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MOORHEAD STATE COLLEGE
COLLEGIATE ACADEMY OF SCIENCE

THE HAGEN

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EDITORIAL

It is my opinion that certain segments of the school system in this country often serve to discourage creative thought in the individual except for in a few minds that would have been creative in any circumstance. Many artists, inventors, and brilliant scientists have come out of our schools, perhaps because liberalism inside the classroom paved the way for free thinking, perhaps because of inspiration outside the school. But what about the average student or the potentially bright student? How many come into and go through the school, reading the assigned reading, doing the assigned work, giving the assigned answers, getting the subject down pat, doing the expected extra work, going out, full of facts and a few tidy generalizations? Fine, good education but did they learn that the few facts they find in the classroom are just the beginnings of life, only the groundwork for creation and adventure? Do they learn that the greatest adventure is not in reading a book and answering the right questions, although this has its place, but in asking the wrong questions, the absurd ones, the different ones, the ones they can't begin to answer?. Do they teach a child how to develop his own answers? Formulate theories about the unknown? Experiment? Apply knowledge? To integrate what he learns into life? Do they bring reality into a classroom from life or do they squeeze the dry facts from uninspiring books? Our students must learn to look squarely at life, they need to ask questions. If you ask a question, you're more likely to remember the answer when you find it. Better than that, it may open up a new insight in the answering.

Maybe it isn't important that a man hunger for knowledge, the untried, the new adventure. Maybe we don't need that kind of man. Maybe the biologist takes the knowledge he has gained and goes out into a small corner of the massive research machine and experiments with what he finds there to make a tiny contribution to the grand whole. Good job. What then does a writer do? Does he just write like what he's read before? If he wants to sell his stuff, maybe, if he wants to create, he forgets he learned the rules. The schools give you the rules, but you can't be shackled by them. Directed by them, but not shackled. What about the scientist with his voluminous nomenclature and his exacting formulas? What about him? He, like the re t of the world who lives on rigid patterns, must forget some of the rules once in a while in order to breakthrough, a curiosity to try something new. And then he's got to know (who can teach him?) what to do with the new when he has found it.

Before it's lost.

Rosemary Medin

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MOLLUSKS

by John F. Schmitz

While eugenics and man's possible future are of utmost importance, let us not stray from those organisms that were undergoing evolutionary change millions of years before first man walked this planet.

One such phylum that exhibits unique and diverse changes is the Phylum Mollusca, which includes such familiar forms as clams, snails, oysters, squids and octopi.

The variety of mollusks, through their extensive fossil record, have led to many theories dealing with evolutionary trends within the phylum. One seemingly unsolvable problem, which has puzzled biologists for decades, is that of segmentation, which is very strongly exhibited in the annelids and arthropods. In 1952, a biological party unraveled the mystery with the finding of a previously unknown mollusk which did show signs of segmentation. Even with this tremendous discovery, there is speculation as to whether the segmentation is of secondary or primary origin.

With this in mind, let us look at some of the afore-mentioned organisms. The class Amphineura (the chitohs), which are considered to be the most primitive of the molluskan classes, is characterized by an anterior head and mouth, a posterior anus, and the visceral mass positioned between the two. The typical molluskan shell is reduced to eight transverse plates along a mid-dorsal line. The gills, which are the chitons' respirtatory organs, lie in a mantle groove between the ventral foot and the mantle proper.

The second group to be considered is the class Gastropoda (stomach foot). The class is characterized by a heavy foot or locomotor organ in a ventral position. The head is anterior, but the anus, gut, and respiratory organ vary in position, the class bing subdivided into subclasses according to the position of the gills in the organism. In the subclass Prosbranchia, the gills and anus are anterior, the members of this subclass having undergone an evolutionary phenomenon, "Torsion." Torsion represents a 180 degree rotation of the body axis affecting the visceral mass. The twisted body, then, is not a product of the spiraled shell. Results of torsion predicted that survivors adopt new excretory channels, respiration by means of one gill, and a shell spiraled to the opposite of the torsion for balance. The subclass Opisthobranchia, slugs, are little more than snails without shells. To this group, evolution has prescribed detorsion, which is simply the reversal of torsion. The third subclass, Pulmonata, has retained the anterior anus and gills affected by torsion, although some of the pulmonates have developed a lung coinciding with the invasion of a terrestrial environment. Many of the fresh water snails are lung bearing pulmonates that must return to the water surface for oxygen. Although most of this subclass respire by lungs, some have secondarily developed a projection which serves as a gill from the ventral foot.

