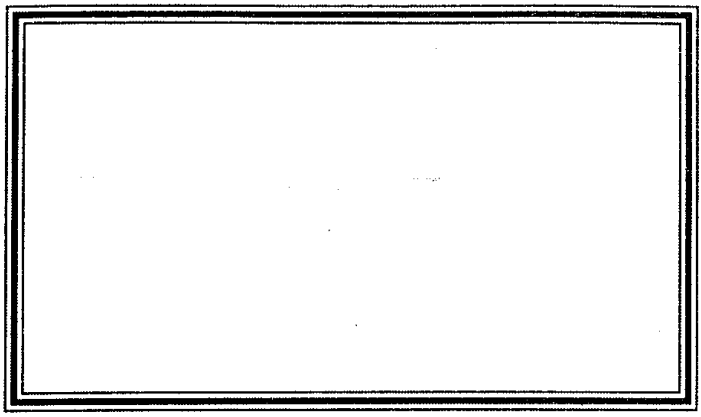
Card 10: an old woman sitting on a bench while holding a young child. Nearby is an old man holding out something in a bag to the child. Shadows of a man and a woman are seen at the background.



Card 11: a room with chairs, center table, a window and a curtain-covered doorway.

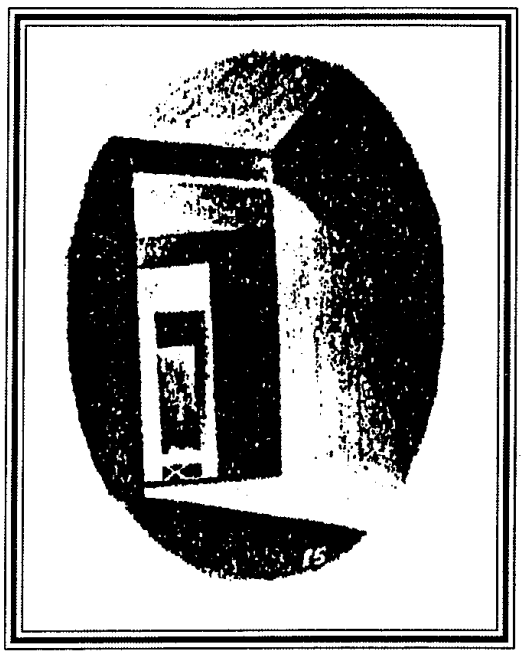


Card 12: a house commonly found in the rural areas with a pathway leading towards it. There are no human figures.

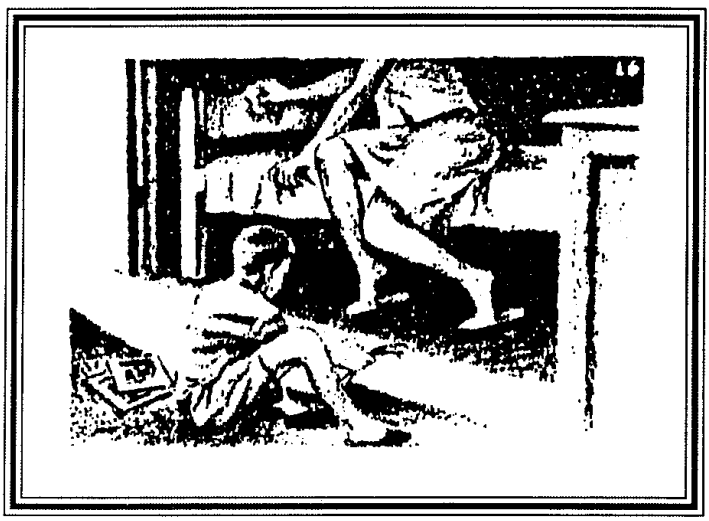


Card 13: a blank card.

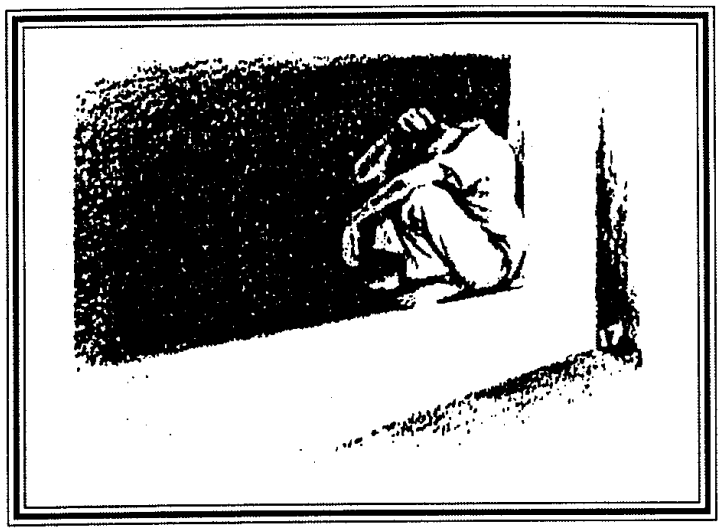
Card 14: a right hand, palm up, sticking out between an infant's pair of legs.



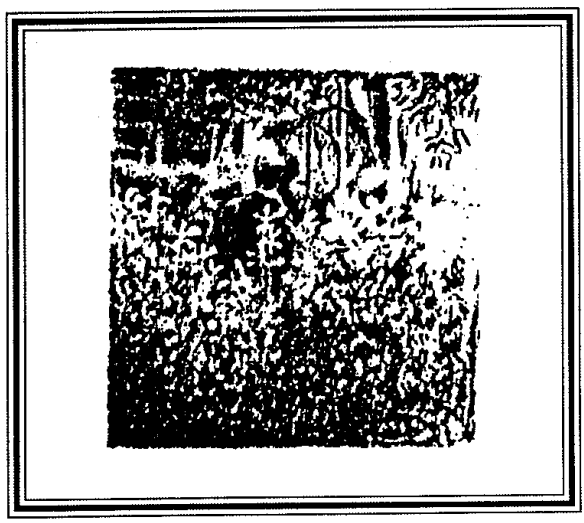
Card 15: a small figure lying in a cot framed by a doorway.



Card 16: a woman sitting on the edge of a bed apparently dusting it while a little boy nearby sitting on the floor, leafs through the pages of a reading material.



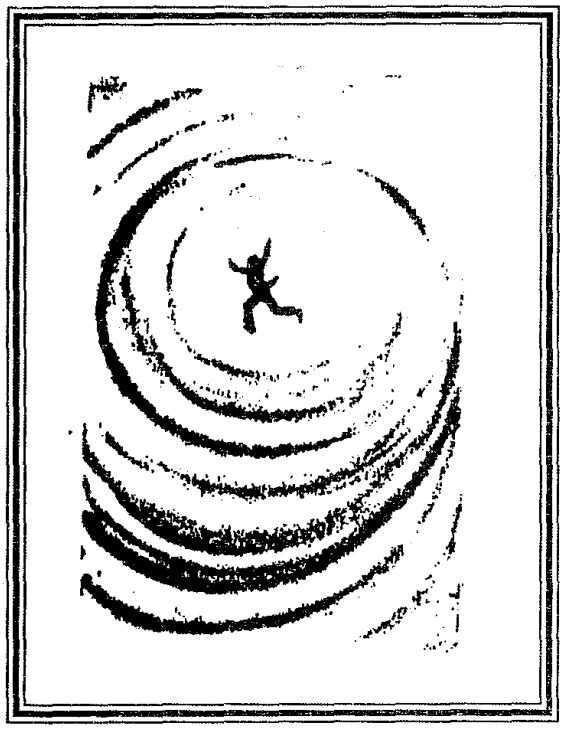
Card 17: a man with down-cast head covered by his right hand, sitting in a hunched position in a corner.



Card 18: shadowy figures of men (or women) in the bushes or garden.

Card 19: four figures, two men and two women sitting in a seemingly back to back position.

