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A MANUAL OF EXPOSITORY WRITING FOR THE ENGINEER

by

LESLIE EMERSON BOYD

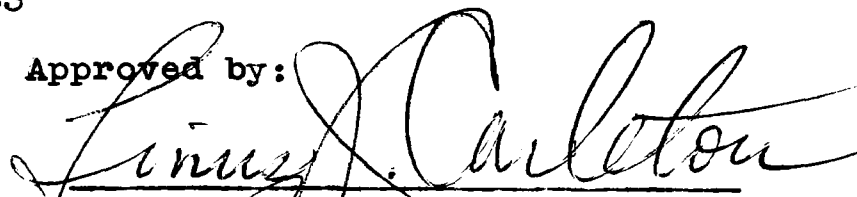
B. A., Huron College, 1930

Presented in partial fulfillment of the requirements
for the degree of Master of Education

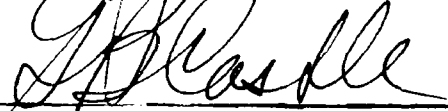
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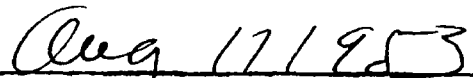
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ACKNOWLEDGMENTS

The writer wishes to express his thanks to those who have cooperated with him in this study.

To the many students with whom he worked during the time the manual was being developed and to the students who wrote the examples included in the manual, he extends his thanks, respects, and best wishes for success.

This work would not have been possible without the encouragement and advice of Professor Linus J. Carleton, graduate adviser, and Professor C. M. Rowe, chairman of the English and Social Science Department at the South Dakota School of Mines and Technology.

Throughout his graduate work, the author received material and spiritual assistance from his wife. It was she who inspired him to do this work and who criticized and typed the manuscript.

L. E. B.

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CHAPTER I

INTRODUCTION

When one is requested to teach a course that he has not had the experience of teaching previously, it is natural that numerous questions concerning the course will arise in his mind. This writer, and teacher, then, did what came naturally when he was asked to teach the classes and types of exposition to a class of freshmen engineering students. All of the questions could not be answered satisfactorily, and so a problem arose.

I. STATEMENT OF THE PROBLEM

It was the purpose of this study to develop a manual of expository writing. The manual was designed to be used with a handbook of composition, such as College Handbook of Composition by Woolley, Scott, and Bracher, and to meet the needs of college freshmen in an engineering school, such as the South Dakota School of Mines and Technology, when the students were required to write exposition.

II. SCOPE AND IMPORTANCE OF THE PROBLEM

What were the questions that arose when Professor C. M. Rowe, the chairman of the English Department, requested this teacher to organize and teach the classes and types of exposition to freshmen engineering students? Some of the questions were answered by the chairman of the department;

some were not. Because he had specific answers for some of the questions, the problem seemed to be delimited. It was the unanswered questions that formed most of the basis for this work. A review of all of the questions is probably necessary to understand the importance and full scope of the problem.

1. What were the objectives of the course to be? The answer to this question was quite specific. They were as follows: (a) To plan and organize an exposition and then write it correctly and effectively, (b) to develop the kind of thinking necessary to describe a process, to define an idea or thing, to analyze an idea or thing, to criticize an idea or thing, and (c) to motivate desirable attitudes toward this kind of writing and thinking. The question was answered, but another one arose as a result.

2. How were these objectives to be accomplished? The method was not clear to the writer nor to the chairman of the department.

3. What classes and types of exposition were to be taught? Professor Rowe was specific in answering this question. The classes were summarized in the second objective: (a) process, (b) definition, (c) analysis, and (d) critical. This question led to another problem.

4. Where was one to find a textbook that adequately covered the classes and types of exposition designated?

What has been written thus far was one teacher's mental reaction to a new problem. It narrowed itself to one

question which summarized the scope of the problem: How may the designated classes and types of exposition best be taught to college freshmen in an engineering school in order to meet the requested objectives and to motivate desirable attitudes toward this kind of writing and thinking, and where were the textbook materials to be obtained for teaching such a course?

The teacher, who had had considerable experience in teaching composition, could possibly solve part of the problem. College Handbook of Composition by Woolley, Scott, and Bracher, a handbook used in other composition courses at the school, had some of the desired information. A survey of related textbooks, which will be discussed more thoroughly in a later section, showed that several qualities that seemed to be necessary in teaching such a course by an instructor of this teacher's personality, experience, and knowledge were lacking.

For example, many textbooks contain descriptions and examples of the classes and types of exposition, together with other kinds of writing; however, there seemed to be a need for a manual which contained only the classes and types of exposition alone. The available textbooks contain examples written by recognized writers; examples written by local students seemed to interest and motivate better when they were written on semitechnical subjects of particular interest to and on the level of freshmen engineering students. Also, students seemed more willing to analyze critically the examples written

by students.

Whether the designated objectives were educationally sound and whether the classes and types of exposition covered were of most value to the students did not seem to be a part of the problem, since they were designated by the chairman of the department; regardless of the assumption, the chairman had evidence to validate his requirements and was confident that they were educationally sound.

III. BACKGROUND AND SETTING

The South Dakota School of Mines and Technology, located in Rapid City, South Dakota, has what might be described as typical college or university entrance requirements. Work for the first quarter in English is also typical, in that the Cooperative English Test (higher level) and the students' past grades are used to determine whether the entering students shall take preparatory English work or shall enroll in the regular first quarter English course. The first quarter of college English is devoted to a review and study of English mechanics, grammar, and the writing of exposition in general. The second quarter of college English is devoted to the study of documentation, outlining, use of the library, and the exposition with the application of all to the writing of a short expository report. It was in the second quarter of English that the previously stated problem arose.

The school is a typical engineering college with nine degree-granting departments: Chemistry, Chemical Engineering,

Mining, Metallurgy, Geology, Civil, Mechanical, Electrical, and General; in addition, it has two service departments: the Department of English and Social Science, and the Department of Mathematics. It is obvious, then, that the students have a tendency to be technically minded and objective in attitude.

IV. SURVEYING THE LITERATURE AND BUILDING THE PLAN

If one were to accomplish the outlined objectives and to motivate desirable attitudes toward the kind of writing and thinking required by the types of exposition, he must appeal to the interests and needs of the students involved.

We turn again to Rousseau. 'Present interest is the grand power, the only one which leads with certainty to great results.... A great ado has been made about finding the best methods of teaching.... A surer means than all of these, and the one which is always forgotten, is the desire to learn. Give the child this desire, ... and every method will be a good one.'¹

And so, knowing the characteristics of engineering students and at least some of the needs found in thinking and writing for the engineer, the author gathered as many textbooks on exposition as could be obtained by questioning book salesmen and by scanning catalogues of the leading publishing companies. About twenty books were procured, but none seemed to have all the material that was needed for the above

¹Robert Ray Aurner, Ph. D., Effective Business Correspondence, Second edition (Cincinnati: Southwestern Publishing Company, 1939), Preface, p. iii.

described course, and all had much material that was not needed. All of the classes and types of exposition were found in these books, but it appeared impossible to select one book that was adequate for the needs of the course.

During the first quarter that the course was taught, the accumulated textbooks were placed on the reserve shelves in the library; and the student obtained the background for the writing assignments by reading from these books, and by supplementary lectures by the instructor. This procedure had its shortcomings because it was difficult to obtain the books when the student needed them, and the student was not always interested because sometimes he could not understand how the type of exposition or the subject upon which it was written had any relation to engineering. The instructor attempted to find the relationship and to suggest subjects that were of, at least, semitechnical nature. Interest seemed to develop, and the students started to think of subjects themselves. Notes were made by the instructor, and some of the best reports were saved.

These reports were read to the students the next quarter that the course was taught, and the interest of the students seemed to be greater. The students were still asked to read from the textbooks placed on the reserve shelves because it was believed that students, yes

most of us should read, during the years when we are coming to maturity, the writings of men of wide learning and deep insight, of men who face the difficult

questions of the significance of life on our planet.² However, the students showed more interest in the examples written by former students and were much more active in analyzing and criticizing the student reports. This attitude can, perhaps, be explained by the fact that a rivalry was created because the students were being asked to analyze, criticize, and write something within the range of their own possibilities. When they were asked to do the same with examples written by recognized writers, they were reluctant, hesitant, and sometimes even sulky because, as many of them said, "Who am I to criticize such a writer?" and "How do you expect me to compete with a professional?" Other teachers of composition have, no doubt, found the same condition. We turn again to Hathaway and Moore and continue the previous quote, "But if we hope to arrive at that same point of experience and wisdom, we should serve an apprenticeship nearer the base of the pyramid."³

Babcock, Horn, and English developed Essentials of Composition for College Students on the same basis. Let us quote:

The purpose of this book is to discuss the types of discourse as directly and suggestively as possible and to set forth as attractively as possible what may be done with them. In order to accomplish these aims, we present, along with the discussion, first, student themes as illustrations of what other students have

²Baxter Hathaway and John Moore, The Exposition of Ideas (Boston: D. C. Heath and Company, 1948), p. xii.

³Ibid., p. xii.

actually done with the types. Then, for comparison, we add examples from recognized writers, including both classical and modern masters. The primary purpose in printing the themes is to stimulate creative rivalry, for it has been our experience that most students do far better work if you put before them papers written by other students--papers which represent positive achievement in certain forms--and ask them if they can do anything like that. Then you are inviting them to attempt something clearly within the range of their own possibilities, and you will find them rising immediately to meet the challenge.⁴

Reed Smith and William S. Hastings made the same observation and used student examples in their textbook, Learning to Write in College, for they have stated in their preface:

In addition to rich and abundant quotation of the best author material both of the past and of the present, particular attention has been given to including specimens of the best student writing in all the various fields.⁵

They continue:

It would probably never occur to a college student that he has it in him to parallel such acknowledged masterpieces as George Herbert Palmer's "Self-Cultivation in English," Kipling's "They," Stevenson's "Markheim," Edna Ferber's "A Gay Old Dog," John Galsworthy's "Quality," or Logan Pearsall Smith's "Silvia Doria"; but a delightful essay or thrilling story by another college student who is no older or better taught than he, but who yet has caught the trick and has succeeded highly where he himself may never have risen above mediocrity, is another matter entirely. It is both an open invitation and a constant

⁴Robert Whitbeck Babcock, Ph. D., Robert Dewey Horn, Ph. D., and Thomas Hopkins English, Ph. D., Essentials of Composition for College Students (New York: American Book Company, 1939), pp. vii-viii.

⁵Reed Smith and William S. Hastings, Learning to Write in College (Boston: D. C. Heath and Company, 1949), p. ix.

challenge. And the last step before doing a thing is feeling that one is able to do it.⁶

Essentials of Composition for College Students has the approach which seemed desirable and could have been adopted as a text for the course except that all of the required types are not included, and much of the 729 pages in the book is devoted to other kinds of writing and the elements of composition.

Students like to do that which makes sense; they like to know exactly and specifically what the goals, objectives, and features of an assignment are. At least, that observation has been true in the case of this writer and teacher of engineering students. Consequently, during the next quarter that the course was taught, a logical definition, the steps in the procedure, and special features and cautions for each class and type of exposition were developed. Engineering students usually being scientific and empirical minded, it was probably natural that such a procedure would appeal to them. Although interest was apparently greater and the writing was improved as a result of this procedure, several questions arose: Is the writing becoming stereotyped? Are the students merely imitators of patterns? Is self-initiative and self-direction being curbed?

After these questions had arisen, the students' reports were scrutinized closely to determine whether they

⁶Loc. cit.

were stereotyped and imitated patterns. Some, of course, were; but it was noted that by cautioning the students and rewarding them by way of praise and grades, self-initiative and originality of style and form were developed in writing.

Questions and statements were designed during the next quarter to stimulate analysis and criticism of the types and examples in order to assist the students in better understanding them and to create a desire to write better reports than the examples. Creative rivalry was the aim. New examples were collected and added to the files; additional features, difficulties, and cautions were noted as a result of reading various textbooks and observing the students' papers; and the logical definitions were improved. The practical value to the engineer for studying and writing such types seemed important as a means of creating interest, and so examples of uses were acquired by reading, observing, and talking to professors from other departments and to students who had graduated. Practical uses were not difficult to find because these types of exposition are used in so many ways.

The term exposition embraces all writing which has as its purpose definition, explanation, or interpretation. Of the four forms of discourse--argumentation, description, narration, and exposition--it bulks the largest, for it includes most technical and scientific writing, most textbooks, biographical and historical writing, the majority of magazine articles, essays, and editorials, all book reviews, art, dramatic, and musical criticism.⁷

⁷Homer Andrew Watt, Oscar Cargill and William Charvat, New Highways in College Composition (New York: Prentice-Hall, Inc., 1943), p. 248.