The next major division of the mollusks is the class Pelecypoda (hatchet foot), which contains such forms as the clams, oysters, scallops, and the oft-hunted geoduck. The name hatchet foot is derived from the wedge-shaped foot or locomotory organ. To visualize the evolutionary development of this group, drape a folded sheet of newspaper over your fist. The mantle, which secretes the shell, is draped over the visceral mass, united dorsally

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but not ventrally, to form the body covering. The entire body is covered by the shell and the mantle. Respiration occurs by means of gills, water being provided by two siphons at the posterior end, one incurrent and one excurrent. Feeding is commonly by the same method as respiration. When the organism draws in water, plankton enters with the current and is trapped in a mucus secretion of the gills. This mucus strand is then passed to the mouth and into the gut for digestion.

The fourth group to be considered is the class Scaphopoda or tooth shells. Within this class there has occurred an elongation of the anterior-posterior body axis. The head and foot emerge from the anterior and both are commonly buried in the sand, the only portion exposed being a small aperture at the posterior extremity. This posterior aperture is the organism's only means of water circulation and waste removal. There are no gills or heart, and feeding is accomplished by movement of tentacles buried in the sand.

The last member of this phylum is the class Cephalopoda or head foot. Included in this group are the nautili, squids, and octipi. This group has become quite specialized for a swimming existence, and it contains the largest known invertebrates. The largest, the giant squid, attaining a length of thirty-five feet. A significant feature of evolutionary change is the dorsal-ventral elongation of the body axis, contrasted to that of the scaphopods which established themselves with an anterior-posterior elongation. The head, surrounded by a ring of tentacles, is represented in a ventral position. The head and siphon (locomotor organ of cephalopods) are equivalent to the foot of other mollusks. The visceral mass lies dorsal to the head encased within the mantle cavity. The shell is external in the nautilus; however it is enclosed in the sqids and octipi.

Respiration is by gills: a water current drawn in the mantle cavity circulates around the gills and then proceeds outwards through the siphon. When the animal is extremely excited, it can build up tremendous water pressure within the cavity and expell it through the siphon for a quick retreat from an enemy.

The circulatory system of the cephalopods forms an extensive system of vessels not previously seen in any of the other molluscan classes.

A highly unique characteristic of squids and octopi is the development of an advanced image-forming eye which is similar to the type of eye found in some vertebrates. Focusing occurs by moving the lens forward of backwards, whereas in most vertebrates focusing is accomplished by changing the shape of the lens.

In reviewing the characteristic features of this phylum, I have tried to generalize within each major subdivision, and have necessarily left out many other significant trends of evolution and adaptation. I have also tried to omit those features which demand explanations of the exceptions to the general rule.

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Though I may not believe in the Order of the Universe I love the sticky little leaves that open in the spring.

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A SHORT DISSERTATION ON SCIENCE AND THE MOVIES

by Harold E. Shuckhart

At the rather non-subtle proddings of your unrelenting editor I take typewriter in hand and put down the following.

As a good (if that's possible) scientist, I must first state my assumptions. I shall assume that all of you have seen at least one of the type of movie I discuss herein. I shall also assume that you remember at least the general plot of this type.

The type of movie I am talking about is the monster picture. For those of you who have difficulty placing movies in types, refer to this list: "The Frankenstein Monster," "The Curse of Frankenstein," "The Return of Frankenstein," "Son of Frankenstein," "The Bride of Frankenstein," "Frankenstein Meets Wolfmsn," ditto Draqula, and most other pictures of this ilk. Note: a possible exception could be "Frankenstein Meets Abbott and Costello." Aside: If the monster picture craze returns with the force it had a few years ago, we may be treated to the spectacle of "Pa Kettle Marries a Teenage Frankenstein Grandmother From Outer Space."

