

SCIENCE IN THE NEWSPAPERS SINCE 1875

An Undergraduate Thesis

Presented by

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Course IX-B

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LETTER OF TRANSMITTAL


52 Augustus Avenue
Roslindale, Mass.
May 21, 1936.

Professor Ralph G. Hudson
Massachusetts Institute of Technology
Cambridge, Massachusetts.

Dear Professor Hudson,

I herewith submit an undergraduate thesis entitled "Science in the Newspapers Since 1875" as partial fulfillment of the requirements for the degree of Bachelor of Science.

Respectfully yours,


Richard L. Odiorne

SUMMARY

Science news, defined and classified in this study, was in 1936 approximately six times the volume registered for 1875. Increasing public interest centered in the automobile, the radio, and the airplane, and the stimulus of the war to sensationalism are largely responsible for the great increase. By per cent the total news on astronomy and biology declined, while other subjects have increased. The wordage on all subjects has risen, reaching a peak in 1930.

The aggregate decline since then is partially explained by decreasing size of newspapers occasioned by loss of advertising in the depression. The data for the above are taken from the "New York Tribune" and the "New York Herald Tribune." Researches in the "New York Times" and the "Boston Transcript" substantiated the conclusions.

Leading scientists, educators, and science writers declare the science news of today to be more adequate than ever before. The problem of popularization satisfactory to both scientist and layman is yet to be solved. Not every scientist is in sympathy with the public taste for the sensational; education of the public in science will help solve the problem.

In response to increased public demand for scientific news, the papers have appointed science editors, and many agencies for the presentation of science in the press have been organized. The future may be expected to bring still greater public interest in science and expansion of science news volume.

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I owe a great debt of thanks to many men in the fields of science and news writing for their co-operation in contributing to this thesis significant material as well as giving encouragement and advice on many of the problems encountered.

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of the United Press Association; Mr. David Dietz, Science Editor of the Cleveland Press; Mr. Hillier Kreighbaum, of the United Press Washington staff; and Mr. Daniel Sayre, Editor of "Aviation". I also want to thank Dr. McKeen Catell, Editor of "Science," and Mr. Robert W. Scripps for their kind letters.

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Mr. Ralph L. Odiorne aided in the large and painstaking task of going through newspaper files and making word counts as well as proof-reading this paper. Without cooperation from many hands, this discussion and compilation of data and opinions would not have been possible. This list omits many of my friends who were interested in the survey and made helpful suggestions. May I be forgiven if the list is incomplete?

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I. INTRODUCTION

I. INTRODUCTION

Despite a wealth of competent articles discussing the place of science in the press, and still more discussing the relation of the scientist to our modern culture in general, the problem of scientific news in the newspapers is still open for treatment, if only for the social importance of the subject. On all hands, the technical expert and science writer alike proclaim the marvels of science, and discuss its "impact" on the lay mind. To synthesize somewhat their ideas, and possibly to add data of a new sort, may be of utility, since the central question is one of vital moment in our times.

Science news, born in the early part of this century, and now grown rapidly to a not easily manageable size, is still in its infancy. Enduring as they do sharp changes in environment from their origin in the laboratory, and passing through the hands of men widely differing in professional interests and philosophies, science news "stories" undergo considerable rough treatment. Not all the problems arising from conflicts between the points of view of scientist and news writer have been solved.

That science news is assuming increasing importance in all departments of the press is a fact. The development in many branches of science has had the effect of shoving the technical man downstage, turning on the limelight, and letting the lay public applaud. The spectacle involves a multitude of problems ranging from astrophysics, with the "why" of the universe,

to biochemistry with the "why" of life.

The reading public ranges from the layman who has only a side-show interest in science, to the professional man who searches the technical magazines for accurate, up-to-date information. The writers range from the garden variety of newspaper man, familiar with the field in only a general way, to the trained specialist who can and does produce readable, accurate, popular science news to reach many classes of readers. Men in the fields of research range from the supersensitive worker, hedged about by laboratory walls, and lacking the critical ability to evaluate his discoveries in the glare of daylight, to the men of great vision who can appraise a discovery or invention both in terms of its value to science and its ability to win the attention of the public.