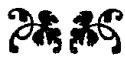
Card 20: a person's lower limbs sticking out of a hole in the ground.



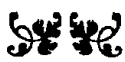
Card 21: a man suspended in mid-air with arms and legs outstretched. The rest of the picture shows graduated concentric circles at the end of which is the man.

Discipline, Culture and Information Systems

Computerization and Behavioral Technology in Government and Society[1]



Tackling the macro problems of government and society, Dr. Lagmay invokes principles of behavioral technology to deal with what he calls the "awesome diversity and depth of our problems". The development of a definitive and compelling information systems is also seen as critical in bringing about discipline. As a matter of policy, he urges the establishment of an information system involving the various disciplines as well as the Cabinet. The concern he voiced about social and behavioral problems in his earlier writings is echoed in this article. More importantly, he shows that the answer to the problem he posed is made available by social science.



DISCIPLINE, CULTURE AND INFORMATION SYSTEMS

COMPUTERIZATION AND BEHAVIORAL TECHNOLOGY IN GOVERNMENT AND SOCIETY[1]

OUR PROBLEM

The national crisis seems to have grown to unmanageable proportion: an entire culture is at bay.

We feel the need for some larger understanding of our situation. Is there another way of looking at the awesome diversity and depth of our problems? At graft and corruption in government? At control of crime and law enforcement, malfeasance in the judiciary, at tax collection and smuggling? At poverty? At environmental degradation and the breakdown in moral standards? Is there a broader conceptualization of the cultural processes in these problems that is both a definition of our situation and its solution?

There is a point made by Gunnar Myrdal about transitional, urbanizing societies, "soft states" he calls them, that have not as yet achieved firm institutional control over the softer, intimate relations of an older tradition. Some behavioral scientists call them "loose societies" as distinguished from "tight societies", where rules, regulations and the law are very much more developed as established norms of conduct. In tight societies, really highly-evolved urban complexes, the sanctions on social behavior are more visible, clearer and probably well internalized such that discipline is easier to enforce and maintain.

Why is the Filipino so much more disciplined and productive when working abroad? It is because the signals, cues and perceptual framework of membership in foreign communities are much clearer in showing him what will happen for what he does or plans to undertake? Maybe the environmental information systems, in some broad meaning of the term, is more definitive and relatively compelling in its operation.

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[1] Paper read during the Annual Scientific Meeting of the National Academy of Science and Technology at the Philippine International Convention Center on July 7, 1993.

There was a time, perhaps about half a century ago, when the information system of our society, including that of the government, may have been good enough. But the world burgeons and moves faster; the mobility and growth of populations accelerate at furious rates; human motivations ramify in all directions, destroying old values and personal boundaries. The resulting loss in social control reveals, in its enormity, a teem of problems that challenges our intelligence and our country.

THE PRINTED PAGE AND THE TELEPHONE

One of the most explosive in the evolution of information system was the invention of the printing press — the multiplication and distribution of information in quantity. Civilizations were built and developed from books, pamphlets, leaflets, magazines, newspapers, a phenomenon well described in MacLuhan's "The Gutenberg Galaxy." Alongside radio, television and the telephone, libraries, mass media, business and industry, bureaucracies, and educational and legal systems were spawned and shaped into the institutions that they are today.

THE MICRO-PROCESSOR AND MODERN TELECOMMUNICATIONS

The advent of the computer and modern telecommunications is creating a new revolution in information systems management that is changing the way people think and do things all over the world. It has become a race to the future. And our country will have engulfed into the vertex of the inescapable.

Micro-processors have become not only incredibly faster and much more capacious in the systematic collection, storage, and retrieval of information in large quantity but also in the analytical processing data. The possibilities of improving management and administration of complex situations is almost limitless and is now before us as a new option.

Indeed, there is no problem of choice here, because, as noted previously, this is but a question of now or later. Like the printed page, the telephone, radio and television, the computer will have soon become a part of our daily lives.

Business and industry here today, by force of necessity, have begun entry into the Information Age and are at the forefront of developments in this field. The computer is not everything there is in management, but it is now more than ever essential for staying competitive. The automatic teller machines of the banking system is a remarkable development in national networking of the computer.

Many government agencies and departments have chosen to computerize and are in various stages of development, all the way from

announcements in the newspapers of their intentions, purchases of stand-alone computers, plans and proposals for local or national networking of minicomputers and mainframes, or some combination of the foregoing. To name just a few being drawn into the tide of the new revolution in information systems: the Bureau of Internal Revenue, the Bureau of Customs, the Philippine National Bank, the Professional Regulations Commission, the Social Security Administration, the Government Service Insurance Systems, and the Bureau of Census and Statistics. The Armed Forces of the Philippines is going to build a national networking information systems for quick-response operations and administration. But still there are many government units, some of them revenue collection agencies, that are just limping into the circle, perhaps without any comprehension of their own possibilities with an effective information system.

Schools for computer training are sprouting all over, mostly in centers of population, the major towns and cities. Colleges and universities are now offering computer science degree courses, but the top-rate computer scientists of the country, most of them trained in the best institutions of higher learning abroad, are leaving the country or serving with the multinationals. This seems particularly true of our good programmers or software experts who are now engaged by corporations based in Japan, Switzerland, or the United States. Our country seems to have some fair level of readiness to enter into computerization. Still, we are just at the threshold.

THE LARGER ARENA OF INFORMATION SYSTEMS

It is easy to forget that the information system of computer-telecommunication language is but a part of the larger information systems that has been developing throughout all of history: from the alphabet and the spoken word, and all sorts of signal systems invented by man in order to communicate and establish forms of social control and governments, to its present stage exemplified by the printed page, radio, television, the telephone, and satellite transmission. One scientist regards information as equivalent to energy in the environment that causes human behavior.

Consider then those special arrangements in the external world that effectively evokes desirable behavior. Social scientists give special attention to the study of environmental contingencies of human responding, which is the special area of the psychologist, sociologist, anthropologist, the social engineers, and oftentimes, without our recognizing it, also the management experts, since indeed the problems we have are in the end problems of management.

The poets, philosophers and the humanities at large, as an important part of the knowledge pool, are engaged in the same task in some subtle and deeper sense of indirect management of information, but we will not consider this point for now. Instead we shall try our hand on some of the more recent developments in behavioral science that might have a bearing on our problem.

THE CYBERNETIC SYSTEM: QUICK AND RELEVANT FEEDBACK

The idea of monitoring is a special case of feedback to the observer of information existing in the field of observation. We monitor in order to determine what course of action to take. It is obvious that if the information feedback is fragmentary or too much delayed in time, the information may have become irrelevant for useful action.

But monitoring also has other special effects. Awareness that human behavior is being monitored functions as a corrective or guide: its presence makes for an element of social control, which was an important feature of the traditional, small community which have all but disappeared in the maze of urbanizing societies.

Furthermore, feedback is probably the very essence of supervision and management.

More importantly, however, feedback for actions taken has been demonstrated to effect immediate reinforcement of behavior. It does not matter whether the feedback is aversive or gratifying; its impact on behavior is lasting and immediately understandable.

THE UNPREDICTABLE SCHEDULE

One of the more recent developments in experimental work on behavior that has broad possibilities of application in social control is that of the variable or unpredictable schedule of sanctions for undesirable or desirable behavior. Some units of our government have already started utilizing unpredictable schedules—spot checks they are called during the anti-smoke belching campaign in the streets. The Bureau of Internal Revenue uses the random check for its tax reviews. Done systematically, the unpredictable or variable schedule of contact between the individual and the agency enforcing the schedule has been demonstrated to exert a very powerful effect on the individual's behavior.

