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Moorhead State College
*Collegiate Academy of Science*

# THE

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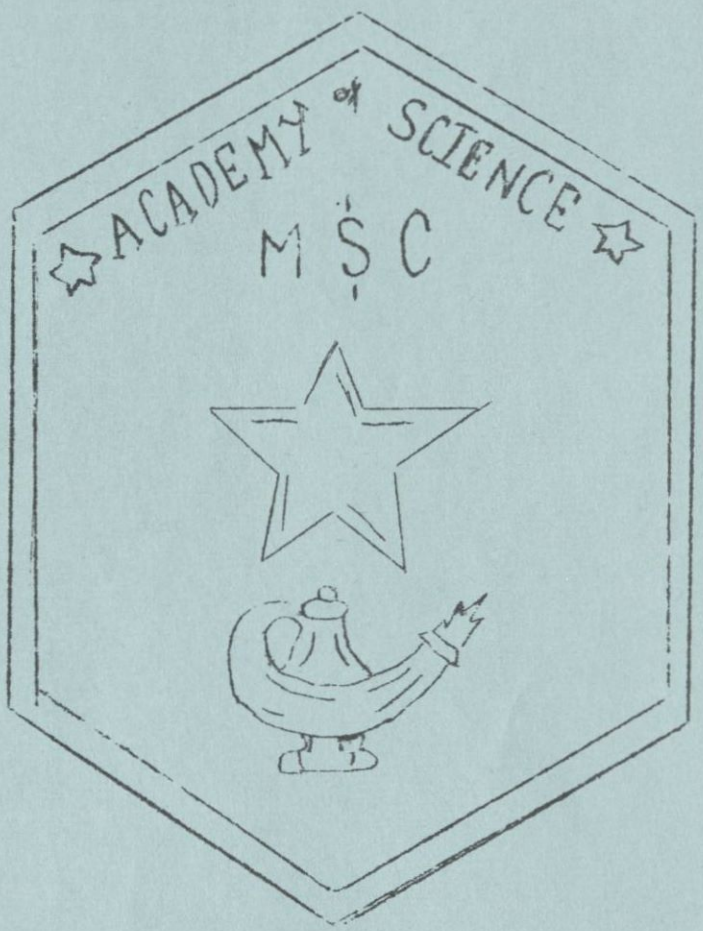


# HAGEN

MOORHEAD STATE COLLEGE
COLLEGIATE ACADEMY OF SCIENCE

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## EDITORIAL

It has been said that in order to have a full understanding of sociology, economics and the politics of democracy, a comprehension of the basic scientific principles upon which its industries are based is essential. That this is evident is shown in the demand for improved scientific education. Typical reactions occur from educators whose interest lie chiefly in the social sciences and humanities.

The significant inroads that science and technology have made on nature in the last two centuries have made the idea of a "general education" obsolete, thereby bringing about"forced specialization." This forced specialization is unique in that nothing can be done to alleviate it. The complexity of research is such that it is not uncommon to find a biologist or chemist working for years on a particular problem the solution of which may be one of great satisfaction to the scientist personally and to the scientific world. If, however, the problem and its solution are the only meaningful events in his life, then one may hasten to ask whether or not that life is an impoverished one. Perhaps it is true that men of such mentality have contributed most to the development of science.

What then is the fate of the "budding scientist"? Will he spend his life probing for a conceptual knowledge of the physical and biological world that is his home or will he spend such a life producing marvels of technology and destruction daily while producing simultaneous works of testimony and confession apologizing for his own fearful creations. If this is so, then today's great indispensible man can look forward only to being tomorrow's villan. Should he strive for a world similar to George Orwell's Nineteen Eighty Four, or a Utopia as presented by B. F. Skinner in Walden II, or will he strive for peace not through accumulation of force through science but the control of such force? The future has the answers to these questions. However, let us not forget the child that is born today, for indeed, he will have reached the age of 21 in nineteen eighty-four - the age of manhood.

Allan A. Brown

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## ACADEMY NEWS

by Evonne Arneson

The academy met November 4, 1963 with President Lowry Craig presiding. Donald Anderson, the chairman of the student advisory committee, presented the following members as advisors to the freshman science students: Donald Anderson, Evonne Arneson, Jim Benedict, Al Brown, George Cowman, Lowry Craig, Dave Horn, John Jenson, Helga Kvasager, Charles Landberg, Mike Lestina, Bill Lopez, Dave Mork, Bill Schill, Barry Tennenhouse, Doug Oss, Pat Watson, and Gloria West. These students should contact Don Anderson to obtain their list of freshman names.