We may accept as a postulate that there is greater lay interest in science now than there was thirty years ago. There comes, however, the question of how much more attention this department of news is getting in the newspapers. An answer to this question would be of value for a number of reasons. First, it would give a physical measure of the activities of the newspapers in injecting science into their columns. Second, it would provide a basis for an analysis of the forces which are bringing science as news before the public eye. Third, it would give editors an estimate of trends in production which might allow a degree of control both in emphasis and quantity of output, if such were considered necessary. Fourth, it would enable scientists to compare or contrast their evaluations of scientific discoveries with the degree of popular appeal in these discoveries as evidenced by newspaper space.

Such, in brief, is the purpose of this paper. The plain statistics of such an inventory would be of little value unless they were correlated with the views of both outstanding writers and scientists who are in a position to judge and comment on the many elements involved in this broad subject. An attempt is therefore made in this study to secure opinions of both writers and scientists to questions such as the following: what branches of science are receiving the most emphasis in the press and what items are regarded as having the greatest news value as opposed to their scientific import? Have there been any notable omissions of scientific items in the press during the last thirty years? Will science continue to get increasing attention in the press, and if so, why? What have been the main events in the development of science news since 1900? What does the future hold for the continued popularization of science?

In addition to an inventory correlated with the opinions of specialists, there has been included a study of a large part of the literature on the subject both in books and magazines. The leading science editors have dealt with many aspects of the public's interest in science, the most comprehensive and recent one being "Science and the Public Mind" by Benjamin C. Gruenberg. In this book, most media for the dissemination of scientific information receive attention, and a convincing picture of science as a major element in our culture is drawn.

The first general problem involved in determining a basis for a statistical study is a definition of science news. In looking over the files of fifty years of newspapers, what

criteria shall be set up in order to categorize news as scientific or non-scientific? And, moreover, when it has been decided whether a story is scientific, what classifications shall be set up to determine what branches are getting the most space?

In reply by letter to questions on this subject, Mr. John J. O'Neill, Science Editor of the "New York Herald Tribune," writes:

"The most generalized description would include any activity in which the scientific method is used to solve problems. At the other extreme it could be confined to news of the activities of the professional scientists engaged in research in the purely physical sciences. In the every day handling of science news, the subject is a very nebulous one and its limits are invariably set through continuous compromises with circumstances. We have on the Herald Tribune staff a Radio Editor, an Automobile Editor, an Aviation Editor, a Garden Editor, a Fish Editor, a School Editor, as well as a Science Editor. When 'science news' is limited to such news as does not fall within these specialized departments and the straight news field, its scope is considerably reduced. Most of these departments are highly commercialized and it is not difficult for science to take into its category technical developments that would rightly come under some specialized headings."

An attempt to draw up a comprehensive list of the kinds of stories in which science appears is beyond the scope of this paper. Were it possible to analyze every paper for that period, it would still be impossible to classify all printed

matter. Broad lines of division, however, are essential to the purpose of this study, and they have been set up for the entire period in as consistent a manner as the nature of the material permitted.

Most scientific material appearing in newspapers can be grouped under the following headings:

1. Stories concerning engineering developments containing a large element of non-scientific material having news value apart from the public's interest in science.

2. Reports of scientific meetings with explanations of papers read and discoveries announced.

3. Reports of scientific discoveries not originating at meetings of societies, but announced through news directors of educational institutions, professional societies, or industrial research laboratories.

4. Surveys of advances made in scientific fields written by newspaper feature writers or editors. These are not "spot" news, but are written to provide a background of information and interpretation for discoveries or developments of current interest.

5. Publicity for airplane, automobile and radio concerns appearing on radio or automobile pages.

6. Announcements of new scientific institutions or educational facilities connected with scientific research.

7. Announcements of awards and promotions, appointments and deaths of prominent scientists with incidental material concerning their contributions.