Nuff said. To the object of my writing in the first place. The general plot of any Frankenstein picture is as follows. The hero either discovers, or rediscovers, a process by which he can return life to dead bodies. The hero then assembles and activates, or finds a monster from the last picture,and reactivates, the monster. The monster is always at least six inches taller than anyone else in the picture, has shoulders four feet wide, battery clips sticking out of his temples, a steel rod sticking through his larynx; he always wears a hand-me-up coat which is a foot and a half too short in the arms, size 20 army shoes; his face looks like a seat belt commercial; he walks like his knee caps and elbows were in plaster casts, but you would too if your clothes were that tight.

Now the monster is controlled by the hero, but something goes wrong. The monster escapes and prowls the countryside. The monster then a) kills a peasant, b) kills a child, c) scares a beautiful young girl who might be engaged to the hero, d) any combination of a, b, and c, e) actually doesn't but is suspected of doing a and/or b probably by doing c.

The result of this is obvious. The simple townfolk of the village surrounding the mansion or castle of the hero form a screaming, torch-carrying, hate-filled, blood-thirsty mob and go out to comb the hills and swamps for the monster. Of course they find him. By now the hero has either been killed by the monster or is trying to save him from the mob. The mob chases the monster into a) an old castle or windmill, b) the hero's castle, or c) a swamp. The mob sets fire to whatever dwelling the monster is in, or the monster falls into quick-sand. The hero dies or nearly so. End. Note one important fact: you never see the monster die. The last thing you see of the monster is his hand disappearing under the water or his body sheathed in flames and covered by the falling rubble of the building but you do not see him die. He is still capable of coming back for the next picture.

There are those of you out of the few still reading who asr wondering what this has to do with common sense science, the kind of science you are used to getting. And I am coming to that.

I feel that the movie is a complex allegory, perhaps subconsciously placed

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there by the movie maker, and perhaps originally by Miss Shelly. In the allegory, the monster is a scientific idea which goes against the grain of common people. He is the product of an alien, completely incomprehensible science. He will force the common people to change their way of life if he is allowed to live. And so he must die. The creator of the idea is killed or disposed of and the knowledge which created the idea is muffled. But the monster, the idea, even though smothered, drowned, crushed, still lives. The mob and the motion picture audience go home confident that the monster is finished, but the monster and the idea can not be killed, can not be stifled. The monster comes back in the next picture, and the idea comes back in someone else's mind, stronger because it has withstood opposition.

Without opposition perhaps we would not be where we are today. The thoughts of the Greeks were hotly argued, but neither proven nor disproven by fact, and so the guesses of Galelio, Jenner, Copernicus were opposed, were fought. These men and others like them were forced to find facts to back up what they said. When they couldn't, sometimes years later someone else did. And their lucky guesses became foundation stones in modern science.

But modern science today is seldom opposed by the common people. Indeed, often there is little cross-field criticism, because of lack of understanding. The man on the frontiers of science today is so specialized that he has little time for keeping up with the field next door, let alone one in a different department. The biologists have no time to understand the physicists, the chemists are too busy to read about the biologists, and the physicists are forced to ignore the chemists in order to stay on top of the writings in their own area of specialization. I say this is wrong, but I am placed in the position of the destructive critic. I can point our wrongness but I can not see rightness. I can not find a solution. I welcome comments.

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DID YOU KNOW???

I. Dr. Alexis Carrel at the Rockfeller Institute kept a heart taken from a chick embryo beating and growing for twenty five years.

2. A new types of modern glass will transmit current, "spun" into fibre as fluffy as wool, hold molten metal and made into tubes so tough it can hammer like nails into wood.

3. Dr. Clifford N.Mills of Sioux Falls S.D. solved the age old circle problem which Archimedes proposed to his student Apollonius of Perga in 250 B.C. Even Rene Descartes failed to calculate this problem.

4 Safety pin was invented by Walter Hunt of New York City in I849. Within the short period of three hours he conceived the idea and sold his patent rights for $IOO.