Gloria West showed the Academy six (6) shield designs which she had drawn. No decision was made on the adoption of a design.

Bill Schill presented, to the Academy, a number of program ideas for the coming year. Most are still in the planning stage but prospects for "64" look good. Planned for the next meeting is a medical movie followed by a talk by a doctor. Bill reminded all members to suggest any ideas on programs to the committee. John Jensen was appointed to be a member of the program committee.

Al Brown, the editor of The Hagen, reported on the first edition of the paper. He stated that he needed many more members to help with the typing. Also all persons are requested to submitt articles for publication. Members who are able to type and wish to contribute to their paper, please contact Al.

Pat McCloud was elected chairman of a dance committee which will schedule and organize a dance to be sponsored by the Academy.

Dr. Noice reported on available funds for student research. He stated that any students who are interested in an area of research can contact any of the science faculty members who will be happy to help.

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## SNEAK PREVIEW

by Lowry Craig

Three new courses will be offered by our Science Department. They are Biochemistry by Dr. Meeks, Invertebrate Zoology by Mr. Collins, and Plant Morphology of Lower Forms by Dr. Tolbert.

It was thought that a sneak preview into the above courses might answer for the student such questions as: What is the course all about?, Do I really need it?, Will I find it beneficial toward my field of study?. The answers may prevent the student from finding himself in a course he does not want or require.

BIOCHEMISTRY: Biochem will be a two credit course offered both Winter and Spring quarter. There will be no lab. Organic Chemistry is the prerequisite.

Biochem deals with the chemical process which go on in the living organisms, ranging from viruses and bacteria to plants and animals. It can be broken down into four main groups:

1. Carbohydrates
2. Proteins
3. Fats and oils
4. Vitamins and hormones

The first part of the course introduces the student to classification, structure, formation and reactions of the carbohydrates, lipids, the proteins, nucleoproteins, and nucleic acids. The student is next introduced to enzymes, the catalysts, digestion and absorption, and blood from a biochemical point of view.

Now the student is supposedly in a position to study a much more contemporary type of biochem, the metabolic changes which carbohydrates, lipids, proteins, and minerals undergo in the body. Finally the vitamins are studied and under the heading Nutrition it is found out how carbohydrates, protein, and fat is in a normal diet.

Biochem is not recommended for pre-med students as they will sufficient instruction in medical school.

Next issue the "Sneak Preview" will cover Invertebrate Zoology and Plant Morphloogy of the Lower Forms.

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Anyone who isn't confused doesn't really understand the situation.

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## METHODS COURSES LAG

F. L. Campbell
(Biology-Student Teacher)

It is interesting to note that in the past few years there has been an increasing amount of pressure applied to alter the high school science curriculum. This altering of the curriculum should improve the background of the perspective college student.

In the sciences this trend has resulted in new courses and concepts which are now being effectively used in some high schools.

In biology these changes have been presented by the AIBS in the form of the BSCS high school materials. Three approaches to biology are offered to the student, ecological, cellular, and chemical. Each is excellent in its presentation of the material. Seventy per cent of the material is common to all three versions of BSCS, so basically they cover the same biology.

In physics the PSSC approach takes a fresh look at the method in which physics is presented to the high school student. Rather than employing rote memory, the concepts and materials are derived. This gives the student a clearer insight into the problems of physics.

In chemistry two approaches are offered. The first is the Chemical Studies approach which is presently favored over that of the Chemical Bond by high school and colleg professors alike. In eigher case, the approach requires a reasoning process rather than memory on the part of the student. This method increases the student's grasp of the abstract concepts of chemistry.

All of the new ideas toward presentation of the basic sciences have been developed to better qualify the high school student to meet the challenge of college or work. It is my hope that in the near future, this college will see fit to offer methods courses for the perspective teacher of BSCS, PSSC, or Chemical Studies. I feel that only then can the graduating teacher be qualified to present his science to the future high school student adequately.

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## DID YOU KNOW?