8. Reports of religious speeches or sermons with discussions of the implications of modern science in religion, theology and metaphysics.

It will be seen that these items are listed roughly in the order of wordage which we might reasonably guess. Item 1, of course, has the widest variety of subject matter. It includes all sorts of large engineering projects, such as the construction of waterways, bridges, tunnels, power developments, transportation and communication systems and so on. While engineering is as old as the pyramids, the development of "science" since the industrial revolution has made it a unique feature of our culture. To the civil engineering ingredients of this item can be added the news relating to the automobile, the radio, and the airplane, which have occupied a large portion of news for the past thirty years. So voluminous has been the news relating to these fields, and at the same time so nebulous, that it was judged to be beyond the limitations of this study.

It may be suggested, before passing on to the next item, that an inventory from 1900 to date of this type of news would be illuminating, and would give one means of tracing the history of the automobile, the radio, and the airplane from the time they received widespread emphasis in the press. A census-taking of the sort proposed could be followed out on the basis of the following classifications:

ENGINEERING

1. Civil
2. Electrical
 - a. Radio
3. Automotive
4. Aeronautical

Electrical engineering, as we know it today, does not go back much further than 1900; prior to that time, not enough was known about it for it to be of general interest. With the appearance of the radio, about 1921 and 1922, an enormous interest in electrical science was aroused. The newspapers carried columns containing popular discussions of methods of radio design and construction, a phenomenon which probably reached its peak between 1925 and 1930, when commercial sets were perfected beyond the average limit of amateur skill. Concomitant with interest in radio came increased scientific interest in electricity, which no doubt provided large numbers of people with the technical vocabulary and the ability to understand the simpler theories of radio communication.

Radio columns and radio news today occupy much space in large newspapers, but in general there has been a division into two parts: highly technical discussions for the amateurs who have been graduated into the class of experts, and non-technical items relating to radio networks and broadcasting problems. Here it has merged with other kinds of engineering appearing under such broad headings as "radio engineering," being relegated for the most part to special feature sections or pages. Short wave radio has tended to revive amateur interest in the field, but commercial sets have already exploited radio so well that a repetition of the early twenties with popular participation in radio construction seems highly unlikely.

As to television, when it does become available for large numbers of people, we may expect that the radio industry will be one step ahead of the public. It is likely that

in the future visual communication will occupy fully as large a part in the news as audio-communication has in the last decade. In a word, the trend of "science" news relating to radio has gone from the hobby stage with widespread interest in the science of radio to the commercial stage, where public interest in the subject is reflected more in a large amount of "broadcasting" news with less technical material on radio construction and electrical theory.

In the automotive field, much the same thing has been true. Regarded in the first stage as oddities, automobiles brought with them increased interest in the mechanics of construction, giving the reading public an idea of brake-horsepower, miles per gallon, hydrogenated fuels, and aero-dynamic streamlining. It would be interesting as an independent study to follow this development from the self-starter era to the time when advertisers emphasized the "unsurpassed beauty" of their products, through the period when mechanical excellence got the most advertising ballyhoo, to the present time when the automotive engineer has outdistanced the capacity of the buyer to discriminate scientifically, and now talks more about riding-comfort than he does about the mechanical properties of knee-action wheels and uses scientific catch-words as a guarantee of economical performance.

Diversified as this type of news is, and quantitatively occupying such a large part of the news, though germane to the problem of increasing public interest in applications of modern science, it has not been treated in this study.

As for Item 2, the reports of scientific conventions and meetings, most of these stories contain a large portion

of strictly scientific material, though occasionally there will be items merely giving the names of the speakers and the subjects discussed. These latter are an admission on the part of reporters that the scientific material transcended their abilities to interpret it, or was too technical to be easily popularized. Scientists themselves often recognize some subject matter as highly technical and will let the reporter know where the best material is. Expositions of material presented at meetings have been included in this census-taking; the other type has been ruled out. The next two broad headings probably include a major part of science news, and feature stories have received careful analysis. In cases where especially large features or supplements have weighted certain months heavily, these have been noted to simplify adequate interpretation of the data.