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N O T I C E S

Future speakers at Academy meetings will include Mr. M. Plenert who will talk on " Wild Life of the Upper Mid West ", and Mr. Fred S. Cooper who will speak on " Antibiotics ".

Notices of Academy of Science meetings and programmes will be posted in Hagen Hall on the three new bulletin boards we have acquired.

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THE TWO CULTURES--A RECONCILIATION
by Doug Medin

"Krankheit ist wohl der
letzte Grund
Des ganzen schöpferdrangs
gewesen;
Erschaffend konnte ich genesen,
Erschaffend wurde ich gesund."[1]

C.P. Snow (1959) has contended that the gap between the "traditional and "scientific" cultures is artificial and treacherous. It seems to me not that the gap between the two cultures is artificial, but rather the conception of such a gap is artificial. Much of the difficulty lies in C.P. Snow's use of "scientific" and "traditional." "Traditional" is used broadly to mean the liberal arts culture while "scientific" is used rather narrowly to mean the physicist-engineer culture. Thus the breach becomes artificially created. By his use of "scientific," C.P. Snow ignores the science whose problems lie closest to the humanities: the social sciences, particularly psychology.

Sigmund Koch (1961) has written a significant paper on the role of psychology in the science-humanism antinomy. He writes, "Relative to the present divisive situation in the world of knowledge, psychology, then, might be seen as a third force. It could be seen as a third force whose ranks, when they arrive in no man's land in sufficient numbers, would fill up the gap separating the contenders and reveal all three forces for what they really are: detachments from the same army which had forgotten there was a common enemy."

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[1]Freud, S., Collected Papers, Vol. 4, New York: Basic Books, Inc., 1959, p. 42.

Schools such as Moorhead State College have tried to bring science and the humanities together by requiring courses in both areas. I suggest that mere contiguity alone does not constitute the necessary and sufficient conditions for a rapprochement. A new methodology (psychology) is needed to relate and give significant meaning to science and humanities. Psychology, by its integration with both science and the humanities, can represent human knowledge for the "organic thing" that it is. In this manner, and only in this manner I fear, can a reconciliation be realized.

What will the reconciliation bring? Koch describes what man will be when he abandons the artificial notion of a science-humanities antinomy. "He will be highly specialized (the present differentiation of knowledge demands this of scholars), but whether his work falls into an area allocated to science or humanity, he will have deeply within him a sense of its relationship to whatever areas are relata, however they be named. He will also have a sense of relatedness of all inquiry and not be ignorant of, or interested in, at least a few of the things that exist across the gulf that so effectively separated his forebears."

Yes, Margo, the world is larger than you think, after all. In reality we see the gulf was only a chimera.

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NATURAL SELECTION AS AN ECOLOGICAL CONCEPT

BY Allan Brown

Many writers and scientists have reviewed the history of natural selection and its relation to the evolutionary theory. Few, however, have alluded its relation to Ecology. This is not surprising, however, because Darwin presented his theory as an evolutionary explanation of the origin of the species and, as such, much of his explanation became incorporated into it. So much confusion surrounds our conceptions of species, evolution, and natural selection that the relation of the latter to ecology is not wholly clear. Recognizing, however, that natural selection takes place at the level of the relation of the individual organism and its environmental conditions places it by definition in the realm of ecology.

Darwin and Wallace (1859) suggested that evolution was controlled by natural selection.

By failing to clearly define natural selection and discussing it in terms of its consequences, Darwin's language is often ambiguous as to what constitutes natural science and its distinction from the explanation of evolution.

Therefore, instead of a definition of natural selection, there was a wealth of examples of the consequences of natural selection, each in turn presented with the expressed hope that it would make clea r what he meant by the term. He speaks of it as a prihciple but does not enumerate either its properties or any details of it as an elemental operation, e.g. "From Darwin:"

"I have called the principle by which each slight variation, if useful, is preserved, by the term natural selection . . . but the expression survival of the fittest is the more accurate and sometimes equally convenient."

And, "The preservation of favourable individual differences and variations, and the destruction of those which are injurious, I have called natural selection or the survival of the fittest. Variations neither useful nor injurious would not be affected by natural selection."