1. In the United States alone, 27.2 million pounds of asperin were consumed in 1962.
2. Highest recorded temperature in the United States was 134 degrees F. recorded at Death Valley, California, in July 10, 1913.
3. Beryllium has the greatest toxicity of any nonradioactive element known.
4. As a varnish dries, or cures, it undergoes two principal chemical changes, polymerization and combination of large molecules with the air's oxygen, both processes forming a continuous solid film coating.

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Dr. Willy Ley, first honorary member of the MSC Academy of Science has written an excellent article on rocketry in the Nov. 18, Mpls. Trib.

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## MYCOLOGY: AN AREA OF PLANT SCIENCE VERY IMPORTANT IN THE PATHOLOGY OF HUMAN AND ANIMAL DISEASES

by James L. Frisk

Bacteria and viruses are usually the common agents responsible for the majority of diseases of man, however, fungi also play a part in the ills of humans and animals. For many years, medical science has known that various fungi produce toxins which are directly responsible for causing many diseases, however, many diseases particularly those of the liver have escaped notice by physicians as being related to fungal toxins.

Fungi may be used medicinally in a variety of ways. A fungus metabolic product such as penicillin may be used in the treatment of infections; fungi may be important agents in the synthesis of valuable medicines, such as cortisone; or the entire fungus body, for example yeast cells, may themselves be used as a theraputic agent.

Fungi may be both beneficial and harmful as shown above. A specific example is the ergot fungus, Claviceps purpurea, which is the source of a very valuable medicine in obstetrics which induces uterine contractions, and also causes contractions of the blood capillaries, hence is useful in controlling hemorrage during childbirth. This same fungus was also responsible for a great many fatalities in areas where rye bread was extensively consumed, because prior to improvements in grain cleaning and milling processes, sclerotia were not separated from the kernals but instead milled with the rye, which the people later consumed. In one area in France 3000 persons died of gangrenous ergotism during an epidemic in 1777.

Historically, the first infectious agent of disease to be described was a fungus. Schoelein demonstrated, in 1839, that favus was a mycotic disease. Even though medical mycology had an early beginning, the field has relatively few workers, and there is a necessity for the mycologist to collaborate with the medical pathologist. Various diseases have been incorrectly diagnosed as TB, lung tumors, pneumonia, influenza, measles, smallpox, and polilmyelitis, however, the actual diseases were those of pulmonary cryptococcosis, coccidioidomycosis and histoplasmosis, all of which are ultimately related to fungal toxins.

Mycoses are often regarded as tropical diseases, but there have been a great number of cases in the temperate climates also. "Athletes foot" is a common fungal disease that infects great munbers of Americans every year.

In my opinion it is very necessary that there be further studies concerning the possibility that poisons derived from fungi may be toxic to man, for even though mycology has existed, as a science, prior to bacteriology, there is relatively little known of fungal toxins in the etiology of human and animal diseases.

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# ECOLOGICAL FACTORS AND SIGNIFICANCE OF DIFFERENT METABOLIC RATES OF FISH

by Richard Desens (Biology)

The many adaptions of an animal or plant will determine the ability of the species to maintain a significant population. I would like to discuss the following variables: temperature, habitat, size, and sex. The metabolism will be measured by oxygen usage per gm. wt. This is a standard measure when discussing ecology and metabolism. The use of various species of fish provided the information with which the variables will be discussed.

TEMPERATURE: Some fish are adapted to a large range of temperature change. The blue gill of this area is accustomed to temperatures varying from 30 C to 0 C. Some arctic fish, on the other hand, are accustomed to temperatures varying from -1.9 C to -1.7 C. Comparing the oxygen usage of the two fish, it is shown that at the same temperature the arctic species has a much higher rate of metabolism per gm. wt. This shows an adaption to cold temperatures. This is true for most fish of each ecological region. Exceptions to this will show lack of adaption. Species which are not adapted to an area usually have very few sub-species in that temperature zone.

HABITAT: Although most fish are either fresh water or marine, there are examples of fish which live in either or both habitats. The salmon lives in the ocean but spawns in fresh water. An Alaskan whitefish has two sub-species -one marine and the other fresh water. The fresh water sub-species has a lower rate of metabolism than the marine. This shows up in the form of a larger, fater fish. This is shown when all o other variables are held constant. We can say that the fresh water sub-species is better adapted to its habitat even though the increase in metabolism of the marine may be due to an external factor.