Item 5 includes a measure of scientific information along with press agents' ballyhoo. This type, consisting of a variety of diverse elements, cannot be boxed off into a watertight compartment. It has been omitted from the inventory in this study.

In Items 6 and 7, again we have evidence of "news value" of science, but merged with other ingredients which makes statistical treatment almost impossible. In stories where most emphasis is laid on scientific feats made possible by new facilities, along with interpretive information, they have been included; where there was little or no emphasis on this factor, they have been excluded.

The appearance of scientific information in reports of sermons appearing on religious pages bears witness to another

phenomenon: the conflict of science and religion with efforts in the pulpit to reconcile with theology some of the disturbing truths being made known by the astronomers and biologists. While they do indicate that the implications of current discoveries have penetrated deeply into both metaphysics and theology, they do not indicate, in themselves, a growing popular interest in science. Because of this they also have been left out of this inventory.

To summarize, the above classifications include most of the types of stories in which scientific information appears. Excluding those classifications which we have pointed to as being either fields in themselves or as being not susceptible of statistical analysis, we have remaining the following types of stories:

1. Reports of scientific meetings and conventions.
2. Spot news stories originating not at meetings of societies but in scientific or industrial laboratories, and written either by reporters or press representatives.
3. Feature stories and columns, written on the basis of material in scientific papers or culled from the professional journals and the scientists themselves.

So much for the main limitations of this study. The next question is how to devise a method, if possible, of finding what branches of science are receiving the most space in the newspapers. Preliminary to drawing up a set of classifications suitable to the purpose, the classifications of the National Academy of Sciences in America and those of the Royal Society in England were studied. The

divisions made by those societies are as follows:

National Academy of Sciences

1. Mathematics
2. Astronomy
3. Physics
4. Engineering
5. Chemistry
6. Geology and Paleontology
7. Botany
8. Zoology and Anatomy
9. Physiology and Bio-chemistry
10. Pathology and Bacteriology
11. Anthropology and Psychology

Royal Society

- | | |
|----------------|--------------------------|
| A. Mathematics | K. Paleontology |
| B. Mechanics | L. General Biology |
| C. Physics | M. Botany |
| D. Chemistry | N. Zoology |
| E. Astronomy | O. Human Anatomy |
| F. Meteorology | P. Physical Anthropology |
| G. Mineralogy | Q. Physiology |
| H. Geology | R. Bacteriology |
| J. Geography | |

It will be seen that every classification (with two exceptions) of the National Academy of Sciences is included under some heading in those of the Royal Society. The first exception, engineering, has already been discussed above; the second, pathology, is mentioned later. On the basis of a general survey of science news in the current press let us analyze each of these headings with an effort to discover what distinctions can be made in separating one branch of scientific news story from another.

A. Mathematics: One of the abstract sciences, above the level of all but a very few newspaper readers, even if it did have a wide appeal, which it does not. Even accounts of Einstein's theories have almost completely left mathematics out of the picture, making use of it only where it was possible to invent simple but startling analogies. Here the news value has been definitely associated with a picturesque figure, which the public likes to visualize as flying on the wings of space and time, piercing the borderlands of an enigmatic universe. It is dangerous to speculate and generalize as to the reader psychology behind public interest in any of the big news stories. It is reasonable in this case, however, to assume that a large part of interest in Einstein's theory came about because of its connection with astronomy and the movements of the heavenly bodies, to which man has turned his eyes ever since history began. This type of story does not bulk large in the whole picture, and because it is so completely intermixed with astronomy, in general it was classed under that heading.

B. Mechanics: A generic term covering a wide range of subjects from celestial mechanics to the design of a wrist watch. Most of the news which could be classed under this heading would be engineering rather than science. Beyond that, the term has too vague a meaning to be useful in this study.

C. Physics: The broad definition of this subject definitely oversteps bounds into other sciences such as chemistry and biology, but a dictionary definition, with some modifications, permits the use of this heading in this analysis.