The accumulated information was presented to the students by the lecture method. Many students found it difficult to grasp the ideas by the auditory method and, consequently, were not always attentive. If one is to learn, he must apply himself to the learning activity; hence, application and attention are significant in determining the effective outcome of the work. The student was expected to write the report quite largely on the basis of the conditioning given him in class, although he did have the opportunity to read the textbooks on the reserve shelves in the library. "The apprentice masters the principles and theories of his craft, it is true, but he learns by doing, by repeated practice under the supervision of his teacher."⁸ To continue to quote from Kierzek, "When the mastery of a skill is involved, may I repeat, one learns easier and quicker by doing than by being lectured at."⁹ The principles, technique, and information involved were only a means to an end; and the end was a written report; but "being lectured at" did not seem to be the best method of presenting the principles and theory; and so the accumulated material was organized and written into a brief, simple manual, typed with carbon copies, and made available to the students. That was the first draft of this work.

⁸John M. Kierzek, The Practice of Composition, Form A, 3rd edition (New York: The Macmillan Company, 1949), p. v.

⁹Loc. cit.

Examples of masterpieces written by recognized writers were not included in the manual, first, because it would have been too bulky for our purpose and, second, because there seemed to be a value in requiring the students to search for examples that could be found so abundantly in the textbooks on the reserve shelves, in their regular textbooks for other courses, in newspapers and magazines, and in fact in any reading that they might have done.

Spelling, documentation, outlining, and a review of grammar, rhetoric, and mechanics of writing were principles included in the course; and they were presented and practically applied to the short-form expository report which has been presented in this manual. They were not included because, as was previously stated, the manual was designed to be used with an English handbook, such as College Handbook of Composition by Woolley, Scott, and Bracher.

V. SUMMARY AND CONCLUSIONS

This work, A Manual of Expository Writing for the Engineer, was conceived after this teacher had been asked to teach a class of freshmen engineering students, in the second quarter of English, the classes and types of exposition.

The problem arose because the teacher was searching for an approach or method of obtaining the objectives required and because no one textbook seemed to be adequate. Determining the objectives of the course and the classes and types of exposition to be taught was not considered a part of the problem since they were specifically stated by Professor C. M. Rowe, chairman of the English and Social Science Department, at the South Dakota School of Mines and Technology.

The manual was developed slowly; in fact, as was stated earlier, the course was taught several quarters; many textbooks were analyzed; the quality of the writing and the attitudes of the students were observed; examples of students' reports were collected; and new features, such as questions, lists of collateral readings, and procedures for writing the various types of exposition, were prepared before the first draft was written.

The entire plan was centered around the use of reports written by other students in order to develop creative rivalry and, consequently, greater interest. These reports illustrated what other students have actually done with the types of exposition. The manual was designed to be used with a handbook of composition, such as College Handbook of Composition by Woolley, Scott, and Bracher. Examples written by recognized writers were not included because such examples could be found in so many sources

and because it seemed beneficial to the student to search for them himself.

This manual covered the scope designated by the chairman of the department and solved the problem to his satisfaction and that of the members of the staff. It seemed to accomplish the objectives which had been established.

If this introduction seems brief and incomplete in its description of the approach to the problem, it is because A Manual of Expository Writing for the Engineer is an outline in itself and is completely developed. To give the outline and show all the notations and changes that were made would be a repetition of the pages that follow.

Learning to write the classes and types of exposition seems to be a five-way process: (1) furnishing the students with the principles, features, and difficulties of writing the various types, (2) motivating the student, (3) actually writing reports, (4) criticizing and evaluating the writings by the instructor and sometimes by other students, (5) eliminating common errors from the writing. "Instruction," says Anderson, "is guidance of learning--a process of bringing about behavioral changes by selecting and organizing content or activities (often with the learner's full participation) and stimulating the interaction of pupils with the content

or activities."¹⁰ Chapters II, III, IV, V, and VI are the manual which was designed to furnish the content and activities which will bring about the behavioral changes desired by interaction of the students with this content and these activities.

Finally, this introduction describes the way the method was developed and how it was used at the South Dakota School of Mines and Technology. The manual which resulted could conceivably solve the same problem for other teachers in engineering schools.

¹⁰National Society for the Study of Education, Learning and Instruction, Forty-ninth Yearbook, Part I (Chicago: The University of Chicago Press, 1950), p. 8.

CHAPTER II

THE EXPOSITION

Some training in English composition is required by every student as he begins his college course, no matter what his interests or his plans for specialization may be. This course is designed to aid in developing the ability to write effectively the classes and types of exposition, since those students taking the course are potential engineers and since exposition is the kind of writing that the engineer, who is specialized, is likely to use most. Before the classes and types of exposition are considered, it appears necessary to summarize the history and uses of exposition, its parts, and qualities.

I. HISTORY AND USES

Men are gregarious animals, like cattle, sheep, or deer. They are by nature unhappy when alone. They need the protection and comfort of the herd or flock, but men can be human as well as gregarious. Sometime in the primitive period, they invented language; and that language made it possible for them to invent civilization and solitude. In civilization we live together, and in solitude we live alone. Neither is possible without language, and both are necessary if we are to have an orderly growth

of human society. By talking to each other, we are able to live together and progress; and by reading and writing, we are able to learn from others and to pass on to others who may not be informed on the subject, what we have learned through reading and experience.

For many years, communication was oral and depended upon memory. Since detailed information is hard to remember, much of that which survived was simplified or lost. After man invented writing, knowledge was more accurately preserved; and after the invention of printing, it was much more widely distributed.¹

The exchange of such knowledge was to inform, to explain, and to clarify and is now commonly known as exposition. Exposition is perhaps the most universal of all the kinds of writing, since every person must explain or expound acts and ideas, either new or old, to some degree. We may explain how something is made, such as tying a fly, or how a machine operates. We may pass judgment on the construction of a building in a critical way; or we may evaluate the worth of a piece of machinery, all of which is exposition.

Since the intent of exposition is to inform, to explain, or to clarify, the first duty of the writer is to know of facts. He would not write if there were no facts.

¹F. Earl Ward, English for Communication (New York: The Macmillan Company, 1949), p. 1-3.

One who knows facts has knowledge. An engineer must gain knowledge at all times and must never stop learning. He gains knowledge while he is in school, but he acquires much more knowledge after he goes to the job after graduation. In order to get the job, one must show that he is capable of learning. His record in school will indicate such capacity.

To acquire knowledge, however, is not the end; when his work is complete, the engineer frequently passes on to others anything that he has learned which he thinks might be useful to others working in the same general field. Without exposition, such an exchange of knowledge would be impossible; and newcomers would have to begin all over with the discovery of fire, the lever, and the wheel, and other similar discoveries and inventions.

Someone has to write in order to record the developments of the times, and the people who are doing the thinking and performing the experiments in the various fields of endeavor are the ones who are responsible. The engineer, therefore, is responsible in the field of technology and science.

Time and again, in today's industrial world, so competitive and so vast with opportunity for engineers, I can see the men who are to express themselves in clear, forceful English forging ahead of their associates who have not been trained to write and speak effectively.²

²R. A. Gantt, "English for Engineers," Nebraska Blue Print, 45:115, February, 1946.

This statement has been repeated many times by men who are in a position to observe. Men who are preparing to enter the business of engineering must recognize the fact that business in these days is run by telephoning, conferences, letters, and reports. The man who cannot express himself effectively, orally or in writing, is likely to remain a draftsman, surveyor, or inspector. In a large company, reports from all branches and subsidiaries of the company are sent to headquarters where they are analyzed, classified, and compiled into general reports which the executives use to determine the policies of the company. By these reports, men are judged. Many of these men are known best by their superiors by what they put on paper. One can see, then, that it is not only desirable but essential that members of a supervising staff and men who hold a position of any responsibility must be capable of writing reports and business letters effectively.

On the highest level of attainment, it might be said that Dwight D. Eisenhower wrote his way to the presidency. He uses English well.

The plans he drafted for the European Theatre of Operations got him the job of commanding it. In other words, he wrote his way to power. After the war, as author of Crusade in Europe, he wrote himself into the first large sum of money he ever possessed.³

³Wilson Hicks, Editor. This is Ike--The Picture Story of the Man (New York: Henry Holt and Company, First edition, 1952), p. 88.

It is, then, highly probable that he would not have been in a position to be nominated and elected president of the United States had he not been able to use English well.

The schools must take the responsibility of offering courses that will develop the ability to write and speak effectively, and the students must take the responsibility of putting forth the effort that is necessary to get it. Neither group can accomplish the task alone.

II. MAKE-UP

The make-up of an expository report involves five elements: (1) a subject which adapts itself to exposition, (2) a controlling purpose, known as the thesis, which expresses the writer's attitude toward the subject, (3) an introduction which attracts attention and creates interest in the subject, gives a background and lays a foundation for a thesis, and, finally, states that thesis, (4) a body which presents the evidence, and (5) the conclusion which gives the report a totality of effect and clinches the point of view.

Subject. One day an instructor made the following assignment to a class whose objective was to write exposition: "For the next assignment write a three to four hundred word expository report on some subject that interests you. I am leaving the subject general so that each of you may find something suited to your own experience."

After class a student paused before the instructor and said, "Sir, I have nothing to write about."

"You are familiar with the campus, are you not?"

"Yes, I am."

"Do you know the location and use of each building on the campus?"

"Yes, I think I do."

"Surely, then, you should be able to explain the location and use of one of the buildings."

"But that wouldn't be exposition," the student interrupted. "You said it had to be an expository report."

"Aren't you explaining when you tell where a building is located or what it is used for?"

"Ye-es, I guess so," he said, after a moment's pause.

"Tell me about one of these buildings in your next report," answered the instructor.

The problem of this student was one that occurs every day. Most students forget that exposition is written to explain, to inform, or to clarify. It is the form of writing used most often. Argumentation is quite largely exposition; and much of the description that we write is really exposition; some narrative is expository. If the argumentation, description, or narration explains, clarifies, or informs with a specific purpose, it is basically exposition. Most of the writing done in college is exposition;

for example, answers to examination questions, class reports, term papers, analyses of laboratory experiments, and petitions to the Board of Control. Proficiency in exposition, then, should be of very practical value. It is obvious, too, that if a student is to write exposition effectively he must know thoroughly his facts. He would not write if there were no facts.

Many centuries ago Aristotle pointed out that a whole is that which has beginning, middle, and end. An exposition should give the effect of a whole; but it is more than a whole; it must have a controlling purpose. Now that the kinds of subjects with which an exposition may deal have been clarified, the exposition as a whole and its controlling purpose will be discussed.

The controlling purpose. One does not write expository types just for the pleasure of writing. He writes for someone to read; and, therefore, he expects what he writes to have some effect on the reader. The effect that he anticipates is the purpose of his report. The purpose, which may appear in many forms (a writer's attitude toward the subject, statement of a proposition, etc.), is known as the thesis. The thesis is usually stated in one sentence and should normally appear in the introduction after having been logically and clearly introduced by laying a foundation. It is the fundamental consideration which makes the report distinctly different from

any other report on the same subject. The first question that the writer must ask is, "What am I trying to accomplish?" The type of exposition that he is writing will determine, to a large extent, what the purpose will be. One cannot justify writing an exposition unless there is a central idea involved.

If the writer were explaining the meaning of the term engineering, he might take the following point of view: The term engineering has had a long existence and a varied meaning. "Long existence" and "varied meaning" are the grammatical elements which convey the central idea, or the writer's attitude toward the term.

Suppose that the writer asks the question: "Should a stop-and-go light be installed on the intersection of Main Street and East Boulevard?" The answer to the question is the point of view and is, therefore, the thesis.

Accepting such a controlling idea, the writer is obliged to stick to the thesis if he hopes to establish as a fact his point of view and properly fulfill the assignment. Far too many students wander outside the scope of the subject and away from the purpose of the report when writing.

Introduction. After one has chosen a subject, made his investigation, organized his material, and decided upon a thesis, he is ready to write. The first problem in writing is to make a suitable beginning. Since the introduction

is the place where the reader obtains his initial impression of the exposition, it is important that the opening paragraph shall give a favorable impression. Usually, especially in short expository reports, the first paragraph should lead the reader directly into the subject. It should briefly attract attention, lay a foundation for the thesis, and let the reader know what the attitude of the writer is toward the subject. These requirements might be considered the functions of the introduction.

When an exposition is short, a formal introduction is not necessary; it is better for the writer to get to the discussion of his subject as soon as possible. Yet, he must prepare the reader for what is to follow by possibly making reference to the subject (not with a pronoun), by defining the scope, and by establishing the mood or tone. The nature of the subject, the attitude of the writer toward the subject, and the anticipated reader will determine quite largely how the functions are to be accomplished.