SIZE: The smaller fish generally have a higher oxygen usage in relation to biomass. The efficiency of the larger fish gives them an edge over smaller fish when food is scarce. However, it is not reasonable to say that we should have all big fish. Other important factors, such as food type and habitat, must enter the picture.

SEX: In fish, it has been noted that the female is usually larger than the male. Proof of age was measured by counting rings on the scales. The size was also considered by the amount of "fight" the males and females of a given species exibited. No noticable difference was found in this species. By checking metabolism a marked difference was found between males and females. The males had a higher rate of oxygen usage than the females. This accounted for the difference in size considering all other variables were constant.

At different times it was pointed out that higher metabolism was an advantageous adaption. It was also pointed out that it was an advantage to have a lower metabolism. This is not a contradiction. Each is an adaption of characteristic which makes it suitable for certain conditions. These conditions determine the advantage or lack of it.

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EDITION SPECIAL

PSYCHOLOGY: THE SCIENCE OR SCIOSOPHY?

Somewhere in most courses in psychology students are told that psychology is the science of human behavior. This professorial habit is so often repeated that one is alarmed if some bright student asks "Why is it a science" or "How did it become a science"? I wish the answer was as glib as the question but no academic field has more difficulty in explaining its legitimacy than psychology. There is some question about philosophy being our mother: our father is unknown, but we suspect physiology, mathematics, medicine, history, physics, education, sociology, and even chemistry. Only botany escapes our conjecture. Now that we know what psychology is (and this does not bother me, indeed I see real strength in relating, even promiscuously, to these pure and erudite homo multarum literati) I should like to explore with you where we have been and where we are going.

PSYCHOLOGY THE SCIENCE-THE PAST

Descartes challenged thinking men when he related mind and body in a system of interaction during the early 17th Century. But the discourse on the mind-body dichotomy is overshadowed, for psychologists, by his relentous physical investigations of the mechanisms which relate these systems. Psychology, the science, did not begin with Descartes any more than the world was formed in 4004 B.C. as Arch Bishop Ussher believed, but it does provide us with a significant change of methological procedures in the investigation of mind and body.

During the 18th and 19th Centuries there were no psychologists (some of my colleagues will include the 20th Century and I have a tendency to agree with them but my job is predicated on the belief that psychology exists so I'll temporarily forego an analysis of this belief in favor of economic survival). Many people studied human behavior but their education and interest was not primarily psychological. Sir Charles Bell (and later Magendie) experimented with the sensory-motor arc; Fechner, whose psycho-physical scaling technique of the mid 19th Century remains little changed today, was a physicist; Helmholtz, sometimes called the Father of psychology, was a physiologist; Spearman a mathematician and the great Freud a poor Venninese neurologist. All are likely candidates for parentage.

Less than 100 years ago Wilhelm Wundt, a German physiologist, established a laboratory at the University of Leipzig which concentrated on psychological studies. Three significant things happened at Leipzig: (1) Wundt employed rigid scientific methodology (2) he wrote more than anyone in the world about "psychology" and (3) he attracted students like sodium attracts oxygen. The resulting explosion proliferated scientifically trained psychologists and disseminated scientific psychological knowledge through Wundt's extensive writings.

In the early 20th Century departments of psychology were being established in America. Some of the first were Cornell, Penn State, Harvard, Duke, Chicago, Clark, Minnesota, Iowa, and Stanford. But Wundt's psychology did not mix well in America. Other influences were being felt. Pavlov, a physiologist, Freud, a neurologist, James a philosopher, and Thorndike, an educationalist were all

finding receptive students in the United States. The result was a house containing many giant children only vaguely related and each attempting to make his voice more audible than anyone elses. Some of the best ideas were not heard and others not understood. This disorganized household was fertile territory for the sciosophist--the psychologist's counterpart of the alchemist. These sciosophists, pseudo-scientists at best, promulgated myths about behavior in the name of psychology. The damage done to modern psychology is inestimable, but it was considerable. My science was declared a panacea. "Study psychology and become better adjusted" was one of the mentionable myths. (The obvious conclusion that professional psychologists are "better adjusted" has never been empirically validated.) Phrenology, dream interpretation, parapsychology, astrology, psychokinesis, counselors and even Ann Landers all masquarded under this guise of psychology. Some of these topics may have credibility but they have not generally been scientifically studied.