D. Chemistry: This has been included as one of the major classifications.

E. See (D) Chemistry.

F. Meteorology: A subdivision of physics.

G. Mineralogy: A subdivision of chemistry.

H. Geology: A classification by itself.

J. Geography: Not considered in this study.

K. Paleontology: A field occupying so small a portion of science news that it has been grouped with geology.

L. General Biology: A major classification.

M. Botany: A branch of biology. However, this subject has been given space in house and garden sections or pages of some newspapers, and has been mixed with household advice on gardening problems and landscaping methods to such an extent that it is impossible to measure it. Insofar as it has appeared in regular science columns, it has been grouped with biology.

N. Zoology: Also a subdivision of biology, and classified under that heading.

O. Human Anatomy: What "news" has been devoted to this branch of science has occurred for the most part in connection with methods of treating disease, and has been placed under pathology.

P. Physical Anthropology: A classification by itself.

Q. Physiology: See (O) Human Anatomy.

R. Bacteriology: Classified under biology.

* * * * *

To summarize: The main headings with their sub-divisions are as follows:

1. Physics
 - a. Meteorology
2. Chemistry
 - a. Mineralogy
3. Astronomy
4. Geology and Paleontology
5. Biology
 - a. Biochemistry
 - b. Botany
 - c. Zoology
 - d. Bacteriology
6. Pathology
 - a. Human Anatomy
 - b. Physiology
7. Anthropology

In addition to the above seven headings, it seemed advisable to create two other headings, namely, psychology (which is included with anthropology in the National Academy classifications) and archeology (as distinguished from

anthropology), since archeological discoveries have much scientific interest. The latter have received space in newspapers mostly in the form of feature articles, and are allied with articles about ancient races, which would be grouped under anthropology.

These nine headings, after consideration of the amount of space devoted to them, of time required to measure the space, and of the difficulties of separating one from the other, were decided upon as the main compartments into which the science news would be divided. Definitions of each of these branches of science provided by Webster's unabridged dictionary, are included here, preparatory to a discussion of the difficulties involved in actually classifying news stories under the several headings. The following are extracts from Webster's definitions:

Physics: "The science which deals with those phenomena of inanimate matter involving no changes in chemical composition, or, more specifically, with the most general and fundamental of such phenomena, namely, motion; the science of matter and motion...Physics is usually held to comprise the closely related sciences of mechanics, heat, electricity, light, and sound, and the branches of science devoted to the study of radiations, (X-rays, gamma rays, and cosmic rays) and of atomic structure."

Chemistry: "The science which treats of the composition of substances and of the transformations they undergo."

Astronomy: "The science which treats of the celestial bodies, of their positions, magnitudes, motions, distances, constitution, physical condition, mutual relations, their history and their destiny."

Geology: "The science which treats of the history of the earth and its life, especially as recorded in the rocks... Geology utilizes the principles of physics, astronomy, chemistry, mineralogy, zo-ology, and botany, etc."

Paleontology: "The science which deals with the life in past geological periods...It is based on the study of fossils."

Biology: "The science of life; the branch of knowledge which treats of living organisms. It includes zo-ology, botany, physiology, morphology, genetics...'applies' to the origin, development, structure, functions, and distribution of plants and animals."

Bio-Chemistry: "deals with the chemical compounds and processes occurring in organisms (plants and animals)."

Botany: "The science, or the branch of biology that treats of plants with reference to their structure, functions, development, analysis, nomenclature, and classification."

Zo-ology: "The science, or branch of biology, that treats of animals with reference to their structure, functions, development, analysis, nomenclature, and classification."

Bacteriology: "The science which deals with the study of bacteria. It is a branch of botany, but some of its most important practical relations are with hygiene, medicine, and agriculture."

Pathology: "The science treating of diseases, their essential nature, causes, and development and the structural changes produced by them...usually relates to the diseases of man as distinguished, especially from plant pathology."

Anatomy: "That branch of morphology which treats of the structure of organisms, especially that of the human body."