In the first statement, by referring to natural selection as a principle having certain consequences, Darwin drew a distinction between natural selection and its consequences.

Reviewing these quotations from Darwin and analyzing them we arrive at the following definition of natural selection:

1) It is a principle whereby:

   a) Useful variations of favorable individual differences are preserved.
   b) Injurious variations are destroyed.
   c) Variations neither useful nor injurious are not affected.

2) The fittest survive.

Each of these statements asserts a consequence of natural selection which is obviously something other than the process.

The first alludes to a step in evolution, the second refers to rejection, the third asserts forth circumstances by which nothing happens, and the fourth is survival.

Because it is not wholly clear just what is being selected, these difficulties arise:

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1) Is natural selection a relation between an individual organism and its environmental condition?

2) Does it occur at meiosis? Is it an influence of genic materials on ontogeny to change properties?
3) Is it a genetic operation in populations such that successions of gene frequency may be spoken of?

It should be clear, however, that Darwin's conception of natural selection involves the selective relation of an organism with its environment. In this respect Darwin was close to the ecological implications of natural selection.

Natural selection now, however, is not as "cut and dry" as expressed by Darwin , but more subtle as is the survival of the fittest.

We may tend to look at it as:

1) Comprising elemental operational relations between an individual organism and its environmental conditions such that the organism satisfies all of its physical needs for establishment and survival.

2) It endures through the ontogeny of all stages of the life cycle to successor organisms in reproductive sequences.

It is evident and essential to understand that natural selection permits each like as well as unlike organism to live and carry on all of its vital processes. Therefore, every ontogenetic event of physiology and morphology that is in relation to environmental conditions is a part of the selective operation. This includes any independent stages of the life cycle necessary to this generation of the next selective step. Natural selection is not restricted to just those processes that may introduce change into a population.

Consider, for example, that not only the welfare but the very existence of parasites depends on the availability of hosts to support them. When a parasite causes a disease which is fatal to the host, the parasite usually kills itself together with the host. Conversely, when two or more organisms are mutually useful, the fitness and chances of survival are improved for both of them. Natural selection tends, therefore, to promote cooperation and minimize competition among organisms.

If, then, each and every individual organism is a product of the process of natural selection and all that it implies, then natural selection being a relation between an organism and its environmental conditions is an ecological concept.