The writer may attract attention and create interest by the following methods: (1) by the use of apropos stories or anecdotes, (2) by the use of specific details in description, (3) by the use of conversation, (4) by the use of questions, (5) by a statement which arouses suspense, and (6) by the description of an incident.

The subject may be clarified and a foundation for the thesis may be laid by the following approaches:

(1) by defining the scope of the subject or problem, (2) by stating the importance of the discussion, (3) by presenting the history and present status of the subject being investigated and discussed, (4) by defining terms in the title or thesis, and (5) by describing the idea, object, or procedure involved.

An introduction, as the name implies, is not an integral part of the exposition; it paves the way for the real discussion; it contributes nothing to covering the scope of the subject and to establishing the thesis.

Read the following examples of introductions for short expository reports which were written by freshmen students at the South Dakota School of Mines and Technology. They will suggest varied methods of leading the reader quickly to the discussion of his subject.

FIRST AID

Screech! Bang!! Crash!!! Directly in front of your eyes a man has been hit by a car. Do you know what to do? Will this man be maimed for life or die because you know nothing about vital first aid? First aid, though simple and seemingly child play, can prevent a person from dying or from having his central nervous system permanently disabled before a doctor has had a chance to reach him.

SULFUR

When a housewife polishes her silver, she probably does not think that the substance which causes the tarnish could be very useful to the world. Yet it would be impossible for her to have many of the modern appliances in her home without sulfur, the cause of her darkened silver. Sulfur is one of industry's most

important materials, and our modern way of life would be nonexistent without this unusual element.

HOW TO STUDY

Are you plagued with low grades? Do you seem to be at a loss for time when it comes to getting your school work done? If your answer to these questions is "no," you are an extremely fortunate individual; but if your answer to these questions is "yes," your trouble most likely lies in your study methods because studying requires some definite plan. Yes, in order to study, you must be able to establish an orderly plan of study.

HOW TO BUILD A BRIDGE WING

In the spring, as the days grow warmer, the snow which has been piling up all winter begins to melt; and the water from the melting snow soaks into the ground and trickles into the gullies and creeks. As the water runs along, it is joined by other water; and soon the water is no longer an innocent trickle; but it has gained power and size and is roaring down the creeks tearing at their banks and bridges. Nature never intended for man-made bridges to exist; and when the snow water roars down the creek, it eats at the sides of the bridges with a vengeance. It is in this crisis of spring floods that a poorly built bridge wing will give way to rushing waters.

CHECK

When the word check is mentioned, many people will instantly think of that meaning which was in the mind of the man who said that to him the three most beautiful words in the English language are, "Enclosed find check." But the word has a strange variety of apparently unrelated meanings. The modern American word check was derived from the Middle English word chek which came from the Old French word eschec. Eschec was a corruption through African of the Persian word shah for king. Check has an interesting derivation which has developed largely through the game of chess.

Body. The effect desired by the writer in the reader's mind is obviously different in the various types

of exposition, and the method of accomplishing that effect will also differ according to the type of exposition. Naturally, the method of explaining a process will be different from the analysis of a proposition. Regardless of what the type or method of establishing the purpose of the exposition may be, the thesis must be established to a point beyond a doubt and the scope of the subject must be thoroughly covered. The thesis sentence will place limitations on the scope of the report and will, consequently, control the length of the report or the information necessary to establish the purpose.

The steps or stages by which the purpose is established and the scope of the subject is covered are known as the body. A complete treatment of the classes and types of exposition which will follow is designed to help the writer to develop the ability to handle these steps or stages effectively.

Conclusion. The writer of a report must round off his report with a logical conclusion. It is as unsatisfying to a reader to be left "up in the air" at the end of an exposition as it is at the end of a short story. There must be a concluding statement or paragraph. The conclusion should balance the introduction, should give the writer a chance to drive home whatever in his treatment seems most essential, and should always contribute to a totality of effect.

In the conclusion, the writer may stress the significance of the operation involved in the body; he may comment on the scale of completeness of the discussion; and he may reiterate the critical importance or stress the difficulties of performance of some certain stage of the problem or operation. A restatement of the thesis, a summary, a statement of results, or a combination of all are common methods of writing a conclusion.

The following examples of conclusions of short expository reports were written by freshmen students at the South Dakota School of Mines and Technology. They will illustrate some of the suggested methods for accomplishing the purposes of a conclusion.

FIRST AID

Because blood supplies the body cells with food and oxygen, it has to be in constant contact with the tiny cells at all times or they will die. When a man has lost blood, the remaining blood cannot nourish the cells properly, resulting in weakness or shock, depending on the amount of blood lost. A patient usually goes into shock after losing thirty per cent of his blood; and if the shock is present too long, it can result in death or permanent disability to the central nervous system. For this reason, initial first aid is as important in many cases as a doctor's care after a patient has reached the hospital.

SULFUR

Modern life depends to a large extent on sulfur, the yellow element mined by an unusual process. Sulfur may have a few disadvantages, like tarnishing silver; but it is so important to our way of life that we can afford to overlook these disadvantages and give it much credit for jobs well done.

HOW TO STUDY

Yes, in order to study, a person must pick out the appropriate time of day; he must then find a desirable place that will in turn induce creative study habits; he must then decide to sit down and concentrate; and, finally, the attitude developed by the person studying must be favorable so that efficient and productive studying can be carried out.

HOW TO BUILD A BRIDGE WING

A bridge is no better than the wings that protect it. If a wing fails to keep the flow of water from eating the dirt away from the edge of the bridge, the bridge will weaken and soon wash away. Many bridge washouts could be prevented by building good wings and keeping them in good repair. A good wing is just as easy to build as a poor one; but in a few years, a bridge with good wings will be as good as ever whereas a bridge which had poor wings may have been washed out or weakened beyond repair.

CHECK

Thus it is apparent that the common word check has had a varied development influenced primarily by the game of chess. Check is a verb which means to restrain in some way or to test validity; check is a noun which refers to a design of squares, to a bank draft, or to anything which tends to restrain or to verify.

III. FUNDAMENTAL QUALITIES

"All pieces of writing reflect in their forms and characteristic qualities the nature of their contents and the uses which their writers expect will be made of them."⁴ The nature of facts and explanations given in expository reports and the use to which they are put, as will be made

⁴John L. Stewart, Exposition for Science and Technical Students (New York: William Sloane Associates, Inc., 1950), p. 3.

clear in the chapters on classes and types of exposition, are the most important factors in determining the form which the expository report will take.

Their qualities, also, determine the effectiveness of the writing. Over the years engineers have learned that it is good economy to demand certain fundamental qualities of writing. The qualities save time and energy, for the content of a report can be no more effective than the writing. Let us quote from Aurner again.

'Mistakes in English cost the company more than mistakes in engineering,' asserted an officer of the Westinghouse Electric and Manufacturing Company in discussing his work after a transfer from the engineering to the correspondence department. He explained that, if letters and specifications from sales offices or from within the East Pittsburgh Works were incorrect or incomplete or ambiguous, the result might be prolonged correspondence and sometimes wrong designs and shipments. When he was in the engineering division, he accepted the tradition that it was the engineers who made the mistakes. But, he said, when he was transferred, he found that those who handle correspondence can make mistakes too. 'And,' he added, 'unless these mistakes are watched and avoided, they offer a constant threat of unnecessary operating expense.'⁵

Although precision, definiteness, and clarity are the most fundamental qualities in scientific and engineering writing, other qualities are important in accomplishing the purpose of the expository report. Knowing this, teachers in engineering schools are firm in their demands that writing done by their students exhibit the fundamental qualities of good exposition.

⁵Robert Ray Aurner, Effective Business Correspondence (Chicago: South-Western Publishing Company, 1939), p. 188.

Briefly, then, these qualities will be summarized. Their application will be stressed as the classes and types of exposition are being studied and analyzed in later chapters.

Unity. The term means oneness of thought and is usually accomplished by staying within the scope of the subject and by presenting only information that is necessary to establish the purpose. Unrelated material violates the principle of unity.

Order. The term means logical arrangement of thought and is determined by the nature of the subject. Chronological order, cause to effect, and important to unimportant are common methods of determining the order of material in a report.

Coherence. The term means that the ideas in a report cling together. The proper use of transitions will normally give a piece of writing coherence.

Emphasis. Proper balance of thought is known as emphasis. Usually, it is accomplished by the space allotted to the idea, by the choice of words, or by the position of the thought within the sentence, paragraph, or whole report.

Completeness. Completeness implies thoroughness. The degree of thoroughness is determined, quite largely, by the purpose of the report. If the report sets up, establishes,

and clinches the purpose, it is complete.

Clearness. The term means lucid, distinct, or plain. The entire make-up and all of the qualities of a report determine the clarity.

Conciseness. Comprehensive, brief, much in a few words indicate conciseness. If a report is wordy, it violates the principle of conciseness.

Specificness. The term means precise, explicit, restricted in meaning. If the thought is general, loose, or ambiguous, it is not specific.

Effectiveness. The degree which the exposition accomplishes its purpose indicates its effectiveness. It takes the entire make-up and all of the qualities of the report to accomplish the desired effectiveness.

Interest. If the exposition has the power to attract attention, it has interest.

Vitality. Vigor, liveliness, and unmechanical are qualities that give a piece of writing vitality.

Vividness. Vividness is closely related to description. If exposition is descriptive, graphic, colorful, or striking, it is vivid.

Warmth. Even a writer of exposition should attempt to be genuine, agreeable, and enthusiastic. The qualities

give the writing warmth.

Beauty. The engineer does not, normally, aim to make his writing beautiful; but a pleasurable, excellent, graceful, and euphonious quality may add to the effectiveness of the writing.

Objectivity. The reader of engineering reports is usually not interested in opinions. For this reason, the writer stays in the background; his success depends upon the evidence and style of presenting it. This quality is known as objectivity.

ASSIGNMENTS

1. Make a list of a half dozen subjects which you feel could be developed by exposition, from personal experience, into reports of 400 to 500 words.
2. Go through a unit of a textbook and a current magazine searching for examples that could qualify as exposition. Bring three examples to class. Be prepared to analyze the make-up of the elements: introduction, body, and conclusion.
3. For each of the subjects you chose in 1 above, write an introduction, a sentence to a paragraph in length. Try to vary the method in each and to appeal to different types of readers.
4. What grammatical elements in the examples written by the School of Mines freshmen indicate the controlling

purpose?

5. On the basis of the introduction and conclusion for one of the subjects used as illustrations, develop a body that would cover the same scope and establish the same thesis.
6. Study pp. 272-306 in College Handbook of Composition by Woolley, Scott, and Bracher in order to obtain a background for using the library and for making an investigation.
7. Study pp. 3-26 in College Handbook of Composition by Woolley, Scott, and Bracher which explains the organization of a composition.
8. Analyze the examples collected for 2 from the standpoint of the fundamental qualities of exposition. Which qualities are weak or lacking? Which qualities add to the effectiveness of the whole composition?
9. Outline two of the examples of exposition chosen for 2 in order to determine the plan followed by the writer.

FOR FURTHER READING

- Curl, Mervin James, Expository Writing, Revised edition, pp. 11-46.
- Fulton, Maurice Garland, Expository Writing, Third edition, pp. 3-80.
- Rorabacher, Louise E., Assignments in Exposition, pp. 1-19.
- Smart, Walter K. and Daniel R. Lang, Smart's Handbook of Effective Writing, pp. 16-44.
- Stewart, John L., Exposition for Science and Technical Students, pp. 1-28.

CHAPTER III

THE PROCESS REPORT

Now that the history and uses, make-up, and qualities of the exposition in general have been explained, the background for the classes and types of exposition which seem to be most useful and practical for the engineer has been laid.

I. DEFINITION

The process report is the simplest class and, consequently, is the first to be considered. In its usual form it involves the explanation of a procedure: how to make or do something or how a mechanical device works. By use of a logical definition, it may be explained as follows: a process report is a class of expository writing which explains an operation or how something is done. "A process implies a method of operation: how fabrics are dyed, how a model plane is flown, how a propaganda campaign is conducted, or a skeet field is laid out, how a college course is taught and learned."¹

II. DIFFICULTIES AND FEATURES

There are several difficulties and features of this

¹John S. Naylor, Informative Writing (New York: The Macmillan Company, 1942), p. 62.

class of report which must be given special attention.

Frequently the writer will know so much that he will assume that the reader knows just as much. Be careful to explain specific, technical terms involved: for example, "green" in golf or "beaker" in chemistry.