Physiology: "The branch of biology that treats of the vital phenomena manifested by animals or plants; the science of organic functions, as distinguished from 'anatomy', dealing with organic structure.

Anthropology: "The science of man. Specifically, (a) The science of the human organism...(b).the science of the natural history of man; the science of man in relation to his physical character, to his physical and geographical distribution, to the origin, classification and relationship of races, to his environmental and social relations and to the history of culture, human paleontology, archeology, folklore, and religions."

Archeology: "Early ancient history...The scientific study of the material remains of past human life, and human activities, such as fossils, human relics, artifacts, implements, inscriptions, interments, monuments, especially from prehistoric or ancient times; human paleontology."

Psychology: "The science which treats of the mind... in any of its aspects, systematic knowledge of the phenomenon of consciousness and behavior; the study of the organism and its activities considering it as an individual whole, especially in relation to its physical and social environment."

Up to this point we have discussed in a general way the types of stories in which science news appears in the newspapers. We have set limits, insofar as possible, for the types of stories to be included in an inventory. Within these limits we have made broad lines of division separating the various branches of science, to be used in interpreting the data to that extent permitted by the rigidity of our (arbitrary) boundaries.

Another limit must be imposed in this study. A complete answer to the question of how much more space is the press devoting to science today than (say) thirty years ago, would necessitate an analysis of space in every newspaper during that time, an obviously impossible task. A selection of samples is necessary.

The problem is entirely different from one of determining the characteristics of the sample and deducing the properties of the statistical universe. The American newspaper is subject to so many variables that the news policies of one may bear little or no relation to the policies of others. Therefore, our conclusions about one paper will not extend to the whole field.

Before making a selection of newspapers to come within this study we must also heed another consideration, namely, that there is in this country little more than a handful of newspapers which have officially designated science editors. In papers which do not, science news presumably is covered by regular reporters and goes through the regular copy desks. This latter method of coverage is necessarily somewhat haphazard, though probably quite sufficient in most cases for the immediate demands for science news. The papers which have not, up to the present, undertaken a systematic coverage of science carry so little of it that an inventory would prove nothing more than could be reasonably judged at the outset. Moreover, the character of science news in these papers is not likely to be susceptible of rigorous classification.

In short, the requirements of a statistical study are as follows:

1. It should extend over a long enough period of time to insure finding the beginnings of the phenomenon.

2. It should cover papers which have an appreciable amount of science news.

3. The paper should be at least reasonably representative of a group of papers which have taken the lead in adequate coverage of science.

4. The inventory should be possible of completion within certain limits of time imposed on the research worker.

5. The papers selected should be easily available for study.

In this case, the "New York Times," the "New York Herald Tribune," and the "Boston Evening Transcript" fulfilled these requirements. The first two have at present regular science editors and have devoted considerable space, especially during the last decade, to science; the "Transcript," a subscriber to Science Service, the organization of science writers in Washington, D. C., has consciously and systematically devoted considerable space to science since 1920. Typographical layout and the departmentalization of news in these papers, which facilitated the taking of data, has also taken place within the last twenty years, the general readability being thereby much improved during this period.

II. HISTORICAL NOTES

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The dissemination of scientific information began soon after the invention of printing had made possible wide circulation of written material. Even previous to the formation of scientific societies in the 17th century, there existed wide interchange of information among scientists, and during the life of Robert Boyle, the English chemist, we find Father Marsenne, a French priest, carrying on a wide correspondence among the scientific men of the age, and acting somewhat as a clearing house of information. Publications of the scientific societies did much to bring discoveries to the public, and in fulfilling this purpose constitute a large chapter in the history of modern culture.