Quite apart from the foregoing observations, the unpredictable schedule permits of an unusual economy in personnel, effort, time and equipment, and particularly in the spatial and temporal deployment of encounters which can be programmed in diverse ways. Since no one

knows who will be next in the encounter, the effect on the group would be quite pronounced. The situation now develops a form of discipline where paying attention to the requirements of the schedule and the law, and deciding carefully as to possible consequences, becomes important in maintaining clarity of perception and action because the choices are better defined.

INSTRUCTIONS, SIGNS AND APPROPRIATELY-DESIGNED ENVIRONMENTAL MARKERS

When instructions are clear and easily understood (in the streets, in buildings and offices, in the classroom, and wheresoever), people generally pay more careful attention to and follow what is indicated by the instructions. This is true only, however, if the consequences of following or not following are significant or important to the individual. These consequences are called sanctions, and should always be provided for even if only intermittently. The intermittent sanctions maintain disciplinary control and may be completely benign in character, such as a mild or stern reminder here and there by one in authority, or very severe as in a court indictment that leads to a corresponding penalty. There are levels of sanction in between these two extremes before disciplinary internalization matures naturally into a sense of social order. It should be noted here that the technology of intermittent sanctions is an area of research that invites serious consideration, since its findings are directly applicable to many of our problems.

To repeat the same points indicated above, there should be a systematic study of our public markers and posters, or, more generally, of all instructional signals in the environment, such as those in offices, streets, public places, buildings, and so on, the enforcement of which could be monitored at the local level. The environment would be less confusing thereby because reminders and directives in effect would be all over the place and the public would have some clearer idea of orderly compliance with whatever rules and regulations are expected to be observed. It is necessary in principle to begin with external supports to disciplined behavior in order to approximate and gradually establish conditions of public shame and individual conscience.

THE EXTERNALIZATION OF DISCIPLINE

Practically, all values formed in the earlier years of the individual through the external social environment and only very gradually are these external elements of control faded out. By then, we say that the values have been internalized and have acquired a functional autonomy of its own. Whether the values of the small community, the family and

the kinship system will transfer to and survive under the new conditions of urban life may be debated and discussed. The evidence, however, which can be seen all around us, allows us to conclude that these values have been eroded and have even become a difficulty under the pressure of conditions very different from those of traditional, soft cultures. This is especially true of discipline as a value.

THE QUICK-RESPONSE SYSTEM; SHARPER CONTINGENCIES OF MANAGEMENT

Many courses of action require information based on what is currently happening in the various fields of government operation. All monitoring and supervisory functions consider this kind of information as desirable: not only that the information be adequate and accurate but also that it must be contemporaneous. Any delay in its transmission may render the information useless or considerably lessened in value. Contemporaneity of the information is the essence of computerization and telecommunications, but that is not all of this point. Continuity of feedback in time on all actions taken allows a larger panorama of the field of operation and structure of solutions become more obvious.

The way we think out our problems would have undergone a radical alteration because the information technology actually has the potential to alter possibilities of human responding to situations. In other words, contingencies of management become sharper and clearer as to results, and thus indicate where to put human intelligence to optimal use. The current revolution in corporate management, wherein institutional structures and information systems are being re-engineered to respond directly and quickly to consumer or client requirements, is one of the most important examples that show the power of a quick response system due to the new information systems technology.

REDUNDANCY IN DISTRIBUTED INFORMATION

A noted professor once observed that the ultimate protection against any dictatorial control is the free and widest possible distribution of knowledge and information of every kind to the people. This says good deal about transparency in social and management processes. It makes a statement on the preservation of the general social contract which binds society together as a polity, which is the fundamental rationale of all governments and organized society. Independent sources of information or redundancy in the information pool, is one of the most remarkable possibilities that the new information technology may create for us, because, in some sense, it restores important features of social control in traditional societies.

WHO CHECKS THE CHECKERS?: SUPERVISION OF THE SUPERVISORS.

An important problem in current day Philippine public administration is the question of monitoring the monitors. Another problem with similar characteristics is: how do we enforce the law on the law enforcers themselves? These problems may partly reduce themselves fundamentally to (1) the creation of informational structures that automatically make all transactions and processes more visible and accessible to more people on a continuous basis, and (2) cross-linking the organization or institution with an independent, outside element on a research basis. The possibility of the first suggestion (1) perhaps has a matching tool in the new information system technology, while (2) deserves special attention because of the highly compartmentalized nature of the bureaucracy: they have confining boundaries that are jealousy guarded from being tampered with for reasons of self-interest. Setting up a research arm to study the bureaucracy will be met with vigorous resistance, because the subculture they have set up for themselves will be directly threatened. However, more liberal attitudes now are in the air: higher administration apparently is interested in coordination and cooperation between departments, with NGOs and colleges and universities. While a general statement of government policy of putting an independent research are within a department or unit may not be necessary, this provision for an effective countercheck or audit should be considered.

The problem will certainly be encountered in the course of decentralization of government. The devolution of authority in favor of local governments will meet with similar problems such that it would be necessary to develop an adequately networked system of information technology before more resistance to innovation sets in. The wide spread in territorial distance of administration will force networking for the Department of Interior and Local Governments in the end anyway.

THE "FEAR OF BEING CAUGHT" VS. "GETTING AWAY WITH IT"

In one of the more serious articles published during the recent debates on the proposed bill on the death penalty for heinous crimes, evidence was adduced to the effect that the death penalty most likely would be ineffective as a deterrent because of a flawed system law enforcement and administration of justice. The criminal in effect gets away with it. It was argued that the "fear of being caught" is the significant element of deterrence for the criminal. It is difficult to

disagree with this point view. But what is this "fear of being caught" essentially?

For all practical purposes, it would be quite impossible to keep track of every violator or potential violator of the law. But sampling out a small subset of these violators and meting out the just penalties immediately makes a public statement that should instill a greater respect for the law. The two necessary and sufficient conditions for striking "fear of being caught" are (1) the identification and apprehension of actual violators, and (2) the definitive imposition of penalties on the guilty, preferably made known to the public, even if those caught are few in number. People will learn that as soon as there is contact between him and the law, the inescapable consequence for the violator would be too costly, or, at least, very highly inconvenient. The conceptualization of "fear of being caught" utilizes generalization effects of the actual catch.

Furthermore, conditions of greater transparency created by an adequately programmed information system would considerably reduce the temptation to violations.

NEW PERSPECTIVES, CHANGE AND RESISTANCE

Old habits have an inertia all their own; change in perspective may perceived as a real danger to lives enculturated into an older information system that have been outdated by the complexities of modern life. Problems multiply and ramify in neverending complications, and we solve them the same way people before our own time solve theirs. Computerization and networking certainly will change the way we think and act, even our roles and perhaps our image of ourselves. This is a very difficult subject matter, but it is only fitting to suggest the magnitude of the task before us.

As noted previously, resistance may take explicit forms in such excuses as that the new technology would be very expensive affair and that there are other priorities for our scarce resources. The point is that the development of a new information system for the governments is a priority.

The world is moving inexorably into the global information system in the first place. But more realistically, it could be a fundamental and basic solution to many of our problems of managing the government seen as an organic part of a changing society, problems will yield answers probably only if the new tools of technology are allowed to express the intelligence and creativity of our people. It is a key solution that has the widest possible effects, is versatile, and has the power to

telescope space, time and distance. It will definitely change our cultural ways and we should prepare for the prospects of this new reality very carefully.

The theory is that any form of development can be accelerated by entering into the Information Age right away and pulling the industrialization and agricultural phases along with it. The expensive outlay for establishing an information system on a national scale should more than pay for itself eventually in terms of a new discipline in government as well as productivity and effectiveness in administration.

OFFICIAL STATEMENT OF POLICY

Within the global framework, the nation bids fair to become part of the new revolution in information technology, of the Information Age. Business and industry in the country have moved into computerization and networking ahead of the others because they know it is the wave of the future, the better way to survive the global competition. The government is very much slower and has been fragmentary in its response. There are few bright spots, but they seem to be just reacting to situational problems of the moment without the conceptual equipment of a larger developmental program that should enable them to intellectually prepare for the compelling dialectics of historical forces that are already at the threshold knocking insistently at the door for recognition.