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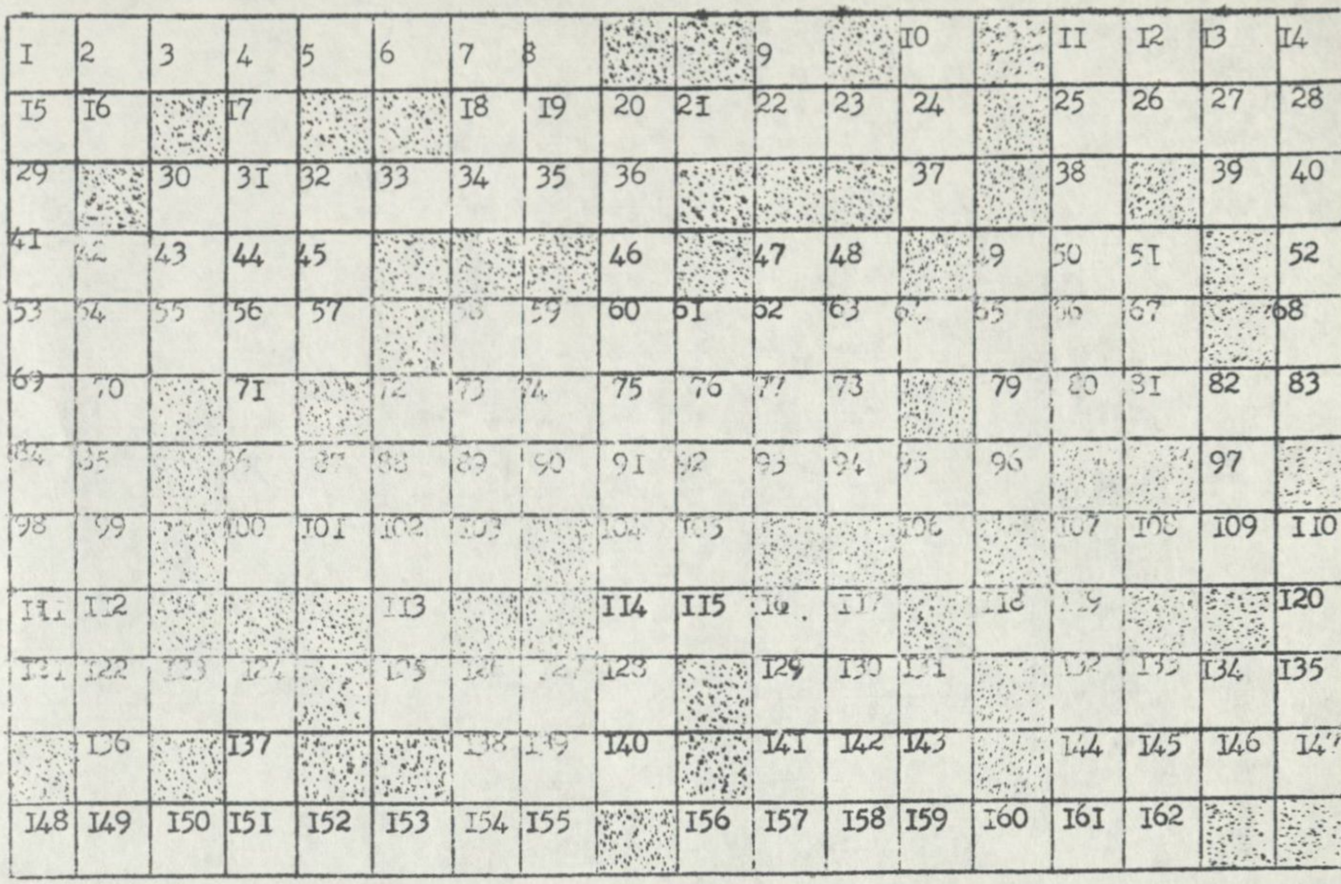

Abscissa

I Cyclic compounds formed by coordination.
II. Young bovine.
I5. Silver.
I8. Sub-atomic particle.
25. Pigmented part of iris of eye.
30. A milky variety of glass.
39. Erbium.
4I. Element found in high-energy fuel.
47. Suffix characteristic of the CH_3OH group.
49. ---------Fleming.
53. Eye socket.
58. Site of embryonic invagination.
69. Sodium.
72. Corrosive, burning.
79. Salamanders.
84. Article.
86. A local race.
Ioo. Monocotyledon plant family with 6 petals, 6stamen, 6sepals.
Io7. A pteropsid.
III. Prefix meaning true or good.
II4. Network.
II8. Nitric oxide.
I2I. Prefix meaning narrow.
I25. Body (suffix).
I29. Chemical(suffix)denoting unsaturated.
I32. Underground fleshy rhizome
I38. --------deferns.
I4I. Parsitic worm of eye.
I44. Excretory compound.
I48. Disinclination to move or act.
I56. A disaccharide.

Ordinate

I. CO_3 (plural)
2. Mercury.
4. Fatty.
7. Above(prefix)
8. To err.
9. Bone.
IO. Cuckoo.
II. Muscle paralyzing drug.
I2. Audio-visual.
I3. Downwind.
I4. Unit of capacitance.
20. Gives rise to the plant embryo.
30. A symmetrical web;to form a circl
32. Hymenopteran.
49. Charged particles.
5I. Neo.
58. Infant.
59. Pronunciation of loess.
6I. Vascular column(botanical)
72. Jointed,usually hollow,stemsof grasses.
82. Coal derivate.
87. Silicon.
95. Einsteinium.
I07. Convergence of light waves.
IIO. Thread(prefix)
II6. Membrane.
II7. Keto---tautomer
I24. Neither.
I26. Eggs.
I27. Bad (prefix)
I3I. Ingest.
I33. Metalic meneral
I34. Rhenium.

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Answer will appear in the next issue of the "Hagen".