In this type of exposition, a diagram or a picture or any kind of Figure will help to clarify. The writer should name, number, and letter the Figure and frequently refer to it throughout the report.

In analyzing and describing an operation, the style of the paper may become extremely mechanical. To avoid being mechanical, do not use short, choppy sentences; do not monotonously repeat introductory transitional words and phrases; and do not persist in using the imperative mood. Vary the connectives, and gracefully combine the short sentences. The imperative mood, if it is used, can be made less monotonous if the writer will use synonyms and will use indefinite pronouns for the doer of the act and if he will vary the voice of the verb. Usually, unless the writer wishes to popularize and informalize the paper, the report will be written in the passive voice and third person. The combining of short sentences will be made less awkward if the writer stocks himself with coordinate connectives to replace "then," "next," "after this," "secondly," "following this," and "to continue." These connectives are not objectionable unless they are monotonously used. It has been said that "variety is the spice of life." This principle was never more true than in

writing. Some freedom of style may be taken, but the writer must be careful of flippancy which will detract from the clearness of the exposition.

III. TYPES

The engineer will have practical use for three types of the process report: the generalized narrative, the step-by-step specific narrative, and the laboratory.

The generalized narrative process report. This type of report explains an operation in a loose way. The report may not include all of the essential steps, and these steps may not be presented in logical sequence. The writer will probably omit minor steps. He may present the steps in the order determined by the purpose of the paper or thesis. Avoid telling how an operation is specifically done--this report is generalized narration. Regardless of what the purpose of the analysis or description may be, the writer does not expect the reader to be able to perform the procedure after he has read the exposition. The paper explains only how such and such a thing is generally done or how a game is generally played; but in making the explanation, it must have an underlying purpose; otherwise it will be only a description and not an exposition. For example, if one were writing on the subject, How to Become a Good Draftsman, he might take the point of view that the proper techniques of drafting may be derived only from good methods of practice. In such a case, the writer would tell only that about

the procedure which would be necessary to establish the point of view. We might conclude with a logical definition. A generalized process report is a type of expository writing which explains an operation in a loose way.

The following steps are recommended in clearly and completely presenting such a report:

1. Logically introduce and state the thesis.
2. A brief description of the subject or object involved or an explanation of what it is (optional, depending on the purpose of the paper).
3. Materials and equipment used (optional, depending on the purpose of the paper).
4. An explanation or description of the procedure.
5. A logical conclusion.

The paper appended at this point in the chapter shows how one student at the South Dakota School of Mines and Technology avoided the above-mentioned specifications or fell into them. It should be studied along with professional examples before an attempt is made to write this type.

Example A

HOW TO BECOME A GOOD DRAFTSMAN

Almost any person who is above the age of ten years can take a set of drafting instruments and make a simple drawing. But a person who has not had proper training cannot do efficient drafting. In fact, there are many seasoned draftsmen who do not do efficient work. A good draftsman must be able to work both rapidly and precisely. The proper techniques of drafting may be

derived only from good methods of practice.

Anyone who wishes to become a good draftsman must acquire a good set of instruments as well as other necessary equipment. To buy cheap instruments is a waste of time and money. Cheap instruments will need frequent repairs and will not do quality work. A drafting set consisting of a bow instrument, a compass, a ruling pen, and a pair of dividers will be sufficient for a beginner. A good grade of paper with a hard finish costs very little more than poor paper and will give much better results.

The ability to concentrate on his work is as necessary to the good draftsman as it is to a person of any other profession. The room in which the draftsman or prospective draftsman is to work should be free from any outside noise and distractions. Concentration is much easier in a place where there are few distractions. Good ventilation will help the draftsman to think clearly; consequently, he will do better work. A good lighting system should be arranged. A combination of direct and indirect light will reduce eye-strain and will prevent fatigue to some extent. In addition to these two lighting systems, many draftsmen use a small, shaded light which may be cast on any particular part of the drawing. The drawing desk and stool should be chosen with regard to comfort. Of course, an overstuffed chair would by no means be proper, but a desk and stool which will allow the draftsman to retain a good posture while working are desirable. Loose, comfortable clothes will allow the necessary freedom of movement.

A beginner should first work for precision and accuracy. As he becomes more proficient in handling the instruments, he will gradually and naturally gain speed. The beginning draftsman must always remember that speed alone is of no value, but accuracy plus speed is a combination that cannot fail.

The step-by-step narrative process report. The procedure in this report is similar to the generalized narrative process report. The main difference lies in the explanation of the operation, or step D. The step-by-step narrative process report explains a procedure in a specific way. All steps are included and are presented in a logical sequence

whereas the generalized narrative process report explains how an operation is generally performed--it may not include all of the steps or present them in a logical sequence. The writer of this type of report should give attention to the difficulties and features of the process report in general. All five steps in the procedure listed under the generalized report should be followed--none are optional. The reader should be able to perform the process with no other directions after reading the report.

"Perhaps the greatest lack in exposition of this type (refers to specific process report) is centralization."² In other words, the writer should show that all parts and aspects of the subject are related and that they affect each other and interact. For this purpose, he will find the greatest help in ascertaining the fundamental notion or controlling purpose for explaining the subject, which is known as the thesis. May we again quote from Curl:

For example, to make your reader see the relation of the various parts of the tachometer, you should discover and present the fact that the machine relies primarily on that principle of centrifugal force as affecting the mercury that whirls as the automobile moves."³

If the reader understands this principle, the various parts of the mechanism assume their proper relations and become clear.

²Mervin James Curl, Expository Writing (Boston: Houghton Mifflin Company, 1931), p. 159.

³Ibid., p. 159.

Examine the example of this type of process report which follows and which was also written by a student at the South Dakota School of Mines and Technology.

Example B

HOW TO CONSTRUCT A CONCRETE WALK

A poor concrete walk is worse than no walk at all. A good walk is very easy to construct if one knows what to do and how to do it. The task may be limited to the following tools: a hoe, a shovel, a float, a hammer, a groover, an edger, and a watertight box. The material that is needed may be limited to sand, cement, water, nails, and enough lumber to build the forms. A concrete walk is a strip of concrete which is from two to four feet wide and about five inches thick.

The first step in building a concrete walk is to level the ground and form a good foundation for the walk. A person will find that he will have a better foundation if he holds the blade of the shovel in a horizontal position when he digs out the excess dirt.

The next step is to build some good, solid forms to keep the concrete within bounds. To build the forms, one should lay the boards in the position that he wants them; and then he should pound some strong stakes at regular intervals behind the boards (see Figure 1). The boards are then to be nailed to these stakes. The forms should be well braced to insure success.

A person can brace the forms by driving more stakes in beside the boards or by running short boards from the tops of the forms to the stakes that are situated three or four feet behind the forms (see Figure 1). The forms must be level with each other, and a person can level them by driving the stakes on the high side in a little deeper (see Figure 1). After the

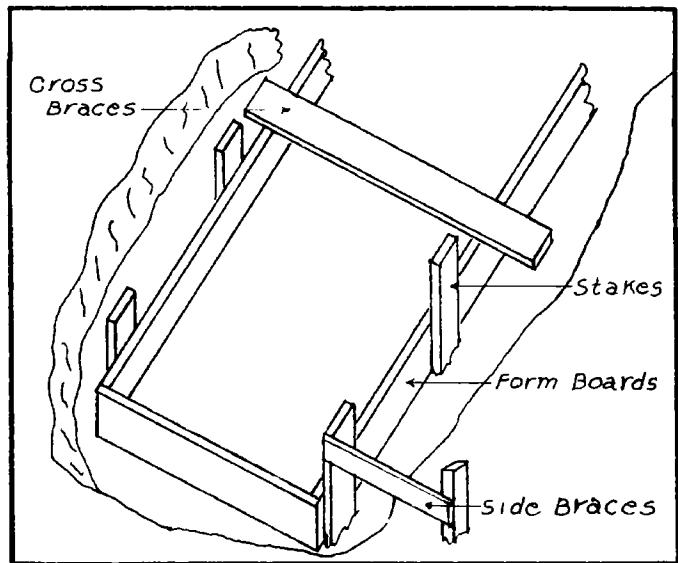


Figure 1

forms are leveled, boards should be nailed across the top to give the forms more stability (see Figure 1).

After the forms are secure, a person can start to mix the concrete which should be mixed in a ratio of five shovelfuls of sand to one shovelful of cement. The first step in mixing concrete is to put the necessary quantities of sand and cement in the box and mix them until the cement is uniformly distributed throughout the mixture. Water is then added to the mixture in small amounts, and the mixture is stirred with a hoe until it reaches an even consistency which will flow but will not run too freely. After the concrete is mixed, it should be placed between the forms and tamped by running the blade of the shovel into it many times.

The concrete is now ready for floating or leveling, and this is done by running a small sheet of metal with a handle on it (see Figure 2) over the surface until it is smooth and flat. When the concrete becomes slightly rigid, it is ready to be edged and grooved.

To edge it, the edger (see Figure 2) is run along the top edge of the concrete; and this puts a smooth, round edge on the walk.

To groove it, the walk is divided into a number of equal parts; and the groover (see Figure 2) is run across the concrete at each of these points. This gives the walk a chance to crack on an even plane if cracking occurs. In two or three days, the forms should be removed; and the cement should be washed.

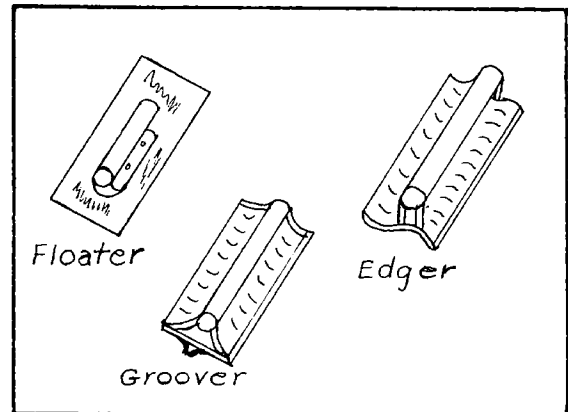


Figure 2

Good concrete walks are a valuable asset to anyone's property; so why not make good ones? It is easier to build one good walk than it is to build two poor ones.

The laboratory report. The laboratory process report is a type of expository writing which states the purpose and materials, explains the procedure, and gives the results of an experiment in a semitabulated form. Since this is the type practiced in all laboratory courses, this manual will not emphasize it.

ASSIGNMENTS

1. Study Chapter V, pp. 155-186, in Expository Writing by Curl entitled "Mechanisms, Processes, and Organizations." Notice, in particular, the professional examples.
2. What is the controlling purpose, or thesis, in examples A and B? Do all of the facts of the bodies cling to the theses?
3. Analyze examples A and B from the standpoint of the difficulties and features of the process report.
4. Could the introductions and conclusions of examples A and B be improved? If so, how? What methods for accomplishing the purpose of each has been used?
5. In example A, the body is a loose, general explanation of the procedure which treats only part of the steps. Are there other steps that should be added in order to establish the thesis?
6. Notice that the materials and equipment used are given in example B. Could one perform the operations with no other instructions?
7. Find one example for each of the first two types of process report. Bring them to class and be prepared to analyze them from the standpoint of the specifications for the various process reports that have been discussed.
8. The following subjects are suggested for writing a process report: a lumber camp, a mining camp, a college fraternity, golf, tying a fly, a concrete dam, a tennis court, the slide rule, the barometer, a blueprint, a

traffic-light system, changing a tire, a mathematical problem, a chemistry experiment, and winning friends.

9. Write a 300- to 500-word generalized narrative process report on one of the above subjects or on any other subject which adapts itself to this type. Apply all the principles previously studied.
10. Write a 300- to 500-word step-by-step process report on one of the above subjects or any other subject which adapts itself to this type. Again, apply all the principles or specifications previously studied.

FOR FURTHER READING

Babcock, Robert Witbeck, Robert Dewey Horn, and Thomas Hopkins English, Essentials of Composition for College Students, pp. 10-27.

Curl, Mervin James, Expository Writing, Third edition, pp. 155-186.

Fulton, Maurice Garland, Expository Writing, pp. 153-190.

Naylor, John S., Informative Writing, pp. 62-85.

CHAPTER IV

THE DEFINITION REPORT

Higher education demands of a student a constantly enlarging vocabulary, both general and specialized. Chemistry, physics, grammar, economics, drafting, and each of the other subjects which will be studied has a terminology peculiar to itself with which the beginner must be equipped before he can begin to understand the field. Likewise, when he finishes his higher education and takes a job in his chosen field of work, he must have a true understanding of the terminology of that field in order to pass his knowledge on to others and to explain the ideas and terms that he uses. Consequently, definition is highly typical of expository writing and highly useful to the engineer.