Following a discussion of the learned societies Dr. Preserved Smith¹ writes:

"Nor were the journals of popular science lacking. One at Gotha and Frankfurt during the six years 1792-97, set forth its program in the following comprehensive title-page: 'News of the Learned and Curious World in which is contained the Quintessence of manifold Learning, and remarkable things in History, Chronology, Genealogy, Geography, political intelligence, astronomy, the law of nature, the civil and administrative law, theology, political science, ethics, physics, medicine, philosophy, philology, military and civil matters; in which also many old and new books and authors are noticed and criticised; and not a few notices of persons important in station, in office, in the army, and in learning, are intermingled; faults and needs of all sorts are pointed out; good

doctrines are taught; and the means of learning many sciences are given; and finally, many pleasing stories and merry jests are added, and all is briefly treated by the collaboration of a curious and learned society and so gotten up that by this one may obtain a gentleman's Erudition. Published Monthly."

The germs of science news in the United States were born in the early seventeen hundreds, the notable developments being initiated by Benjamin Franklin in 1728 with the newspaper entitled: "The Universal Instructor in the Arts and Sciences" appearing in Philadelphia. The name was later shortened to the "Pennsylvania Gazette." "Beginning by reprinting sections from Chamber's Cyclopedia, it early found it advisable to offer more timely articles contributed by Benjamin Franklin."²

We may skip over the long formative period when the newspapers were learning to walk, and outstanding editors, who form the landmarks of this age, were discovering the sales value of new and vigorous types of writing. The broad aspects of this age have been amply covered by a number of histories of journalism; it is beyond the scope of this paper to discuss what little science news occupied this period.

The earliest evidence of a systematic attempt at scientific coverage in the "New York Herald Tribune" since 1875 was the column, "Science for the People" originated in 1877 and continuing until 1882. It is discussed in some detail in Section IV of this paper. A number of years were to elapse, however, before science news as an important element in journalism was recognized. Shortly after 1920 a number of

events were recorded which foreshadowed later developments. We shall not attempt to make a complete history of the recognition gradually awarded to science in the press, but shall point out the most important steps in the process.

Shortly after the turn of the century the tabloids began to feature science articles that make those of today colorless by comparison. Will Irwin writes the following vivid description referring to the "gee whiz" emotions inspired by the yellow journals:⁵

"One surprising discovery: the public liked science or pseudo science! So in tabloid doses, the yellows gave them primitive man, gave them archeology, gave them medical discovery - always jazzed up to the emotional point. Their features varied widely in their soundness. The syndicated Hearst Sunday supplement specializes on archeology and paleontology even to this day; and the matter, popularly phrased though it be, has little in it that a scientific man can justly criticize."

Let us pass abruptly from the era of the yellows to 1920, the datum point of science news as we know it today, and make a few notes on the events leading to the at present highly organized squad of science writers. Science Service, which ranks as the largest agency for the dissemination of science, was established in 1920 by Edward W. Scripps, and had as its object making "the greatest use of the press in the way of disseminating the knowledge which is the result of painstaking work carried on by a few hundred or at least a few thousand well-trained men with great mental capacity."³ Its object is phrased in a different way by Mr. N. D. Cochran in

a biography of Scripps: E. W. Scripps "created, established, and endowed Science Service for the purpose of making science popular, and interesting the entire mass of citizens in the great works of experts in the field of science."⁴

In 1921 Alva Johnson was selected to write articles for the New York Times, and David Dietz became Science Editor of the Scripps Howard Newspapers. One of the first meetings of the A.A.A.S. to receive any great attention of the press was in Toronto, 1922. Referring to it in a letter, Mr. Dietz writes:

"The first scientific meeting to be covered in a systematic and serious way was the meeting of the American Association for the Advancement of Science in December, 1922. Present at it were Alva Johnson of the New York Times, Dr. E. E. Slosson and Watson Davis of the then newly organized Science Service, and myself. I can recall the meetings of the American Philosophical Society in those days, which Johnson and myself covered and which the local papers ignored."