Clearly, the state itself must lead in framing an effective program of development for entry into the Information Age. A vigorous statement of policy declaring that the entire government has been formally launched into the Information Technology will place every department, bureau, unit, and agency of the government within a single framework, moving in synchrony and coordination with every part of the administrative machinery. State universities and colleges, the entire educational system will be tasked with the intellectual preparation of our most capital asset—our human resources. It will be necessary to study on a continuing basis the total human impact of our entry into the Information Age, as it is certain that there will be unique cultural problems of encounter with this revolution borne of the microchip.

COMMISSION ON INFORMATION SYSTEMS POLICY

It would be necessary to have an independent commission on Information Systems Policy under the Office of the President of the

Republic the objectives of which are to study, research on, and formulate policies relating to a balanced scientific and humanistic development of our culture as it enters the Information Age. The Commission shall have an administrative working personnel and its members shall receive appropriate emoluments and expense privileges for work rendered. A broad spread of the disciplines shall compose the membership of the Commission, as follows:

anthropology	mass communications
sociology	literary arts
psychology	history
economics	performing arts
political science	physics
education	biology
linguistics	chemistry
law	mathematics
health sciences	philosophy

2 generalists as members at-large

JOINT EXECUTIVE LEGISLATIVE COMMISSION ON INFORMATION SYSTEMS AND TECHNOLOGY

For the implementation and execution of policy, this commission will create enabling legislation for entry and sustained development in information systems technology for the country, particularly in the bureaucracy itself. There will be programs in human resource development, national problems of ethical and security regulation that will require legislation, and above all, problems of the budget and the search for financial resources. The membership will be almost entirely on an ex officio basis, suggested as follows:

The President
Senate chairman on S & T
Director, National Computer Center
Director, U.P. Computer Center
Secretary General, NEDA
Director, Bureau of Census & Statistics
Commissioner of BIR
Commissioner of Customs
Secretary of DBM
Secretary of DILG
Secretary of Transportation and Telecommunications
Secretary of DOST
Secretary of DENR
Secretary of Agriculture
Secretary of DECS

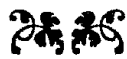
Secretary of Health
Secretary of Defense
Director of PNP
Secretary of Justice
President, University of the Philippines

This virtually is the cabinet of the President together with key legislators and some experts in computers and telecommunications.

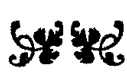
Planning and design for the entire government could be initiated without too much delay. Since projects of this kind take time. Even just to begin in some small way, it is essential to start early. Government must have the plan and the political will to develop its financial resources for the purpose: loans, transfers and allocation or priorities, grants, donations, taxation, for short-term, medium-term, and long-term parts of the project. There shall be an overall plan that sets standards, provides for development and growth, step by step, but leaving important choices to be made at lower level, every unit in the same general direction, integral to each other, coordinated and related but relatively independent and free.

SCIENCE AND SIDDHARTA

CONFLUENCE IN TWO DIFFERING WORLD VIEWS



Dr. Lagmay's background in philosophy shines through his integration of science and "serene life cultures" in this article which is published as a chapter in a book on the integration of science. He affirms that "the traditional dilemmas posed by pain and suffering and release therefrom, the meaning of life, and the spiritual quest remain in the historical legacy of the great religions, the humanities and many poets of modern philosophy itself." He then proceeds to show the unity of science with Eastern philosophy, specifically in the sphere of relaxation and meditation. He analyzes the work on EEG-Alpha and shows the reader how psychophysiological relaxation of the organism can be related to the study of serene cultures "since the techniques for quieting and relaxing the body-mind had been perfected in the East several thousand years ago." A perfect example of a "confluence between the modern scientific idiom and the writings of Patanjali and the discourses of Siddharta". Dr. Lagmay's quality of mind and love for the life of the mind is seen best in this article.



SCIENCE AND SIDDHARTA

CONFLUENCE IN TWO DIFFERING WORLD VIEWS

The problems and aims of classical philosophy, particularly those of the East, have really endured despite developments in science as a different way of defining knowledge and applying it to human problems. The traditional dilemmas posed by pain and suffering and release therefrom, the meaning of life, and the spiritual quest remain in the historical legacy of the great religions, the humanities and many parts of modern philosophy itself.

We are often reminded that modern philosophy, for having excessively engaged itself in analysis of language and abstract conceptual structures, has lost its basic moorings in what had been regarded as most important in the classical tradition, namely, those questions on the meaning and purpose of life and the cosmos, on appearance and ultimate reality, on good and evil, and on human pain and suffering. This criticism may not altogether be true, that philosophy has lost its moorings. There still is a massive legacy to us that has endured throughout all of history in the great religions, in the arts and literature, in philosophy and the humanities as a whole. And this legacy will continue to be the more important framework within which science will evolve and progress, as it has so done all along.

For there indeed has been a remarkable surge in recent times of wholeness and unity as perspectives in science and technology. The new physics and contemporary cosmology seem to be giving us some renewed feeling for the speculations of the pre-Socratic and Vedic philosophers, though perhaps from somewhat different premises. The environmentalists' concern for the planetary ecology has an almost nostalgic touch of the Oriental view of harmony in man and nature. All over the world there has been a large-scale revival of the ancient philosophical classics such as, to name a few, the teachings of the early Christian fathers, the Tao Teh Ching, the discourses of Siddhartha, the Upanishads, and the Zen classics. A noticeable proportion of the scientific community have referred to these writings in ever-increasing frequency. And the postwar rebirth of existentialism indicates in no unmistakable

terms the growing conviction of the primacy of experience and intuition and of the universal human problems of pain, anxiety, and suffering; the problems from which the Royal Society of London, the first and most prestigious academy of science in the world, almost effectively insulated itself when it was founded in the seventeenth century.

And now, with such equal force and pervasiveness as the foregoing observed phenomena, has been the development of studies on serene life cultures—meditative styles of life that have many points of accommodation in psychology and psychiatry, with education and the medical sciences in large measure. It has been said that one of the most significant advances in clinical psychology has been the concept of systematic desensitization to fear, anxiety, anger, and other tension-producing stimuli—a pivotal concept around which a minor revolution in our ideas of psychopathology and psychotherapy has been developing quite rapidly since about three decades ago. An important component of the concept of desensitization is psychophysiological relaxation of the organism, a component that has made the study of serene cultures very important to the scientific world, since the techniques for quieting and relaxing the body-mind had been perfected in the East several thousand years ago. The project of the late Dr. Yoshiharu Akishige and the pioneering work of Dr. Tomio Hirai on the study of Zen meditation are examples of a confluence between the modern scientific idiom and the writings of Patanjali and the discourses of Siddhartha.

More generally, old practices have been brought into the orbit of scientific paradigms, to new levels of understanding by methods and procedures of an essentially modern framework of enquiry. A fair question, therefore, would be: "Is this kind of accommodation necessarily a distortion or a misdirected understanding of the ancient teaching?" The philosophical framework of yoga Buddhist or Christian meditation may be presumed to be quite different from that of modern psychotherapy, and there is good reason to believe that this is true.[2] But one could also look at this in another way: that human understanding is really never complete at any stage or point in time. Traditional ways of thinking assume new forms or even new theological paradigms even as the human problems themselves remain constant. Such is the problem of pain and suffering and of early salvation—all very trite statements but as real today as when it was first formulated since no one knows anymore.

Allow me to describe in some detail, at some level appropriate for most of us educated laymen, what may be considered a spiritual journey in the broadest sense of that phrase, always mindful of something that keeps on making the rounds of my soul: "The question. . is not how to

escape the mind, or the body, or time, or the world, but rather how to find their right use and place."[3] For in what follows, I seek the right uses of the body and the mind through bodily and mental cultivation.