PSYCHOLOGY THE SCIENCE-PRESENT

Maybe John Watson's thesis of radical environmentalism, which was contemplated and then challenged with an antithesis, was responsible for reasonable men of science reexamining this new study. Perhaps the influential voice of Skinner pleading for a psychological language, or multiple authorship, or psychological meetings, should be credited with the entrance of psychology into the realm of science.

I notice my colleagues are now writing "The subject matter of psychology is exactly the same in kind as all other sciences; any differentiation among the sciences is merely a matter of convenience....The data of the psychologist are exactly the same kind as those of the physical scientist." (Spence, "Nature of Scientific Knowledge" unpublished paper) The controversial B. F. Skinner of Harvard writes in Daedalus (Summer 1961), "We are interested in the fact that by arranging certain consequences--that is, by making certain kinds of events contingent upon behavior--we achieve a high degree of experimental control. Our present understanding of the so-called 'contingencies of reinforcement' is undoubtedly incomplete, but it nevertheless permits us to construct new forms of behavior, to bring behavior under the control for long periods of time--and all of this often with surprising ease." Modern psychologists seem to agree that the fundamental aim of our science is to find lawful statements about human behavior.

I cannot leave you with the impression that all contemporary psychologists are unified in purpose or method. They are not. We have come a long way from the early nonsense and have eradicated many of the sciosophists. (Some claim we have been too successful--I don't think so). We have much more to do. In a recent study I analysed two widely used and highly respected tests of personal motivation. The Allport Vernon Lindzey "Study of Values" purports to measure motives in terms of the values; the other, the "Edwards Personal Preference Schedule," purports to assess human motives in terms of needs. Many statistically significant correlations were found between the two scales which tended to support the validity of the instruments, however, the most surprising result was that no relationships or even negative relationships were noted on some subscales of the tests which verbally purported to measure very similar personality dimensions. The validity of these two tests is questionable in my opinion, and yet they are both employed thousands of times in educational, counseling and clinical settings throughout the world.

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Even though some techniques of human assessment are questionable and the training of psychologists is not uniform, the contemporary psychologist, whether his speciality is clinical psychology, experimental psychology, education psychology, industrial psychology, by and large, is better trained, more knowledgeable, a better researcher and more productive than his counterpart of 50 years ago.

PSYCHOLOGY THE SCIENCE-FUTURE

Skinner mentioned it. Most sciences attempt to control their subject matter. The agronomist attempts to control the environmental conditions and cellular form in order to produce "better" varieties of botanical life, the chemist exercises control over elements in order to produce a desired compound, the physician may pharmaceutically alter the internal composition of his patient in an attempt to control disease. The psychologist structures situations which change behavioral patterns. As more empirical data of reinforcement contingencies is reported, control over human behavior will become more exact. The consequences of human control suggests a 1984 or Brave New World but the raw fact is that in the very near future--less than 50 years--techniques for the shaping and controling of human behavior will be so refined that the Orwell-Huxley fantasy will be as old-fashioned as Lum and Abner. But all of this sounds sinister--and indeed, if a diabolic monster could centralize the control of large masses of people, it would be. However, rigid centralization is unlikely if intelligent safeguards are maintained.

Psychologists will, I feel, be called upon to make decisions as important as the physicists of the Manhattan Project. I believe that behavioral control will be employed for the betterment of mankind. Psychotherapy, for example, may be significantly changed so psychotics and neurotics may learn new and more successful patterns of behavior in coping with environmental stress. Education will be radically changed. Patterns of reinforcement contingencies may be designed to correct, say, the poor speller or the slow reader or the frustrated mathematics student or better, prevent the inept student from developing.

We cannot accurately describe the reinforcement contingencies that helped develop a Fermi, or a Mendel, or a Freud, or a Plato, or a Hitler or a Genghis Khan, but they probably existed and sooner or later approximations of these schedules will be known. We shall never be able to duplicate a Fermi or a Mendel but certainly better means of helping people actualize their potentials will be developed.

Psychology will not be unified for a long time - probably never. Our home will always be filled with cantankerous sibs, each scratching out his own nitch in scientific history.

And I kind of like it that way.

Robert L. Solso
Department of Psychology