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EDITION SPECIAL

"U.S. Grants--General Retrospect"

With the orbiting of the Soviet satellite in 1957 the United States suddenly felt the shock of being challenged in the area which it had long held a dear and celebrated leadership--science. Following the initial announcement and its attendant feelings of despair, anxiety, and even defeat, was the inevitable question of how we, the strongest, most progressive nation in the world, could be surpassed. Aside from its effect on the legislator who ignorantly (and ironically) demanded that "we shoot it down," Sputnik I served to focus the attention of Congress on the quality of scientific education and to remind the country of the necessity of basic research to the interests of national security, economic welfare, and medical progress. As a result, Congress fortified the scientific "fuel" with a generous addition of funds; thus reinforced, we re-entered the so-called race for international scientific superiority. With the passing of several years, it is now only fitting that the whole program be evaluated with respect to the original goals of stimulating scientific education and research. Following is a condensation of criticisms found in numerous letters that have appeared in Science during the last few months.

It should be pointed out that government subsidies to science predate the "space age" by many years, but is has been only since 1957 that the budgets reached significant proportions and broad applications. Administratively funds are allocated by the "project method" whereby a person submits a written proposal, including a cost analysis, to any one of a dozen national agencies, such as the National Science Foundation or the National Institute of Health. The proposal is then reviewed and judged on its merit and feasibility by a professional committee. Through this means allotments can be received for the purchase of necessary equipment (which at the termination of the grant becomes the property of the institution), the hiring of skilled technicians, or the defrayal of any other costs associated with the completion of the research goal. Funds are also available for organizing and attending special centers of advanced study, for travel to and from scientific meetings, and for assistance in alleviating the costs of publication.

The success of this program has been truly spectacular. One need merely visit a library and compare the expansion of scientific literature during the last decade with that of the first 50 years of the century to see this graphically impressed. Newspaper announcements of exceptional discoveries are almost as regular as syndicated columns. With the economic shackles of limited institutional budgets broken, many scientists have embarked on researches that earlier would have been prohibitive.

Have there been abuses of this federal subsidy? Certainly. Although the exceptions have been generally few in number and of insignificant proportions, one did involve the misuse of NSF funds by a large professional organization in biology. Naturally, there has also been a percentage of grantees who failed to uphold the spirit and the moral obligation of the contract, but these were minimized through the screening process of the selection boards, by the requirement of a final report or publication, and the desire of the grantee to reapply in the future.

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At the present time, governmental subsidy to science has reached a new phase of its marriage. Proportionate to the many thousands of scientists that have recently emerged, financial aid has not increased at the same rate. The result is stiffened competition and heightened argumentation. By reason of this disproportion, the awarding of grants becomes more judicious (or prejudicious) for it is difficult, if not impossible, to establish criteria in appraising project proposals. No two scientific projects are alike in goals, necessary equipment, and feasibility. Each obeys a probability that the experiment or study can be successfully executed and that the results will be of significance to the field. "Significance to the field" is subject to enormous interpretative latitude. In a recently published letter, a Midwestern insect taxonomist bemoans the lack of appropriations for identifiers of organisms, and he cites the statistic that only about 20% of the insects inhabiting corn fields in Guatemala have been described. In a country whose agriculture emphasizes this grain, we are disregarding a potential menace not far from our border. Support to certain fields, such as taxonomy, has been sacrificed in favor of the more fashionable and "progressive" areas such as genetics.

One theme repeatedly voiced in objection to the "project method" of awarding grants is that this procedure is not equitable but tends to favor the well-established large university, especially those located in the more progressive parts of the country. For instance, in 1962 ten universities received 38% of the federal research funds. Sometimes the statistics are even more revealing. While Massachusetts alone was the recipient of 117 million dollars, ten states, with a total population twice that of Massachusetts, received a mere $560,000. As one might imagine, the correlation between financial support and the general academic stature of the school is positive and almost perfect. Certainly this practice is pardonable if viewed from the standpoint of results, for much less money is required to realize data in a well-established laboratory run by the most competent scholars in the field than would be needed in a poorly-equipped laboratory staffed with mediocre researchers. Such a situation, however, leads to a perpetuating cycle of grants--equipment--results--more people--more grants--more equipment--more results, etc. It should also be borne in mind that the equipment generally becomes possession of the institution, so that it is possible that a moderate expenditure on the part of a university for a few qualified men could result in an expanding research empire of grant-supported technicians and grant-acquired instruments.