I. WHAT DEFINITION IS

As the derivation of the word definition implies, it means setting boundaries or limits and implies doing so in an accurate and exact manner. A lake is properly defined by the shore, a continent or island by its coast line. So, when a child asks, "What is America?" one shows on a map the pink or yellow space that is included within certain boundaries. The boundaries set a limit to the extent of that country; in other words, they define it. As soon as one steps beyond the limits of that country, he is in a realm of quite different conditions and circumstances; he is in a

country that has a different definition. And so, one can see that when someone asks what a hearth is, or contract, or pasteurization, or rheostat, he attempts, in his reply, to set bounds to the thing in question, to restrict it, to fence it off, to state the limits beyond which it ceases to be one thing and becomes another. The primary purpose of any definition is to explain the meaning of an idea or term.

What is done in dictionary fashion and at the same time called definition is greatly different from the definition done with the help of logic. "In expository writing two varieties of definition are to be distinguished. What is called logical is brief but highly exact; ..." ¹ Let us continue from the same source. "What might be called literary, or extended, definition is an expansion of a logical definition. This last usually proves too compact and requires a certain amount of amplification." ² The specifications and procedure for writing these two varieties of definition will be discussed later.

II. DIFFICULTIES AND FEATURES

Practice in writing definitions (particularly the logical definition) is good mental discipline, as well as

¹Maurice Garland Fulton, Expository Writing (New York: The Macmillan Company, 1939), p. 191.

²Ibid., p. 191.

excellent training in conciseness and care in the use of words, since it is difficult to arrive at unexceptionable definitions. The following summary of difficulties and features for writing both varieties of definition will be useful:

1. Define an idea or term, whenever possible, in words simpler and more familiar than it is. The purpose of definition is to clarify and not to confuse.

2. Avoid using the term that is being defined or a derivative of it. To say, "A fork is a fork for eating," explains little or nothing.

3. One may have a dull definition if he becomes too logical; and, yet, the writer must remember that his purpose is to explain the meaning of an idea or term; do not merely "talk about" the subject. It should be possible to make the report logical and also pleasurable to read.

4. Carefully avoid the too mechanical, the "too much" lacking in real life. People read with the double hope of being informed and being pleased. Remember the reader as well as the subject.

5. Italicize words used as words and foreign words.

6. Use bibliography and footnotes if necessary.

7. Do not try to use all of the information found in the investigation. Sift and use that which will most effectively establish the thesis of the report. This principle is particularly applicable to the extended or literary report.

8. Exclude everything that does not properly belong in the definition. For example, if an aeroplane is defined as

a machine that journeys through air under its own power, dirigible balloons, which are not aeroplanes, have been included.

9. Include everything that does properly belong in the definition. If a bridge is defined as a roadway over a stream, either resting on piers or hanging on cables strung over towers, the pontoon bridge and all bridges crossing dry chasms have been excluded. This statement does not imply that one must make an endless list of all possible forms; however, it does imply that a comprehensive statement or statements should be made which will cover all forms and kinds.

10. Be sure that the definition defines and does not merely make a statement about the idea or term. "An automobile is a necessary luxury for most families" sounds like a definition; but, alone, it does not fix any boundaries.

III. TYPES

The meaning of definition and the difficulties of writing and the features of this class of exposition have been considered. Now, let us consider the types. We found that there are two varieties of definition: logical and literary or extended. In developing the literary definition, there are several procedures or types available: (1) etymology, (2) synthetic, (3) analytical, (4) exemplification and illustration.

The logical definition. A logical definition is a type of expository writing which explains the meaning of an

idea or term with one sentence which contains four elements: (1) term, (2) verb, (3) genus, (4) differentiae. The above statement is a logical definition of a logical definition.

Let us analyze it from the standpoint of the elements:

a. The term designates that which is to be defined; for example, logical definition.

b. The verb gives the predication, such as, is.

c. The genus restricts the term to a conveniently limited class, such as a type of expository writing.

d. The differentiae includes the details which distinguish the term from other members of the class, that is, which explains the meaning of an idea or term with one sentence which contains four elements: (1) term, (2) verb, (3) genus, (4) differentiae.

The following statement is a logical definition of a mechanical device: a carburetor (term) is (verb) a mechanical device (genus) for mixing air and vapor of gasoline in proportions suitable for explosion in internal-combustion engines (differentiae).

Definition by etymology. The word etymology is derived from two words of Greek origin.³ Etymos means true; and, as applied to a word, refers to the true meaning of the word. The second Greek word is logia, which means gather. The two words were combined to form etymologia. Our word etymology, then means the gathered truth concerning the

³"Etymology," Encyclopaedia Britannica, 1949 edition, VIII, 790.

meaning of words. In a brief way the meaning of the term etymology has been explained by the use of etymology.

Definition by etymology (as we shall use it) is a type of expository writing which explains the meaning of an idea or term by giving the derivation in narrative form.

Synthetic definition. The implications of the meaning of some terms change over the centuries. A synthetic definition shows how over a period of years a term has changed and then indicates its meaning today in relation to its meaning years ago. In executing this type of definition, the writer must be careful to show that the meaning has changed. For example, vehicles have developed and changed through the years; but the meaning of the term vehicles has not changed; therefore, to show how vehicles have changed would not be synthetic definition. A synthetic definition is a type of expository writing which explains the meaning of an idea or term by tracing the development and change of meaning, over a period of years, in narrative form.

The following report, written by a South Dakota School of Mines and Technology freshman, is a combination of logical, etymology, and synthetic definition. Notice how the writer sets up a central thought or writer's attitude toward the subject and establishes the thought by successfully integrating the three types of definition.

Example A

CHEMISTRY

Probably no term has come to mean so much to industrialists during the past few years as the word chemistry. During this period practically all industries have found a need for one or more of the various branches connected with this interesting science. The science as well as the term itself is very old--probably dating back to before the birth of Christ. The term chemistry is of a rather indefinite origin; however, the most acceptable derivations come from Egyptian and Arabic sources. The term seems to be definitely associated with the word Chemia, which Egypt was called on account of the black color of the soil. This term was also applied to the black of the eye, which symbolizes those things which are obscure and hidden. Chemistry is related to the Coptic word khems or chems, which also signifies obscurity and to the Arabic word chema, which means to hide. It should be observed that all these words have a common meaning, namely darkness or obscurity. This meaning was derived from the fact that chemistry originally dealt with the secret art of the transmutation of metals. This art was a closely guarded secret; and thus from its characteristics, the term chemistry was derived. However, the meaning thus derived from the derivation of the term is not the true meaning of the word chemistry. The true meaning of the word chemistry has a much more significant value. In fact, it would not be possible to give only one definition as chemistry throughout the years of its development has had an interesting and variable meaning.

The term chemistry in its original sense represented a science whose practitioners sought to change the base metals into noble metals, such as gold and silver. Then, too, they sought to obtain the elixir vitae, a substance which was to change old men into youths. The other substance which the practitioners of this form of chemistry sought was the universal solvent, which was to change everything to a liquid form. This form of chemistry was called alchemy, and its participants were called alchemists. The alchemists differed greatly from the chemists of today. Usually they were hindered by social and religious ideologies. They used no scientific method of attack to solve their problems, and as a result most of the theories and solutions which they put forth seem absolutely ridiculous today.

As time progressed, however, the meaning of the term chemistry began to change. Scientists began to disregard the superstitious beliefs which had hindered the advancements of the old alchemists. They began a long and never-ending search for truths regarding the composition of the earth and changes that take place thereon. Scientific methods of reasoning took the place of the mysticism, astrology, and magic which the alchemist had to contend with. Generalizations and laws were not formulated until they had been proved by years of experimental evidence. As a result, progress in the field of chemistry was rapidly accelerated; and the meaning of chemistry evolved into the one which it has today.

Today, chemistry is the science that treats of the composition of substances and the changes which they undergo. The modern chemist, having cut himself off from the superstitions and mysticisms of the old alchemists, prides himself on being scientific. Nevertheless, he still cannot escape the golden taint of the old alchemist from whom he derived his name. Since the relationship is merely in nomenclature, the influence fortunately is not great. Thus, chemistry has grown from a stage of superstition into one of the most important sciences of the day.

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Definition by exemplification and illustration.

An effective, and yet a simple, method of explaining the meaning of an idea or term is to give examples and illustrations. When one does not understand, he naturally says, "Give me an example," or "Illustrate your point," or something equivalent to these statements. When he understands, he says, "Now I see what you mean."

The examples and illustrations must be carefully selected. They should not be obscure but should be of such a nature as to really clarify the meaning of the term under discussion. They must be presented interestingly and attractively with the illustrations firmly integrated into the narrative, descriptive examples.

The terms illustration and exemplification are normally used interchangeably; but for the writing of this type of definition report, a clear-cut distinction will be made. Illustration means to elucidate with pictures, Figures, or any design that seems desirable. Exemplification means a written case which elucidates and shows the characteristics and qualities of the idea or term being defined in narrative form.

The danger in this method is that the examples and illustrations chosen will not be fair. If the Figures and written cases cover too little ground or if they too highly accentuate one phase of the subject of definition, this unfairness may occur. To avoid this danger, be sure that the examples and illustrations are sufficiently comprehensive; and if they are not, add more of them to the report until there is an all-around coverage of the idea or term being defined. The writer should avoid simply giving different uses of a concrete term; rather, he should give examples of a concrete term which are physically different but a basic principle of sameness in meaning and use. If the uses are given, the meaning has not been explained by this method.

Definition by exemplification and illustration is a type of expository writing which explains the meaning of an idea or term by the use of Figures and written cases; it is usually assisted by contrast and comparison.

Analyze example B which follows. It, too, was written by a student at the South Dakota School of Mines and Technology. Is the example obscure or clear? Are the illustrations and examples well integrated? Do they cling to the central purpose? Do they have common characteristics? Is the example comprehensive with an all-around coverage? What is the controlling purpose?

Example B

VALVE

The valve plays one of the most important roles in modern industry. If one of the huge valves at Boulder Dam were to fail to operate, the electric power output would be reduced; and many cities would be without electricity. The word valve comes from the Latin word valvae which means folding doors. Valves vary in size from the small valve used in automobile tires to the huge valves in the Panama Canal. A valve is a mechanical device which controls the flow of liquids, gases, or loose materials.

Valves are usually made of metal, such as iron, steel, copper, or bronze.

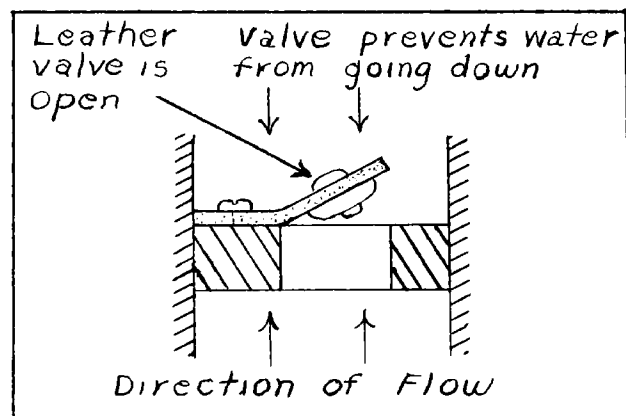


Figure 1

The most ancient form of the valve is the leather flap valve which is still used in small pumps (see Figure 1). The flap valve is used in hand pumps to allow water to pass through the plunger on the down stroke and to prevent its return on the lift stroke.

The human heart is an example of a valve which allows a liquid to flow in one direction but opposes the flow in the opposite direction. The valves in the human heart generally operate in pairs, one allowing the blood to flow into the heart and another allowing the blood to flow out as is shown in Figure 2. Valves of this type are also used in many automobile fuel pumps.

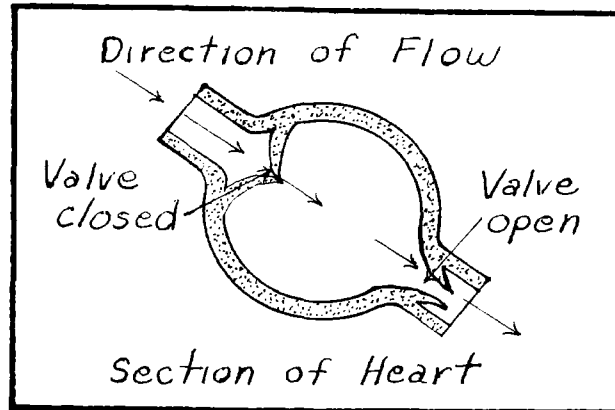


Figure 2
HEART VALVES

All automobiles, in order to operate successfully, depend upon a small steel valve which controls the intake of fuel and the exhaustion of burned gases. Although these valves make up only a small part of the engine, the successful operation of the automobile engine depends upon their efficient operation. As is shown in Figure 3, these valves are held closed by a strong spring and are opened at the correct time by a device called a valve lifter.