EEG-ALPHA AND THE PROBLEM OF STRESS-RELATED ILLNESS

Medicine has taught us that stress and tension have been implicated in various kinds of bodily and mental disorders, and that the proper remedy, among others, has always been to quiet the individual through rests in its various forms. But it was not until Jacobson[4] came out with his monograph *Progressive Relaxation* that a full-fledged scientific demonstration of how a wide range of organic and psychological disorders would yield positively to a relaxation technique—a technique which since then has become standard method for quieting physiological arousal and tension of the body. The method Jacobson used was that of relaxing the voluntary muscle system of the body, and, by doing this, he showed that there were profound concomitant changes in pulse rate, blood pressure, and the activity of the parasympathetic nervous system, the state of the vital organs, and a host of others. Unfortunately, Jacobson did not concern himself at that time with the measurement of brain wave potentials or the electroencephalogram, although this technique was already available then through the work of Berger.[5]

It was much later on that workers became interested in the relationship between "quiet physiological states" and the electroencephalogram, particularly on EEG-alpha waves (8-12 Hz) which in many studies had become associated with relaxation. "An abundance of alpha wave activity has classically been considered to represent states of rest (not sleep), relaxation and relief from attention and concentration. Conversely, lack of alpha wave activity and its replacement by beta and waves of faster frequencies (13 Hz and above) has been interpreted as indicating states of alertness, attention, orienting, and anxiety," says Brown.[6] The foregoing terms on faster frequency brain waves are usually associated with tension, stress, physiological arousal, responding to sudden or startling stimuli, and the like. Almost all of the symptomatology of the so-called fight-or-flight (emergency) responses, described by Cannon[7] belong to EEG-beta. When alpha disappears (alpha blocking), as in visual or auditory-orienting responses, or in tension and anxiety, or when the individual is focused on something, as in problem-solving or visual pursuit tracking, beta waves appear on the record. Very early enough, "Berger, Lord Adrian, and later Grey Walter. . . found that alpha disappeared if the subject engaged in mental activity requiring considerable attention. . . . By 1935 alpha was known to be importantly

related to relief from both visual activity and attention. The situation remains nearly the same today. In the thirty-odd years that have passed, alpha activity has been inspected, counted, dissected, suppressed and distorted in a hundred ways, yet the average brain researcher is unsure whether alpha is associated with mental effort or relief from mental effort," Brown further states. [8]

More recently, however, since some two decades ago, developments in the personal control of muscle relaxation and of the production of EEG-alpha through biofeedback methods, relaxation states have been thrown into greater prominence. The growing literature arising from biofeedback research has shown very clearly and conclusively the significance of stress and anxiety on the one hand and of relaxation and quiet life styles, on the other, in relation to disease and health, respectively. Stroebel and Glueck[9] quote from Shapiro, one of America's leading biofeedback scientists, ". . . the vast majority of ills and the illness-onset situation itself are clearly not beyond subjective control. These cannot be the private domain of the doctor-scientist but are a matter of the responsibility of each individual. . . . (Indeed) modern man may require personal demonstration through a structured period of self-learning to incorporate the concept of individual responsibility into his daily life-style in times of both health and illness. This learning may best be accomplished at an early age, with the teaching, for example, of the four R's in the second grade: reading, 'riting, 'rithmetic, and *relaxation.*"

ATTENTION CONTROL OF OCCIPITAL EEG-ALPHA ACTIVITY

Dewan[10] and Nideffer[11] review the subject of focal and non-focal attention in the production of alpha, parts of which are pertinent to this paper.

Berger[12] found in 1930 that alpha waves were blocked when subjects saw patterned visual stimuli. Many investigators thereafter, however, maintained that alpha was produced when there was no visual stimuli. Short and Walter[13] summarize this situation by suggesting that alpha is a non-focal attentive state that would be blocked by attention to either real or imagined visual stimuli. Others have in fact found that, more generally, focal attentive states may be auditory, tactile, or visual and may inhibit alpha waves. [14] It was also found, however, that the relationship between attention to stimuli may not be as invariable as previously supposed. Mundy-Castle,[15] for example, found that there was not exactly a one-to-one correspondence between alpha and attention or visual activity. Furthermore, Dewan[16] found that, in some cases, there could be considerable mental

activity and attention, and there would be no alpha blocking. This last finding is important because it is a counter example against the classical position on alpha blocking.

THE OCULO-MOTOR HYPOTHESIS ON ALPHA BLOCKING

As early as 1935, Durup and Fessard[17] tried to explain alpha blocking in terms of ocular accommodation (bulging or flattening of the lens of the eye by the ciliary muscles) in order to focus the eyes for greater clarity of vision. Later, Mulholland[18] elaborated on this hypothesis by stating that there is occipital alpha blocking in connection with (1) minimization of the angle between the visual target and the fovea, (2) minimization of target blur, and (3) control of the pupils of the eyes to optimize the level of stimulus input.

The following studies support the hypothesis as developed by Mulholland:

(a) Mulholland[19] found that alpha will be produced by a subject tilting his eyes upward. Alpha could be produced so skillfully that the subject is able to send messages to a computer by the simple expedient of getting dots and dashes of the Morse code electrically translated for long-and short-interval tilts of the eyes upwards.
(b) Fenwick and Walker[20] also found that there is alpha production by a corresponding tilt upward of the eyes, but this was not true for all subjects. However, it was suggested by Dewan that when alpha actually does occur during the eye-tilt upwards, there was a defocus of the eyes and a relaxation of ocular convergence.
(c) Mulholland[21] studied alpha production under three conditions: (1) subject focuses on, and tracks, a moving stimulus; (2) subject blurs the stimulus and continues tracking it; (3) subject blurs the image and refrains from tracking. Alpha production was greatest in the third condition and was least in the first
(d) In a study by Peper,[22] subjects were unable to prevent blocking of alpha in visual tracking.

In summary, investigations therefore seem to suggest that eye movement, accommodation and convergence are associated with alpha blocking, although this is not always the case. These exceptions will require a separate analysis elsewhere, but we should note it here for our purposes. Likewise, while focusing one's eyes disrupts alpha, and appears to be almost always true in every case, the "almost" part of this statement makes it consistent with the first argument of this paragraph. Indeed, Kamiya[23] found that one of his subjects was able to develop alpha production without tilting the eyes upward, where the entire experiment

was ostensibly aimed at the production of alpha by the upward tilt of the eyes. For all these, Mulholland[24] hypothesizes that the relationship between alpha and attention is only a secondary effect of eye movements, which are associated with generalized attentional responses called "orienting reflex. " And finally Oswald[25] reported that intense auditory (not visual) alertness could be maintained while producing alpha so long as there was loss of ocular fixation and accommodation.

NON-LABORATORY AND QUASI-LABORATORY EXAMPLES OF ALPHA PRODUCTION WHERE THE OCULO-MOTOR HYPOTHESIS MAY BE INVOLVED

Extensive studies have been made of Zen Buddhist monks in meditation and have found high alpha production in such meditative states. [26] Akishige and his students have demonstrated that high alpha production can be obtained from experienced mediators under conditions of problem-solving, such as those of arithmetic, where there would ordinarily be the expected alpha blocking. The state of alpha quiet however was the result of specialized training stretching usually a number of years. My own question is: "Is there a shorter method suitable for everyday life, as one moves about in work, that can generate perhaps not too high-amplitude alpha but of such strength as to be a significant departure from EEG-beta state?" Zen meditation in all likelihood helps to defocus the oculomotor apparatus, and one should hope that a direct check on this may be made sometime in the future.

Nideffer [27] cites a personal communication from a certain Pappas in 1972 which claims that the latter was able to teach speedreading, electrical assembly, pipefitting, taping, and carpet buying to students under alpha state.