Such is not the case in smaller schools for several reasons. First, science faculties are often limited in time, training, and (commonly) in incentive to perform significant investigations. As a result their research competencies are without history and their proposals are judged, latently at least, in relation to their laboratory accomplishments. In this manner the applicant is on trial. In addition, the selection committee is, and correctly so, generally composed of outstanding, avid researchers from the larger institutions. Without denying their integrity, there must certainly be an element of prejudice in their decisions.

Nearly everyone will agree that "politicking" should be minimized in such awards, but a recent move by the Department of Health, Education and Welfare potentially allows this danger to increase. Contracts and grants awarded by that branch are now announced through the offices of the congressmen. The result is a

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press release of often inadequate and misleading content. A book entitled "How to Mend China" would attract the attention of diplomats as well as do-it-yourself householders. Similarly a grant for the "Study of Fat Bodies in the Isles of Langerhans" is certain to conjure vivid, but wild, imaginations in the minds of the lay public although academically such a study might be of profitable endeavor. Then, too, a $10,000-a-year grant for 10 years would merely appear as a $100,000 lump. Furthermore, the reader is not generally informed of how the expenditures will be made, so that his impression is that it is a salary or gift. The title (left uninterpreted), the amount (coupled with the congressman's name), and the lack of detail add a suspicious dash of political influence that is unbecoming both professions.

President Albrecht of NDSU, in a recent letter to Science, maintains that the small school should be less concerned with the competition for funds and more inflamed by the emigration of competent personnel to the larger grant-supported centers. This tendency of scholars to concentrate in the grant-laden larger institutions necessitates some basic changes in the complete administration of government support, for it is perhaps the most dangerous effect of the whole program. By constantly eroding the quality faculty from the small school, the whole program is defeating some of the original purposes.

Some argue that this concentration of workers in the larger laboratories and its coincident emphasis on team research has stifled much of the individuality and initiative of the scientist. Because much of this moot argument depends on the project as well as the personalities involved, one can merely say that future experience should determine if there is a "best" manner of doing research.

As was mentioned earlier, scientific literature has mushroomed in mass, but can the same be said of the quality. Undoubtedly, each grantee feels compelled to "show something" for his time, and therefore, attempts to publish his often-incomplete findings even though they may contribute little. The result is a general downgrading in quality of journals so that the reader must separate the "grain from the chaff." According to the notable biologist Paul Weiss, this runaway preoccupation with research and publishing is producing aimless, inconclusive, and unrelated science. The ludicrous extreme of this tendency is evident in many industrial research centers where companies have recently hired philosophers merely to aid the scientist in redefining his original goals. In the academic area, the scientist is commonly pressured by competition for results, by job security, and by professional recognition to publish. And grants are fast becoming the key to publications.

Perhaps grants have backfired in other ways too. For instance, prices of apparatus and equipment have advanced disproportionately to other manufactured items during the last few years. While it might be argued that these changes are merely the result of supply-and-demand economics, it appears that companies have been too eager to lap up much of this government windfall. To the budget-minded, non-recipient schools, these increases make the prospects of properly equipping and maintaining laboratories especially dim.

The foregoing picture was not meant to be black but a "tell-tale" gray. Nearly everyone will agree that government support of science is no longer a luxury but instead a necessity, for expensive long-range projects are the indisputable windows to the future and the pillars of the past. Critics of the federal program especially take exception to the present system of allocation of funds, and correctly so.

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It is admirable that the critics are chiefly scientists themselves, even those who have enjoyed the maximum benefits of the support. Changes are certainly forthcoming. At the present, committees are re-evaluating the entire program in perspective to the original goals. Only last week NSF announced that it was offering 20 five-million dollar institutional grants to upgrade the level of science in certain schools. Perhaps the future will see a longer percentage of the total federal science budget devoted to institutions other than projects, so that the smaller colleges might share in, and profit by, more research.

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