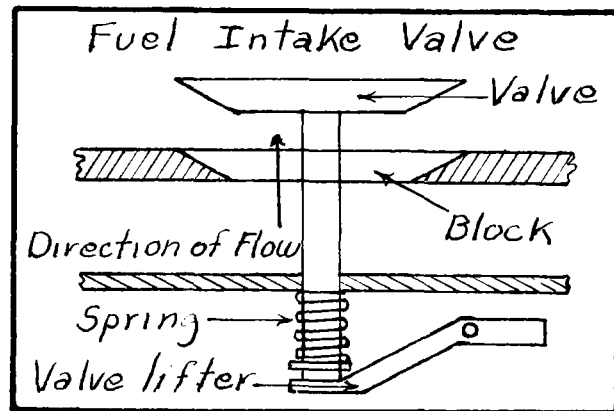


Figure 3
AUTOMOBILE VALVE

The ordinary water faucet is a type of valve which is called a screw valve. Although many valves are automatically operated, the water faucet is turned by hand until the correct flow of water is obtained.

Another type of valve is the safety valve which opens when the pressure of a liquid or gas reaches a dangerous point. One application of this type of valve is the safety valve in a pressure cooker. If the pressure cooker builds up too much pressure, the safety valve opens and allows the steam to escape.

The float valve is a type of valve which opens when the level of a liquid reaches a certain point.

The first valve was a crude device made of leather; man has since so expanded his industries that many different types of valves are needed to meet his requirements. Valves not only make our lives much more enjoyable but they also protect our safety. A valve is a

mechanical device employed to control the flow of liquids, gases, and loose materials through pipes, chutes, and passages.

Analytical definition. A common method of explaining the meaning of an idea, term, or object is by analysis. In this case the writer explains the subject from as many different points of view as possible. He may describe its appearance. He may tell where and how it is found, what it is used for, or what its physical properties are. By so doing, he hopes that one or more of the explained aspects will catch the attention and understanding of the reader. He may show what it is not and, thereby, show what it is. A discussion of what it is not should be scattered through the context in the way of contrast. An analytical definition is a type of expository writing which explains the meaning of a term or idea by giving a summary of all the varying aspects, by telling what it is not, thereby telling what it is in the way of contrast.

In the next student example, what are the varying aspects of the subject? Notice how the writer explains what the term rubber means by the use of contrast. Is the coverage complete enough to explain thoroughly the meaning of the term?

Example C

RUBBER

Rubber does not exist in nature as actual rubber, but it is easily obtained by processing the juices of

certain tropical trees. There are hundreds of types of plants whose juices, which are called rubber latex, are suitable to the making of rubber. A process has been developed fairly recently by which man can produce a synthetic rubber hydrocarbon from other hydrocarbons of similar chemical structure. Rubber is an elastic, resilient solid obtained from rubber latex. However, the term rubber is applied widely and loosely to crude rubber, pure rubber, and all compounds of the rubber hydrocarbon.

Rubber in its crude and pure forms is of little value, but it becomes one of the most useful materials of modern life when it is compounded with other substances and vulcanized. The main qualities which make rubber so valuable, especially when it is vulcanized, are as follows: toughness, softness, elasticity, impermeability, adhesion, and electrical and frictional resistance. The pneumatic tire makes use of several of these qualities of rubber, but a satisfactory tire could not be made of rubber alone. Compressed air and nylon or cotton fabric must be used with the rubber to produce the desired results. Types of shock absorbers vary from chair cushions to the mechanical shock absorbers of industry, and most of them make use of rubber in some way. But rubber itself will absorb very little shock until it has been filled with air bubbles. This fact was definitely proved recently in New York. An egg was dropped from a seven-story building upon a small square of rubber placed on the sidewalk. The piece of rubber contained thousands of tiny hydrogen bubbles. The egg bounced several feet into the air, and it was unharmed by the fall.

Rubber is used widely in making shoes and overshoes, but shoes or overshoes made of rubber alone would not be practical. Leather or fabric must be used with the rubber to make quality shoes. Rubber is an excellent insulator, and it is used as insulation in practically all electrical wiring. Special types of rubber may be used independently as insulation, but the rubber insulation is usually covered with a more durable material to increase the effectiveness and the life of the insulation. Good erasers can be made solely of rubber, but the addition of an abrasive substance to the rubber will produce a more effective eraser. Rubber can be made highly resistant to water, and it is used in the manufacture of many waterproofing materials. Cloth impregnated with rubber is used in making raincoats and many other waterproof coverings. Thin sheets of rubber could be used alone as a waterproof material; but a cheaper, stronger material is produced when a fabric is

impregnated with rubber.

Pure rubber is a white, unsaturated, solid hydrocarbon which burns almost as easily as any other hydrocarbon; but it would be impractical to use rubber as a fuel. Rubber is used widely in industry, but it is usually combined with other substances which possess qualities that rubber does not have. Rubber is, however, very resistant to the action of all but a few chemicals. It is not, therefore, a useful chemical reagent; but it is used in the chemical world for stoppers, tubing, sealing material, and so forth.

There are thousands of other uses of rubber in this modern world. Perhaps rubber is not essential to the existence of mankind; and, yet, because of its wide and important uses, it is very essential to the progress, the prosperity, the well-being, and the happiness of all mankind. Motorists, scientists, industrialists--yes, almost every human being, would be hindered in his work, in his play, and in his life as a whole without this wonderful blessing of nature.

ASSIGNMENTS

1. Study Chapter V, pp. 67-97 in Essentials of Composition by Babcock, Horn, and English, entitled "Definition of the Abstract Term or Idea." Notice in particular the professional examples.
2. Analyze examples A, B, and C from the standpoint of the difficulties and features of the definition report.
3. What types of definition have been used in this chapter to explain the meaning of the class of exposition known as definition and its types? Be specific.
4. The following subjects are recommended for writing a definition report by the logical, etymological, or synthetic types: engineering, orchestra, archaeology, science, psychology, geometry, plumbing, meteor,

alphabet, microscope.

5. The subjects listed below are adaptable to definition by exemplification and illustration: thermostat, ribs, branches, bridges, shafts.
6. Almost any subject, concrete or abstract, will adapt itself to analytical definition.
7. Write an exposition which defines an idea, term, or object by the use of logical, etymology, and synthetic definition.
8. By the use of exemplification and illustration, define an idea, term, or object in the form of an exposition.
9. Explain the meaning of an idea, term, or object in an exposition by the use of analysis.
10. Study pp. 272-306 in College Handbook of Composition by Woolley, Scott, Bracher on "The Library and the Research Paper."

SUGGESTED SOURCES FOR DEFINITION INFORMATION

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Tweeney and Hughes, editors, Chamber's Technical Dictionary. New York: The Macmillan Company, 1940.

Note: Use any standard unabridged dictionary or encyclopedia. Also, use the card index in the library for locating books that may have information.

CHAPTER V

THE ANALYSIS REPORT

When a chemistry instructor assigns a solution of unknowns or a mathematics instructor assigns a problem to be solved, one is obliged to analyze it--to break it down into the elements of which it is composed. Likewise, when a report is assigned in the English class, the student must determine the divisions of the subject. After the student graduates and enters the field as an active engineer, he will be assigned one task after another which will require analysis. Analysis is a process which reaches into almost all of the activities of life.

Every problem to be solved, every situation that requires thinking through, must be analyzed and its components discovered, in order that a solution or conclusion may be intelligently reached.¹

Thus a prospective engineer can readily see that he will have many practical uses for this class of expository writing.

I. DEFINITION

Analysis, in a way, is basic to all expository writing, in that all exposition demands that the subject be broken down into its component parts; however, the various classes and types of exposition are different in purpose. What we think

¹Louise E. Rorabacher, Assignments in Exposition (New York: Harpers and Brothers, 1946), p. 135.

of as an analysis report has its own special purpose.

Like the process report and the definition report, the report by analysis will have a general objective which will always be the same regardless of type. The general objective of the process report is to explain an operation; the definition report explains the meaning of an idea or term as its general objective, whereas a report by analysis always breaks down the subject into its component parts or classes for the purpose of seeing of what the subject is made. Whenever one wants to show how a purpose is brought about, to show result, influence, consequence, importance, cause and effect, or difference or wishes to solve a problem, he is likely to use analysis.

Curl² has pointed out that if one is to write an analysis, he will be required to observe two virtues, truth and thoroughness. An analysis of a subject which is incorrect would be as worthless as a problem in mathematics incorrectly solved. If an engineer is requested to investigate a proposed tract of land for the Rapid City Airport and fails to report numerous lakes within the tract or high hills around the tract, he has not only been incomplete in his analysis but he has also been untruthful or inaccurate.

On the basis of completeness, analysis can be divided into two classes, formal or logical and informal or literary.

²Mervin James Curl, Expository Writing (Boston: Houghton Mifflin Company, 1931), p. 98.

II. THE TWO CLASSES OF ANALYSIS

Formal analysis continues its splitting into sub-headings until the demands of the thought are entirely satisfied. Informal analysis, on the other hand, does not attempt to be so thorough, but aims at giving the core of the subject, at making the point of view understood to a point beyond a doubt. If one is to establish the validity of buying a certain tract of land to be used for the proposed Rapid City Air Base, he must consider all aspects--this is formal. If he fails to consider the aspect of surrounding terrain, for example, his analysis is worthless. However, an editorial writer seldom intends to give all classes or divisions of his subject; he intends only to give enough to interpret the subject properly and truthfully--this is informal.

Formal and informal analysis are also to be divided according to whether the subject is singular or plural.

III. THE TWO CLASSES OF FORMAL AND INFORMAL ANALYSIS

Analyses are to be divided upon the basis of whether the subject can be divided into parts, which will indicate that it is singular, or classes, which will indicate that it is plural--that is, men may be divided into classes, such as black, yellow, or white, whereas man must be divided into parts, such as leg, arm, and head. In the first case, we have what is known as classification; in the second case, we have what is known as partition.

IV. PRINCIPLES AND PROCEDURE OF ANALYSIS

The problem that confronts the writer, then, in any type of analysis is "How shall I go to work?" The first necessity is to choose a subject which readily adapts itself to analysis and the type that is to be applied; then one must determine the controlling purpose and, on the bases of subject and controlling purpose, decide whether the division will be partition or classification and the treatment formal or informal. The principles of outlining³ must be put into practice. A complete investigation of the subject must be made in order to lay this foundation. When the data or information is gathered and organized, the student is ready to write.

V. TYPES

Analysis may appear in several forms which are determined, quite largely, by the purpose for breaking down the subject and wanting to see of what it is made. Analysis by enumeration, statement of significance, statement of relationship, and statement of problem are considered in this chapter.

Analysis by enumeration. One of the forms in which analysis may appear is enumeration. It will usually answer

³Edwin C. Woolley, Franklin W. Scott, and Frederick Bracher, College Handbook of Composition, Fifth edition (Boston: D. C. Heath and Company, 1951), p. 9.

the question, "What is the purpose of the subject?" It is distinctly in the enumerative order, the progression being determined by the controlling purpose or thesis; however, the report must be in the narrative form and must not be tabulated.

Analysis by enumeration takes a predictive point of view; it shows purpose and, consequently, shows what the results or consequences should be, not necessarily what they will be. For example, the "G. I. Bill of Rights" was passed by Congress to aid veterans of World War II in readjusting themselves in civilian life and to provide them with a start in civilian life. The ways in which this purpose is accomplished are the enumerations. However, there were probably certain results or consequences, such as corruption, which were never intended as purposes.

Analysis by enumeration is a type of expository writing whereby the writer shows the purpose of a proposition by tabulating the reasons or explains or establishes the purpose of something by giving the reasons why the purpose is accomplished. In the following report written by a South Dakota School of Mines and Technology student, what are the purposes of the Missouri River Authority program? Are the purposes the same as some people think the results or consequences will be? Has the writer generalized or has he been specific in the enumerations? Is the subject formally or informally treated? Is the subject partition or classification? Notice the outline. Has the writer

violated any of the principles of good outlining? What is the thesis? Notice that the purposes establish the thesis.

Example A

THE MISSOURI VALLEY AUTHORITY

- I. Introduction
 - A. Need for flood control
 - B. Other advantages of Missouri Valley Authority
- II. Flood Control
 - A. Present situation
 - 1. Monetary losses
 - 2. Loss of life
 - B. Successful system
- III. Power source
 - A. Rural
 - B. Industrial
- IV. Irrigation
 - A. Need for irrigation
 - B. Results of irrigation
- V. Conclusion
 - A. Need for Missouri Valley Authority
 - B. Advantages of Missouri Valley Authority

THE MISSOURI VALLEY AUTHORITY

Each year the lower Mississippi River valley is swept by devastating floods. Much of the flood waters comes from the Missouri River. The Missouri River Authority, a system of dams on the Missouri River, will stop extensive flood damage on the Mississippi and offer many additional advantages to the people of the Missouri River basin.