More recently, Fritz and Fehmi[28] have developed a method which they claim to produce consistently high alpha by passive attention to "space" (space between the fingers, space several inches around the entire body, space between the two ears, space around the forearms, and so on). He in fact has standardized this method as therapeutic strategy for the relief of anxiety, tension, pain, and a number of psychological disorders. One is reminded, in turn, of the original Jacobson technique of progressive relaxation mentioned earlier, where one pays attention successively to muscle groups of the body (not "space" as in that of Fritz and Fehmi). Harrell and Coles[29] in fact did a laboratory check of this phenomenon and concluded that the sustaining of attention is one of the components of progressive relaxation. I have a strong

presumption, held for almost two decades by this time, that when one pays attention to one's body in the aforementioned manner, there is bound to be a defocalization of the body.

Nideffer and Sharpe[30] in fact developed a method for a life-style based on either a narrow focus or a broad focus in the management of one's visual apparatus. A broad-focus visual style has a larger visual field (edge-to-edge), as opposed to a narrow one, where the visual field is narrower and restricted to clear, fovea vision, as in reading, arithmetic problem-solving, and visual pursuit tracking. Nideffer has elevated this kind of attention control training into a therapeutic modality as well as into a life-style that optimizes functioning for both physiological and psychological health.

The foregoing kind of defocusing in all probability has been going on for thousands of years up to the present time in meditative cultures—among the Hindus and Buddhists and similar traditions. Herman Hesse,[31] the novelist, is mentioned in Pennington,[32] as having called our attention to an old game among the gypsies of Europe which, by systematic exercise, develops the broad, defocused type of visual attention. Likewise, Carlos Castañeda[33] of Don Juan, the master of his story, as delineating a procedure as follows: "...walking for long stretches without focusing the eyes on anything directly but slightly crossing the eyes, to keep a peripheral view of everything that presented itself to the eyes. He had insisted, although I had not understood at that time, that if one *kept one's* unfocused eyes at a point just above the horizon *(tilted eyes of Mulhollând?)* it was possible to notice, at once, everything in almost 1 80-degree range in front of one's eyes. He had assured me that exercise was the only way of shutting off the internal dialogue" *(internal dialogue that produces "the tangled knots of thought").*

In 1976, when I attended a brief workshop seminar with a Zen master named Oshida, I was instructed that the sensation of seeing the visual field should be one of looking as though there was a nearer object that is not there, while the gaze is farther away. Of course, I noticed that there was an automatic defocusing of the eyes and enlarging of the field of vision. According to him this points to the meditative way with eyes open.

There are apparently many ways of defocusing the oculomotor apparatus and thereby getting around to demobilizing the tension-bound state of the body. I recall quite clearly a passage from Krishnamurti, which of his works I no longer remember, of his experience of listening to silence, that is, not to sound but to silence as foreground to everything. Paying attention to silence is a difficult thing at first, but one soon learns

to develop a selective attention to it, with any sound emanating from space around you as the background. Silence can either be background or foreground in the perceptual field of attention. Sound ordinarily, in everyday life, is foreground; only when there is absolutely no sound does silence seem prominent and comes to foreground of the perceptual field. This silence can be the foreground all the time as the center of one's attention, and the skill for this is attained with constant practice. The oculomotor apparatus defocuses, the visual field widens, and relaxation ensues. Alpha production goes up and the entire body defocuses.

The advantages of silence as a source for orienting one's attention are obvious:

1. Silence can be foreground or background; others can only be foreground, e. g. , paying attention to the rising and falling of the abdomen during breathing, or to a fixation point in space or imagined space, all of which can only be foreground.
2. Silence is continuous and always present, either as foreground or as background.
3. Silence is a non-agitating, "quiet" source which is absolutely compatible with the production of the alpha response.

Those of us who have experienced the alpha state of consciousness will easily see why silence, which enhances this state, could easily be put into the service of basically spiritually-oriented pursuits. The larger dimensions of life itself places a heavy responsibility on all of us to be peaceable, lucid, and kindly, something which the alpha state enhances even if it does not guarantee them necessarily. Whether in sitting meditation, or while actively in motion in the workaday world, one can learn the feel or the sense of deep quiet and tranquility that goes with the alpha state.

CONCLUDING REMARKS

I have taken recourse to describing a research area in science which, if regarded separately and without a real-life context to support it, may seem irrelevant to the problem of this conference. But the tremendous interest this type of study has spawned in psychology, medicine, and education may help us to understand why the topic is genuinely related to the alleviation of pain and suffering, and, I am convinced, to the cultivation of mind and body for spiritual ends.

In the EEG-alpha state, it is easier to be free of the tangles and tension of thought, easier to let go of objects, ideas, desires, and obsessions while retaining a lucidity of understanding of situations and

meanings. Postures of attack and defense are easily dissipated; and attitudes of greed, anger, hate, and aggression and all the fear and anxiety that go with them are dissolved because profound serenity is the polar opposite of all these. When one is deeply quiet, it is easier to be kindly and generous and forgiving. And true love is silent and also deeply quiet.

This is not to suggest in any way that kind of journey that the sage and the master undergo, from one level of consciousness to the highest stages of transcendental bliss. But I sometimes wonder whether the words of Siddhartha, that watching the breath constantly, continuously, and so gently as one may, as the only way to ultimate salvation, was not really meant for the ordinary man to discover what it means to be free of all those things that we grasp at and cling to and hold on to, while sitting with legs crossed in quiet meditation.

ACKNOWLEDGMENTS

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NOTES

[1] Y. Akishige (ed). *Psychological Studies of Zen*, vols. I & II, Bulletin of the Zen Institute of Komazawa University, No. 1, Tokyo, Japan.

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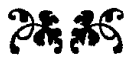
DEPTHS OF HUMAN UNDERSTANDING

SCIENCE IN SEARCH OF MEANING



This article reflects the author's encompassing and integrative perspective as a scientist with deep philosophical roots.

He expounds on the limitations of science and the harm that a science without value and meaning can do. But at the same time he makes us appreciate its power to illuminate and make life better for us; "while science is mother to many destructive, power oriented mindset that thrives on greed, unmindful of the value of life, it has also contributed to the well-being of man".

He bridges the gap and reveals the connection between modern science and the older formulations of philosophy and practice, such as, the repetitive monotone stimuli in prayer. He points out some ways that have been utilized, both in clinical practice and in contemplative disciplines, to gain access to the "deeper self" or "unconscious". These include cricket sounds in the night and the drone of surf waves in the seashore.

He establishes these connections and commonalities, and at the same time points to the differences-

"While Western Science is just starting to do its own scientific study of the subject matter, those of the east date way back to many thousand years of history".

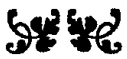
He says that the essential virtues of the ancient teachings was that they were borne directly from experience by people who were arduous in effort and delicately tuned to sacred pursuits. He emphasizes this point thus, *"Theirs is a way of life not the fragment of a job in the short term."*

He states that scientific methods have "ramified and proliferated from the central idea of experiment"... but it has also spawned powerful conceptual, abstract instruments for "explaining away" many important ancient ideas of the east... and in the process, trivializing these ideas in the attitude of "nothing more but..."

He goes on to suggest that if a scientist is willing to undergo the discipline of the contemplative, he will inevitably come to a different conceptualization of human problems.

Finally, he asserts that "to forge an understanding and respect between modern science and the ancient wisdom of experience, it would be necessary to be a scientist, humanist and philosopher all in one, as in the days long gone".

Those days are not "long gone"... because that is truly what Dr. Lagmay is ... a scientist, a humanist and philosopher all in one.