Many lives are lost, and millions of dollars worth of property damage is done every year by the Mississippi River flood waters. If part of the water could be held back for a short time, much loss of life and property could be avoided. This theory has been proved many times by the network of dams included in the Tennessee Valley Authority. The dams built by the Missouri Valley Authority would enable men to conquer the formerly uncontrollable flood waters of the Mississippi.

The power potential of the Missouri River has not been utilized. Many rural communities in the areas on

both sides of the Missouri are without the modern conveniences made possible by electricity. In addition to furnishing power to thousands of rural families, the Missouri Valley Authority could provide power to city residents and industrial consumers at rates much lower than are now being charged by independent power companies. With the prospect of low power costs, many industries would be drawn into the sparsely populated area of the Missouri River Valley. These industries would open a new field of employment and greatly increase the population.

Under present plans for dam construction, the entire valley of the James River, in eastern South Dakota, could be irrigated. Production of food on land that is irrigated is more than double that on nonirrigated land. Many people on the earth are in a state of starvation today. Many people could be fed with the additional production of food by irrigation of the James River basin.

There exists today a need for flood control on the Missouri River. The Missouri Valley Authority will not only prevent floods but will offer a new and better future for the population of the Missouri River valley.

Analysis by statement of significance. Frequently a writer wishes to show the root meaning of a subject--its importance, influence, consequence, or result. In these instances, he is using analysis by statement of significance. As stated previously, analysis by enumeration shows purpose. Significance, at times, is the result, influence, or consequence of a purpose; other times significance is the same as the purpose. The purposes of the Missouri River Valley Project are irrigation, power, and flood control. These purposes may also be results of the project; however, the significances or consequences may be graft or the project may put many private utility companies out of business, in which case the significances are not purposes. If purposes and significances are the same, then the only difference in

the types of analysis is in the point of view taken by the writer.

Analysis by statement of significance is a type of expository writing whereby the writer establishes the proposition by showing result, consequence, importance, or influence in narrative form without attempting to break the subject into its obvious parts. What is the central point of view of Example B which was written by another student at the South Dakota School of Mines and Technology? Which of the kinds of significance (importance, influence, consequence, result) are shown in the example? Could the significances be purposes?

Example B

COAL IN MODERN TIMES

Almost anything that a person may think of today is related to coal in some way, is derived from coal, or is produced by the use of coal. Consequently, coal has become one of the most important substances of modern times; and serious consequences befall the nation when the supply of coal is not adequate.

Coal is a black, combustible mineral which is composed of carbon and carbon compounds. Its chief use is as a fuel in industry where it produces nearly all of the heat needed to keep many huge industries in operation. Without coal, many of the nation's major industries would stop operating.

Nearly all of the iron and steel produced today is made with the use of coal. The coal is destructively distilled and broken down into coal gases and pure carbon in the form of coke. This pure carbon is mixed with the iron to produce steel. The gases are burned to distill more coal and to heat and melt the iron or steel. In the hot, nearly melted state, the steel can

be worked into the many shapes required for the production of many articles in common use today. When the supply of coal is low, the production of the large amounts of steel required by this nation is impossible.

Transportation also depends largely upon coal. Many of the railroad engines which haul produce all over the nation depend upon coal to furnish the power needed to transport the produce. Without this coal, the huge system of railways cannot operate. This in turn causes a large supply of produce to pile up in the stock piles, and more factories shut down. Other factories, unable to obtain the necessary steel and other raw materials because of lower steel production and lack of transportation must close.

Even the common people who never think of factories or railways feel the importance of coal. Coal keeps many of them warm in winter. Coal derivatives furnish the dyes for their clothes. Coal derivatives furnish many of the medicines they take when they are sick. During an extended coal shortage, people are unable to buy the products they need to keep a home in order. Many people are left without work when the factories in which they work are idle because of coal or raw material shortage. In this manner, coal has a significance to everyone in every walk of life.

Coal is a very important substance. It provides men with work. It provides iron and steel for construction, for automobiles, and for thousands of other products necessary to maintain our standard of living. It provides transportation. It provides medicines, dyes, and many other articles. A shortage of coal can bring serious results to a nation which is so dependent upon coal. The importance of these results is shown by the fact that everyone in the nation is affected by them.

Analysis by statement of relationship. A third class of analytical writing is the showing of the relationship or connection between two or more ideas or things. Under this heading we find a large group of subjects which answer the question, "Why?" as for example, "Why do we have strikes?" "What is the difference between Ping-pong and lawn tennis?" or "What are the causes and effects of strikes?"

Relationship will usually take the form of difference or cause and effect. In using either of these forms, the writer must be careful to have a central thought which a discussion of the relationship establishes; otherwise the discussion is not exposition. Difference implies comparison.

Analysis by statement of relationship is a type of expository writing which establishes a point of view by showing the connection between two or more ideas or things by cause and effect, difference, or any connection which has real existence. In each of the following analyses, what kind of relationship is shown? Is there a real purpose or thesis for showing the relationship or is it artificial?

Example C

DISTINCTION BETWEEN HELICOPTER AND AUTOGIRO

After the first flight of the heavier-than-air machine made by Orville and Wilbur Wright in 1903, development in the field of aeronautics has proceeded at a rapid pace. The development was given a great impetus by the event of two world wars. Many and various types of airplanes were conceived during these evolutionary periods. During the course of these historic events, the need for an airplane which could become air-borne in a limited space and could remain suspended in air was realized. The solution to this problem was given by the invention of the helicopter and autogiro. As these types of airplane became more common, the use of the terms, helicopter and autogiro, began to be used interchangeably. However, although both machines are of the heavier-than-air type, a fundamental difference in construction and operation makes a definite differentiation between the two.

Both the helicopter and the autogiro differ from the ordinary airplane by having a revolving instead of a stationary wing. This revolving wing, which resembles a large rotor, is situated on top of the fuselage. This location is also the place where the helicopter and autogiro differ.

Because the large revolving rotor of the helicopter is power driven, the helicopter does not derive its lift from the motion of the whole machine through the air. As a result of this phenomenon, it is capable of hovering and of rising and descending almost vertically. In many types the helicopter has only this one revolving air screw. In other types it has a power-driven propeller situated on the tail. This air screw, however, merely serves as a rudder and stabilizer. The helicopter derives practically all of its lateral as well as vertical motion from the main rotor. By varying the pitch of the blades in the rotor, the operator can cause the helicopter to move forward, backward, or sideways or to hover in mid air.

The rotor of the autogiro, on the other hand, is not motor driven; and as a result it is dependent for its rotation upon the forward movement of the whole machine. To obtain this forward movement, the autogiro has a power-driven air screw similar to those on conventional airplanes. The blades of the horizontal rotor are hinged about axes which are perpendicular to the spindle about which they rotate. As the plane moves forward, these blades open in such a manner as to provide the maximum lift. The speed of these advancing wing tips is about twice the forward speed of the machine. Because the rotor is not power driven, the autogiro cannot rise vertically; however, it is capable of becoming airborne in a very limited space. In addition, it cannot hover in mid air or move backwards or sideways; but it is capable of very low flying speeds.

Thus, a fundamental difference is seen to be existing between the two types of aircraft. While the difference is not too great, the individual features, nevertheless, are quite distinct. Because of these differences the uses for each type of aircraft are varied. Helicopters have been used for rescue work where the landing of any kind of aircraft would have been impossible. In war time they have been used to a great extent for purposes of observation. The autogiro has been used mainly where the landing room is limited. Then, too, since the autogiro is supposed to be more efficient, it has certain economical advantages over the helicopter. In the future, common characteristics of both types of aircraft will probably make possible the services which cannot be rendered by other aircraft; and as a result, helicopters and autogiros will maintain their position of importance and value.

Example D

STRIKES

The present condition of strife between labor and industry in this country will have results of grave importance to all the people of the country. A careful analysis of the reasons why the strife exists and the results which it will have clearly shows that the people of this country are being victimized by power-crazed leaders of labor.

At times in the past, strikes have been called to bring about better and safer working conditions. Today working conditions are improved to such an extent that they are no longer a cause of strikes. The majority of strikes are brought about by jurisdictional disputes among the labor unions or by demands of labor for higher wages. The cause of jurisdictional disputes is clearly a desire for more power by the separate union bosses. Labor leaders declare that higher wages are needed to compensate for a higher cost of living. Higher wages are in turn a cause of higher prices. Thus the only person who can profit from higher prices is again the union boss.

The many strikes and work stoppages in the industries of this country through the past few months have prevented the production of an adequate supply of consumer goods. A natural result of such an inadequacy of supply is an increase in prices. As a final result, those persons who do not get a corresponding increase in wages are the victims. All strikes, regardless of their causes, have the same effect. The only person who benefits from strikes is the labor leader. Through jurisdictional strikes he gains power, and from higher wages he can collect higher dues.

Strikes which are brought about for unjust reasons serve only to provide a means of power and wealth for the labor leaders at the expense of all people who are not members of labor unions.

Analysis by statement of problem. Another form in which analysis often appears is a statement of a problem.

If Rapid City has a water problem and an engineer is asked to investigate the conditions under which the city

may secure its water supply, he will have a problem. First, the engineer will have to analyze the conditions. He will find how much water is needed, how great the present supply is, what sources are available for an increased supply, what the character of the water in these sources is, and any other conditions that may be important. He will try to determine whether the problem lies in the source or distribution of water. Then it will be necessary for him to present a solution to the water problem based upon the conditions surrounding the problem.

Obviously, the nature of the committee that appoints the engineer will somewhat determine the manner of approach to the conditions. If the report is to a financial committee, the engineer will emphasize cost; if the report is to a committee on availability of sources, he will emphasize available quantity and quality of water.

The writer must not confuse this type of analysis with statement of relationship, particularly cause and effect. The conditions of the problem may be the causes of the problem, but the effects will never be the solution. If Rapid City has a water shortage, lawns may dry up and people may go without baths. Dried lawns and no baths are effects, but they are not solutions.

There are, normally, four steps in the procedure for writing an exposition or report of analysis by statement of problem: (1) logically present the problem and state the thesis, (2) present the conditions which are

involved in the problem. If the report is formal, all conditions must be presented; if it is informal, all important conditions must be presented, (3) present the solution to the problem based upon the conditions, (4) reach conclusions based upon the thesis. If the report is advisory, the writer will make recommendations based upon the conclusions.

An analysis by statement of problem is a type of expository writing which solves a question by first presenting the conditions followed by the solution. In the following report written by a South Dakota School of Mines and Technology student, has the writer treated the conditions thoroughly enough to establish the thesis? Are the conditions directly related to the thesis and problem? Criticize the outline.

Example E

FLUORESCENT INTERFERENCE AT CONNOLLY HALL

- I. Introduction: Fluorescent interference at Connolly Hall
 - A. Effects on radio reception
 - B. Types of interference
 1. Direct radiation
 2. Voltage fluctuations
- II. Important conditions
 - A. How interference enters radio
 1. Directly
 2. Indirectly
 - B. How fluorescent lights produce interference
 1. Voltage change
 2. Poor electrical contacts
- III. Using an interference filter
 - A. Where to install
 1. Installation in fluorescent light
 2. Installing in radio
 - B. Effects of a filter
 - C. How an interference filter is constructed

- IV. Interference received by the aerial
 - A. Method of shielding lead-in
 - B. Solution for radios with built-in aerials
- V. Conclusion

FLUORESCENT INTERFERENCE AT CONNOLLY HALL

The interference to radio reception at Connolly Hall which is caused by the fluorescent lights is both bothersome and unnecessary. Many students can receive only the broadcasting station at Rapid City whereas others with better and more efficient receivers can receive several of the more powerful stations. The fluorescent interference is so loud that the weaker stations cannot be received. The two main causes of the interference are direct radiation into the radio through the aerial lead-in and voltage fluctuations. Almost everyone has noticed the "click" that is produced in a radio when an electric light is turned on or off. The "clicks" which are caused by electric lights are much like the "hash" which is produced by fluorescent lights with the exception that fluorescent lights produce a continuous series of "clicks" or interference. Is the fluorescent interference at Connolly Hall so bad that some drastic action must be taken to prevent it?

Fluorescent interference can get into the electrical system of a radio through the electric light supply line and through the aerial lead-in. Many portable radios have built-in antennas which are hard to shield against interference. The best place to eliminate the interference is at the fluorescent light, but the interference can be reduced by the use of an electrical filter in the radio.

A filter which is an electrical device used to eliminate electrical interference can be placed in the fluorescent light and will eliminate almost all of the interference caused by the fluorescent light. In order to be effective, filters must be placed in all of the fluorescent lights in Connolly Hall because if one of the fluorescent lights were left unfiltered, the interference would not be eliminated. Another method of eliminating the interference would be to install the filter in the radio. If the filter were installed in the radio, it would not be necessary to filter all the fluorescent lights. If interference is being picked up by the aerial, it can be eliminated by shielding the aerial lead-in. The most effective and economical method of eliminating fluorescent interference would be to install a filter in the radio instead of the fluorescent light.

Fluorescent interference at Connolly Hall is bad enough to warrant the use of a filter, and the best place to install the filter would be in the radio. The use of a filter is the only method by which the interference can be eliminated. By eliminating the fluorescent interference, one can have better and more enjoyable radio reception.

ASSIGNMENTS

1. Study Units 7 and 8 on analysis, pp. 135-166, in Assignments in Exposition by Rorabacher.
2. Investigate several newspaper and magazine editorials. Bring those to class which exemplify wholly or partly the types of analysis discussed in this chapter.
3. The examples of newspaper and magazine editorials are likely to be informal analysis; make a list of four or five subjects to be investigated which would probably demand formal analysis.
4. Study pp. 6-18 on outlining in College Handbook of Composition by Woolley, Scott, and Bracher.
5. Criticize the examples in Chapter V on the basis of the make-up and fundamental qualities of exposition which were discussed in Chapter II.

FOR FURTHER READING

Curl, Mervin James, Expository Writing, Third edition, pp. 97-154.

Fulton, Maurice Garland, Expository Writing, pp. 209-260.

Rorabacher, Louise E., Assignments in Exposition, pp. 135-260.

CHAPTER VI

THE CRITICAL REPORT

The process, definition, and analysis reports are ways of getting at the way something operates, at the meaning of an idea, term, or object, or at the component parts of something; but frequently one needs to go further, into an evaluation of an idea, term, or object. Such a weighing of values is known as criticism.

The engineer will be required frequently to estimate the worth of some object or idea. A civil engineer may be required to estimate the worth of a designated road on the basis of what the road is for and how well it serves its purpose, or a mechanical engineer may be requested to appraise the value and qualities of a designated piece of machinery.

I. WHAT CRITICISM IS

When people are among friends, they express their opinions without hesitation; consequently, few of them pass a day without answering such questions as "What do you think of the fluctuating stock market?" or "What do you think of the new Studebaker?" Much conversation is given to such estimates of all conceivable subjects. So long as we base our opinions on sincere personal judgment and sound principles, it makes no difference whether we praise or blame,

accept or reject, or present good or bad. The student too often makes the mistake of believing that criticism is always negative. Such a belief is not true. In fact, a good criticism should present both positive and negative sides. Naturally, one side will be predominant; the predominant side will be determined by the point of view or thesis of the report. A presentation of both sides is demanded on the assumption that nothing is so bad that it does not contain some good and vice versa.

...criticism is the attempt to estimate the worth of something--object or idea--either abstractly on a basis of principles and relations, or personally on the basis of our reactions to the subject of criticism.¹

A critical report is a class of expository writing which expresses a reasoned opinion of an idea or object of judgment in narrative form and with a central, predominant point of view. Criticism should not be confused with argumentation, which has, as its purpose, conviction. Remember, the purpose of criticism is evaluation.

II. REQUIREMENTS DEMANDED OF THE CRITIC

"Anybody can say something about anything!" is an old saying; but it is only when we have a well-considered basis for our opinions that they are of any value; consequently certain requirements are demanded of the writer of criticism.

The first necessity of a critic is to be able to

¹Mervin James Curl, Expository Writing (Boston: Houghton Mifflin Company, 1931), p. 187.

analyze. He must break the object or idea into its component parts and must see of what it is made. One wishes, for example, to criticize a particular automobile. It is not enough to say with gusto, "Isn't she a dandy?" If on the other hand, the automobile is said to be a good buy because of economy, roadability, and beauty, the critic will have given the reader definite and useful criticism, for he will have analyzed the virtues of the object--its components.

Second, the critic must have some knowledge of the general field in which the subject lies. For a man who has no knowledge of photography in general to criticize a colored photograph would be foolish.

Third, one must have sound, sincere, and common sense regardless of how much knowledge and ability to criticize he may have. "Educated fool" and "lacking horse sense" are old and crude terms, but they describe well the individual who does not apply this principle to criticism. In other words, be realistic and practical in applying knowledge.

Fourth, the critic must be unbiased and unswerved by the opinions of others. He must have confidence in his opinions and must estimate the value of the subject as he finds it. Likes and dislikes must be based upon reasons.

III. TYPES

With the necessary qualities acquired, the writer is ready to begin. The next problem is what method or type of

approach shall be used. Although there are several types or methods of criticism, the thesis and judicial criticism, which seem to be most practical for the engineer, will be briefly examined and exemplified in this chapter.

A critical thesis report. The first type of criticism is called the interpretive or, more specifically, the thesis criticism according to Babcock, Horn, and English.² The critic presents a point of view, or thesis, in the introduction, pro or con, with regard to the object of criticism and he attempts to establish this point of view without any personal feeling. Usually, the writer's criticism will not deal with all details; it will only drive home a few points that seem to be most significant. The writer is not attempting to state the whole truth; he is attempting to establish a truth. He does not evaluate on the basis of a set of standards. This type of report should not only be supported by conviction but also by sound evidence. A critical thesis report is a type of expository writing which expresses a reasoned opinion of an idea or object by establishing a point of view with the objective tone.

The writer should follow the procedure outlined below. He must be particularly careful of the proportion; for example, the other side should not be given as much space as the proof. Here is the suggested procedure: (1) logically

²Robert Whitbeck Babcock, Ph. D., Robert Dewey Horn, Ph. D., and Thomas Hopkins English, Ph. D., Essentials of Composition for College Students (New York: American Book Company, 1939), p. 165.

introduce and state the thesis, (2) describe the idea or object of criticism, (3) prove the thesis to be true, (4) present the other side, (5) give conclusions based on the thesis.

Read examples A and B which follow and which were written by students at the South Dakota School of Mines and Technology. Do the examples defend or attack the object of criticism? Do they attempt to establish the whole truth or a truth about the object? Are they objective or personal in tone?

Example A

THE PRESSURE COOKER

Most men consider good food to be more necessary for a full life than anything else except birth, but improvements in the methods of cooking or in the equipment available have always been very slow and gradual. However, the recent invention of the pressure cooker has simplified the methods and has improved the results of cooking very greatly in only a short time.

A pressure cooker is a vessel equipped with a strong cover which can be fastened to the body in a firm, airtight joint. To a small vent in the cover, a valve is attached to control the pressure attained inside. When in use, the cooker must always contain a small amount of water which will evaporate and fill it with steam. Under the higher pressure, this steam will reach a temperature above that of steam under only atmospheric pressure.

The greatest advantage of a pressure cooker is that the higher temperature attained will cause food to cook more rapidly and, therefore, to require the use of less fuel than cooking at ordinary temperatures. Since water is always present in the form of steam, it is impossible to scorch food or even to dry it out or to cause it to shrink in volume, as can be done so easily in ordinary cooking. Because of the short cooking time and because a small amount of water is present, foods cooked in a

pressure cooker retain a much larger amount of the essential nutritive components which are dissolved or destroyed by long heating, or are evaporated completely away in the ordinary cooking processes. Because of its controlled pressure, an autoclave is naturally far more efficient at higher altitudes than any other means of cooking which is subject to the low pressures found there.

Of the few disadvantages of the pressure cooker, the cook's inability to visually check the progress of the cooking from time to time is the greatest. The cook must learn an entirely new technique of spending more time preparing food to be cooked than actually cooking it. All flavoring must be put on the food before the cooker is sealed; one cannot taste the food afterward. In addition, one can cause the vent in the top of the cooker to be closed by improper loading so that too great pressures which can burst the cooker can be built up.

Of course, any cook who can read and follow the directions supplied with these cookers will have no difficulty with the few troubles mentioned. The time and fuel saved will soon make up for the trouble the cook may encounter in first learning this new method, and the extra nourishment and flavor found in food cooked this way will please everyone who is lucky enough to eat the results. The pressure cooker has made cooking easier for the cook and eating easier for the eater than either ever was before.

A critical judicial report. The next useful type of criticism is the judicial criticism.³ The judicial critic must possess the requirements of a good critic and must apply the principles of good criticism even more than in the thesis criticism. The critic must view the object of criticism according to established law and recognized precedent and must apply a large element of sound judgment because facts, principles, and theory do not establish the point of view by themselves.

³Ibid., p. 165.

This type of criticism differs from the thesis criticism in that the critic must select a set of standards for judging, and he must apply them in an impartial and impersonal manner. The writer must be careful not to get an inadequate or faulty set of standards. A critical judicial report is a type of expository writing which passes judgment on an idea or object by the use of a set of standards. Normally, the writer will adhere to the following schedule of procedure: (1) Logically introduce and state the thesis, (2) state the judicial standards, (3) describe the object of criticism, (4) establish the thesis on the base of the standards, (5) present the other side, (6) give the conclusions based upon the thesis and standards.

In Example B, are the standards inadequate or faulty? Has the writer applied sound judgment to the facts? Does he appear to be biased or prejudiced?

Example B

ARCHITECTURE AT THE SCHOOL OF MINES

Recently the school newspaper presented an artist's sketch of the new dormitory now being constructed at this college. After this new building is completed, the campus will be as unsightly an example of poor architectural planning as any other campus in the United States.

The South Dakota School of Mines and Technology is located at the east edge of Rapid City. One can identify the school buildings easily because they do not resemble houses or each other. At this college, students are trained to be engineers; and in the future the engineers trained here will design and construct many buildings over this country and throughout the world.

Preferably, each building in any group of buildings built at the same place by the same institution should be built in the same style and of the same materials as the others so that the group will appear to be one harmonious whole. Although one cannot expect the buildings of any college to be so beautiful that tourists will travel many miles to gaze at them, certainly the buildings of an engineering college should be sufficiently beautiful to inspire love and appreciation of the truly beautiful in the students. Each structure must also perform well the function for which it was intended by providing sufficient space, light, and fresh air for the efficient hearing of lectures in all the classrooms.

With the exception of the Hudson River bracketed and the log cabin, practically every style of architecture which ever attained popularity in America is represented once on this campus. The Chemistry Building is in the California Mission style, with its square towers and gray stone walls; the Engineering Building is in the graceful and beautiful American Colonial style; the new dormitory will be in the most radical modern style; and the other buildings represent whichever style was popular at the time each was built. Everyone will admit that these varying styles clash with each other and make the campus appear to be a clutter of unrelated buildings. No one can ever claim that all of these styles will always be considered beautiful or are considered beautiful now; the gymnasium will always appear to be a drab and unadorned factory building; and the radical style of the new dormitory will make it ugly when that particular style becomes unfashionable.

The buildings of the school are adequate for the task required of them in most cases. Most of the classrooms and laboratories are spacious, well ventilated, and sunny; the gymnasium is well designed both for sports and for use as an auditorium; the administration offices are properly impressive and spacious. All of the buildings appear to be economically constructed with very little waste space.

Even though the buildings do perform their functions very well, one would think that the same efficient interiors could easily have been enclosed in more pleasing exteriors. If all the buildings were in the style of the beautiful red-brick Engineering Building, the campus would be a lovely sight and would increase greatly the students' sense of beauty. Certainly no future buildings need be built in a still different style; in the present variety there should be a style to fit anyone's taste.

ASSIGNMENTS

1. Read Chapter IX, pp. 163-195, on criticism in Essentials of Composition by Babcock, Horn, and English. Pick one of the professional examples and be prepared to tell the class whether it is a thesis criticism or judicial criticism and why. Criticize the writing and writer using the requirements of a good critic for your standards.
2. Listen to a conversation which is basically criticism. Report to the class what you have heard. Criticize the conversation on the basis of the principles of good criticism as discussed in this class.
3. Write a thesis criticism of 300 to 500 words on any subject that you are qualified to judge or evaluate.
4. Write a judicial criticism of 300 to 500 words on any subject that you are qualified to judge or evaluate.
5. List a number of subjects suitable for evaluation.

FOR FURTHER READING

Curl, Mervin James, Expository Writing, pp. 187-235.

Naylor, John S., Informative Writing, pp. 108-119.

Rorabacher, Louise E., Assignments in Exposition, pp. 254-272.

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