DEPTHS OF HUMAN UNDERSTANDING*

SCIENCE IN SEARCH OF MEANING

ABSTRACT

Developments in psychological sciences might throw some light on traditional beliefs and procedures, pointing to the generality of its principles, across a wide range of similar phenomena. Religious traditions employed these principles, certainly learned thru hard experience and discipline in the long evolution of man's search for depth and meaning in life, thru practices such as prayer repetition with its concomitant suggestibility effects in different levels of relaxation or trance states. The ability to enter at will into varying states consciousness is possible of attainment thru psychological methods borne of present day science, with an understanding conformable to levels of access to some deeper self; in either samatha to samadhi. The holographic hypothesis of Bohm and Pribram seems consistent, by drift and tenor; with the ancient experience and its metaphysical construction of man and nature. Attitudes of trivialization of ancient beliefs, such as the "explaining away of. . . " by scientific rationalization, or "it is nothing but..." in much the same way, are contrasted with attitudes of accommodation, of humility and respect for, a natural evolution in man's knowledge of himself and nature, each step of which is expressed in language appropriate to the science and culture of it time.

* Paper prepared for Session VI of Commitee IV on Science, Nature and the Sacred, of the International Congress on the Unity of the Sciences, held in Seoul, Korea, August 20-27, 1995.

Science, as a way of knowing, has given man some dominion over nature; it has unfolded new perspectives on the ancient problems of pain, sickness and suffering and offered him a growth of fresh ideas on the cosmological design. True, science has become mother to many tools of destruction and power-oriented mind sets that thrive on greed and, more often than not on an unmindfulness of the value of life and all creation that supports it. We should not however, gloss over the good that science and technology has contributed to the well-being of man and to the changing modes of understanding our environment and, indeed, even ourselves. We should be willing to consider how new frontiers of knowledge are ineluctably reframing older conceptions of man and nature.

Of course, traditional ways of doing and thinking are threatened and there is resistance. Nevertheless, there has been an accommodation of the new understandings by adaptation and necessary adjustment in method and interpretation of time and situation. The new physics, for instance, is now engaged in eastern philosophy, having entered into areas of thought that generally had been proscribed in scientific circles. Still there is now a growing feeling among not just a few scientists that this continuing dialectic of statement and resistance has been a healthy influence all around and has stimulated a renewed vigorous interest in the older formulations of philosophy and practice. We are, I believe, now much more aware of the limitations of science, even as we realize its power to illuminate, in its own special way, many problems that challenged our ancestors. In what follows, we offer a set of ideas, new and old, some from scientific work, some from an older stock, which may have some relevance to familiar articles of faith and practice.

REPETITIVE MONOTONE STIMULI IN PRAYER

Prayer repetition is an example in religious practice that, almost without exception, seems to be part of the sacred framework. Of course, not all prayer is repetitive, however; still, monotone repetition in varying forms strikes one as generally present in the mystical tradition. Christian ceremonial chant, sometimes with alternating response and reply between groups, may be regarded as repetitive monotone, particularly when it is rhythmic and the meter is short and simple. Then you have the mantra of Hindu contemplative disciplines, and many others of a non-aural character (tactile, visual, kinaesthetic-proprioceptive, or some combination of these).

Sometime in the middle of the last century, an English physician, James Braid, wrote a tract[1] on a phenomenon and procedure for which he coined the word hypnotism, a term which exists up to this day. Braid

found that by presenting a stimulus object to which a patient fixated his attention for some three minutes, he could get the patient to relax and enter into a hypnotic trance, deep enough for him to undertake painless surgery without anesthesia. In short, thru a repetitive or continuous presentation of an object which the subject paid attention to and by writing out his observations, Braid gave us the standard fixation technique in hypnosis thru which one could produce varying levels of relaxation/trance effects with the corresponding alterations in the consciousness of the subject. An interesting thing about this result is that the subject thereby becomes highly suggestible, or open to suggestions from without or within.

One notes at this point that the process of repetitive, monotone stimulation has analogous, perhaps even identical, characteristics to those prayer repetition in religious practice. One essential idea is that attention (awareness, mindfulness, and consciousness of) is sustained towards a stimulus source. The time course of the relaxation-suggestibility effect ensuing from the procedure is such that, depending on the history and personality structure of the subject, the onset of these effects occurs from a few minutes to as far as about an hour.

There are, however, other natural or man-produced monotone repetitive stimuli that have been variously utilized in clinical practice and in the contemplative disciplines: cricket sounds in the night; the drone of surf waves in the seashore and of waterfalls; rhythmic sounds, particularly of music, e. g. Ravels's Bolero; kinaesthetic-proprioceptive stimuli in the dance. In these examples, the subject often enters into an altered state of consciousness, and, if he goes deep enough, into a profound state of relaxation and eventual trance state, there is greater access to a "deeper self", the "unconscious" to use the language of analytical school.

The monotone stimulus method is not by any means the only way of producing profound relaxation and suggestibility. The scientific literature on relaxation and quieting methods leading to altered states of consciousness is quite extensive, and a few examples are offered here for our purposes: (1) sensory deprivation, work at McGill University and other laboratories, have shown relaxation effects and altered states of consciousness in subjects exposed to homogenous, uniform sensory fields;[2] (2) autogenic training, very much in favor with continental European psychiatrists as a therapeutic procedure, requires one to pay attention successively to different parts of the body with repeated suggestions that those parts are functioning in ways that describe a relaxation effect;[3,4] (3) meditation, in which one is mindful, aware, or paying attention to one's breathing, resulting in profound relaxation or trance.[5]

The materials on meditation and the contemplative experience are quite very well developed, and, while western science is just starting to do its own scientific study of the subject matter, those of the east date way back to many thousand years of history. [6]

OPEN, RECEPTIVE STATES IN VARIOUS LEVELS OF SAMATHA

High suggestibility in the deeply-relaxed individual indicates an open, receptive state which means release in varying degrees from limited, constricting mental states. For release from conditioned mental sets "de-automatization" is the term used by Deikman of the Langley-Porter Neuropsychiatric Institute of UC in San Francisco Medical School.[7] [7] The organization of human memory at deeper trance levels is considerably altered, a fact deliberately utilized in psychoanalytic work, particularly in conjunction with hypnosis wherein levels in depth trance (samatha) could be modulated at will. Insight, the therapeutic objective in analysis, is attained thru a systematic exploration of the unconscious in the samatha state.

The method of free association, in less formal situations, seems to be a process involved in much of creative of artistic and scientific work. [8] Aldous Huxley, the writer, for one, did some exploratory work of this type in deep trance under the supervision of Milton H. Erickon, perhaps one of the most original scientist-scholar on hypnotic phenomena[9]

The open, receptive state of mind has been well studied not only in the arts and the humanities but also in the healing professions.

Indeed, the paths to the deeper self has had a time-honored history all its own, in such as those of Patanjali, Sri Aurobindo, the discourses of Siddhartha, the Buddhist Abhidhamma-kosa and the Visudhimagga of Buddhagosa, the Tibetan Matramudra, and the Holy Bible of the Christians. The Philokalia on the works of the early Christian fathers details the methods and practices of a comtemplative discipline that was more in the spirit of the ancient eastern mystical tradition. The works of Meister Eckhart still is part of a long list that stretches across many ages, many lands. We also need to be reminded of the Gita, the Vedas and the Upanishads as constituting probably the oldest contemplative tradition that explored the territory with remarkable wisdom.

Along this line of ancient tradition, the late Krishnamurti must be considered one of the most enlightened adherents of an entire way of life that expressed itself from the depths of the inner self.

THE OBSERVING SELF: THE HIDDEN WITNESS

Experimental work at Stanford by Hilgard and his associates, has revealed that, under deep hypnosis, there is a personality in the subject reporting an experience of pain which he, under light trance, is not able to report. Hilgard calls this personality that is able to tell the truth in deeper trance state "the hidden observer. "[10] This experiment has been replicated subsequently in several other laboratories. [11, 12]

There is also an analogous description by Deikman[13] of an "observing self, " a little man in a little man, or ghost in the machine, that has the reflexive capability of being conscious of its own consciousness, of commenting, observing and directing himself, a deeper self perhaps much like Hilgard's hidden observer.

Murphy notes that a mysterious intelligence often comes into play during hypnotic suggestion, and, quoting Lewis Thomas, author of 'Lives of a Cell', "There has to be a person in charge, running, matters of meticulous detail beyond anyone's comprehension, a skilled engineer and manager, a chief executive officer...a cell biologist of world class. "[14]

Furthermore, Murphy observes. "This, perhaps, is the most fundamental insight we gain from hypnosis, this glimpse of a superior intelligence within us that can drastically alter our perceptions and thinking restore health functioning, and enhance our most basic capacities. [15] In sum, one who is aware of his being aware, an observer who does not lie, a witness who openly receives all information and integrates them with great skill and precision.

Who is this deeper self, so celebrated among the ancients and continuing to be the object of serious scientific research even up to this very day? Expressions probably referring to this being abound in sacred literature: "the elusive presence", "someone up there is telling me or guiding us", "my conscience tells me", "who is the who of 'Who am I?'", "what we are looking for is who is looking" (St. Francis of Assisi), "Who in the brain is interpreting the hologram?"

THE HOLOGRAM

Karl Pribram and David Bohm, neuroscientist and physicist, respectively, have proposed a holographic paradigm for describing the human psyche, for one, and the physical universe, on the other. A hologram is one where the structure that produces it contains information that can be found in every part of the structure. [16] A corresponding description by Bohm[17] of the physical universe is something similar to this—an ontological implicate and explicate (enfolded and unfolded) order which I think hearkens back to Spinoza in his concept of nature begetting and nature begotten.

The hologram seems to ring the sound of the monad of Leibniz, who proposed it in the seventeenth century as did Spinoza of his concept of nature. You could push the history of this idea for as far back as over two thousand years and one realizes that the concept is not new. And yet the hologram is really very new; Bohm's implicate order is derived from entirely different premises. The essential virtue of the ancient teachings was that they were borne directly from experience by people who were arduous in effort and delicately tuned to sacred pursuits. Theirs was a way of life, not the fragment of a job in the short term.

The hologram seems to have the possibilities of a speaker, organizer, synthesizer and processor at very highly integrative levels, since it has the most information and because of its structural framework. However, the full experiential potential of the holographic process would not be immediately available; access would only be thru special training for most of us, particularly those at deeper levels from the ordinary waking state. The monad of Leibniz, the holographic brain of Pribram, and implicate-explicate order of Bohm thus display for us an open field for speculative metaphysics that brings us tight at the doorsteps of sacred literature.

It is difficult to imagine how these historically existing achievements of human thought could be mutually inconsistent— they seem headed in the same direction. New procedures and conceptual tools evolve in science as we know it now and the science of the past had its own. The tasks of the ancients were very much better supported within an integral framework of an unabashed search for some meaning in life and solutions to the problem of pain and suffering, in the course of their perfection, at every step of the way, immediately visible as the filaments of incandescence of Edison as he labored over thousands of thousands of materials to find the right filament. The ancients were heavy on the experiential side of their inquiry, patient and unflagging in their search for the depths of the human psyche; they instinctively knew the problem lay there. The behavioral regimen they fashioned for reaching into the depths is now the subject of investigation by the methods and concepts of the hard sciences of the day.

SCIENCE AND THE INVARIANCES OF NATURE

The search for invariances or uniformities in nature has a spirit and equipment that are more adapted to and congruent with the modern temper. The scientific drive, as we know it today, has a flow and spread in the language and lifestyle of various cultures that are wide and deep, and probably irreversible. Formulations of processes in nature in one area of work that seem quite different from those of another field may

be seen in terms of common invariant processes. The periodic table and the law of universal gravitation are good examples. Such discrepancies in recognition between traditional views and those of the present are pervasive even in educated circles. In modern physics, for instance, our conception of the cosmos is very radically different from those of the past, if only for the fact that our understanding of physical processes and the methods of studying them have undergone many profound changes. In much the same way, with the advent of modern science, our comprehension of how the human mind functions, in terms of invariant processes, has been undergoing a significantly similar evolution.

In this paper, I have tried to describe with what might be regarded as irreverent, and, even possibly, superficial, broad strokes some of the more recent work in psychology and related areas of study, referring oftentimes to practices in the past and the present that seem relevant. Broad strokes, yes, with blurred boundaries and missing details, but better yet, maybe, would be not to lose the main ideas on the fine points. And a formulation however in terms of invariances (analogues, or similarities) has a many-sided freedom for exploring subject matter.

A conceptual link between samatha and insight, on the one hand, and relaxation-release-openness effects of attention to iterated stimuli, on the other, points to a commonality in natural processes that suggests quite clearly another perspective in the way we could look at religious, artistic and even scientific practice itself.

SOME HELPFUL ACCOMMODATIONS IN PERSPECTIVE

A professor once remarked that we do not really know very much, nor even appreciate, one remarkable mutation in the evolution of man and our planet earth until we understand science in the heart, and the heart of science is the experiment. Scientific methods have ramified and proliferated from the central idea of the experiment, oftentimes well beyond the comprehension of most of us. But it has spawned powerful conceptual, abstract instruments of thought for, unfortunately, "explaining away" many important ideas of the past. This has had the consequence of a trivialization of those ideas, or practices arising from the ideas, in the attitude of "nothing more but..." towards direct, practical experience.

If, on the other hand, by some good fortune, the scientist, or anyone at all, is willing to undergo the discipline of the contemplative, he will inevitably come to a somewhat different conceptualization of human problems. A necessary corrective to the cultural emphasis on control of

the external environment, in distinction of control of the inner self, seems to be in order. Whatever imbalances there are in our education, still, science is just an aspect of a protean problem: that of understanding life itself in depth.

To forge a larger circle of understanding and respect between modern science and the ancient wisdom of experience, it would be necessary to be a scientist, humanist and philosopher all in one, as in the days now long gone. And the field is vast and the journey far too long within so short a time. The only way, as Alexis Carroll once suggested, is to give up on the pleasures of ordinary men, because, I suppose it will take an unusual amount of time even just to sample the waters.

NOTES

[1] Braid, J. *Observation on Trance or Human Hibernation.* Edinburgh 1850.

[2] Zubek, J. P. *Sensory Deprivation: Fifteen Years of Research.* New York: Appleton-Century-Crofts, 1969.

[3] Schultz, J. and W. Luthe. *Autogenic Training.* View York/London: Grune and Stratton, 1959.

[4] Another important method is that of Elsa Gindler, who taught that attention to body parts, to breathing, posture and movement had a "calming effect" or some "sense of allowing" and "letting go".

This is cited in Murphy, M. *The Future of the Body: Explorations into the Further Evolution of Human Nature.* New York: Tarcher/Perigree, 1993.

I came upon this remarkable book after I had finished the initial draft of this paper. And now I must acknowledge that this monumental work has range and depth in presentation of scientific and traditional materials that has been useful to me in more ways than one.

[5] The most important classic on attention-to-breathing meditation is in the long *Discourses of the Buddha.*

[6] One of the most useful commentaries on the method of the Gautama Buddha is Budddhagosa's Visudhimagga (The Path of Purification) tr. by B. N. Nyanamoli.

Of more recent vintage would be *Psychological Studies on Zen* by Akishige, Y. (ed.) 2 vols. , Tokyo, Zen Institute of Komazawa University, 1970, and Murphy, M. and S. Donovan. *The Physical and Psychological Effects of Meditation.* Study of Exceptional Functioning, Esalen Institute, 1990, a monograph listing some 1, 300 studies from 1931 to 1990.

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[14] Murphy, M. op. cit., 348, quoting from Thomas, L. Warts. Human Nature, 1979, 2, 58-9.

[15] Murphy, M. loc. cit, 348.

[16] Wilbur, K. (ed.) *The Holographic Paradigm and Other Paradoxes.* Boulder, Shambala, 1982.

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