Mr. Johnson was awarded the Pulitzer prize for the best job of reporting done during the year for his report of the Toronto convention. Several other newspapers appointed young men to write science news, among them the "Washington Star," the "New York Herald Tribune," and the "Detroit News." In 1927 the Associated Press selected two men to cover science news. Mr. Kent Cooper adopted the principle that the best results in writing science are obtained by men who are primarily trained journalists of exceptional ability. "This principle has proved to be sound, and has been generally followed by the press of the United States."³

After a few of the leading newspapers and the press associations had taken action in appointing men to write science, there arose an association of science writers. Dr. Austin H. Clark, Press Director of the A.A.A.S., continues the historical survey:³

"In April, 1934, there was organized the National Association of Science Writers, with a membership limited to staff members of newspapers and press associations who devote their major interest to science. The purpose of this association is 'to foster the dissemination of accurate scientific knowledge by the press of the nation, in co-operation with scientific organizations and individual scientists.'"

The charter members were twelve in number, representing the Associated Press, the Scripps Howard Newspapers, the "Philadelphia Inquirer," the "Washington Star," the "New York Times," the "Herald Tribune," the "Detroit News," and the Hearst Newspapers. Mr. David Dietz was elected president.

Several notes on the attention given to science by the "New York Herald Tribune" are given in a letter from Mr. John J. O'Neill, Science Editor:

"The first holder of the title 'Science Editor' (in the 'Herald Tribune') was Dr. E. E. Free, former Editor of the "Scientific American," who took the position in 1926. He did not give his full time to the task. He contributed a lengthy article each Sunday. He was succeeded in 1928 by Dr. H. H. Sheldon, Professor of Physics, New York University, who contributed one long and half a dozen short articles each Sunday. In 1929 science, radio, and aviation were merged into a single section under the editorship of Lloyd Jacquet. This

section was discontinued in 1931. Jacquet and Sheldon were succeeded by George Pendray, now Science Editor of the 'Literary Digest.' Robert Potter, Ph.D., now with Science Service, Washington, D. C., held the post from 1932 to 1934. I took the position when Potter vacated. I had been Science Editor of the 'Brooklyn Eagle' for several years."

A similar chapter is recorded by Mr. Kaempffert, Science Editor of the "New York Times." He writes:

"The 'New York Times' has always devoted attention to science, but more systematically to pay attention to science news about 1920." The first Science and Engineering Editor officially designated as such was Mr. Kaempffert. Mr. William Lawrence is Science News Editor, and devotes himself to science news reporting, while Mr. Kaempffert limits himself to writing editorials on science and engineering.

There are many ways to illustrate the appreciation of the service of science writers, which we have seen organize themselves in the last fifteen years. For example, Mr. Howard Blakeslee, Science Editor of the Associated Press, was selected to give the commencement address at the Massachusetts Institute of Technology in 1934. He received another outstanding award from the American Institute, one of the oldest scientific organizations in the United States, "for his contribution to man's fuller understanding of the world in which he lives by accurate presentation of the news of science in the language of the layman and for his service in the development of science through fostering the public's interest in its advancement." Mr. Kaempffert was the commencement speaker at Carnegie Institute the same year. Also, Mr. Thomas Henry of the "Washington Star" was elected a member

of the Washington Academy of Sciences and shortly after addressed the Academy on the relation between science and the press.

To quote again from Dr. Clark:⁶

"Science in this country has had a strenuous uphill fight for recognition. Full recognition was accorded about three years ago, when, at the first showing of his new picture, Mr. Charles Chaplin had among his guests of honor Professor Robert A. Millikan and Professor Albert Einstein. What does this mean? Fundamentally of course it means that the canny Mr. Chaplin saw in Professors Millikan and Einstein possibilities for more free newspaper space devoted to his new picture than could be secured by the presence of any other guests."

In this section an attempt has been made to sketch some of the important events in the development of science news to its present status. Let us continue with a study of the quantitative growth of the literature as shown by the New York Herald Tribune.

References

¹ History of Modern Culture (Henry Holt, New York, 1934), II, 138.

² Ibid., p. 290.

³ "Science and the Newspaper Press of the United States" Nature, February 9, 1935. Vol. 135, No.3406, pp. 239-240.

⁴ E. W. Scripps (Harcourt, Brace, and Company, New York, 1933), p. 293.

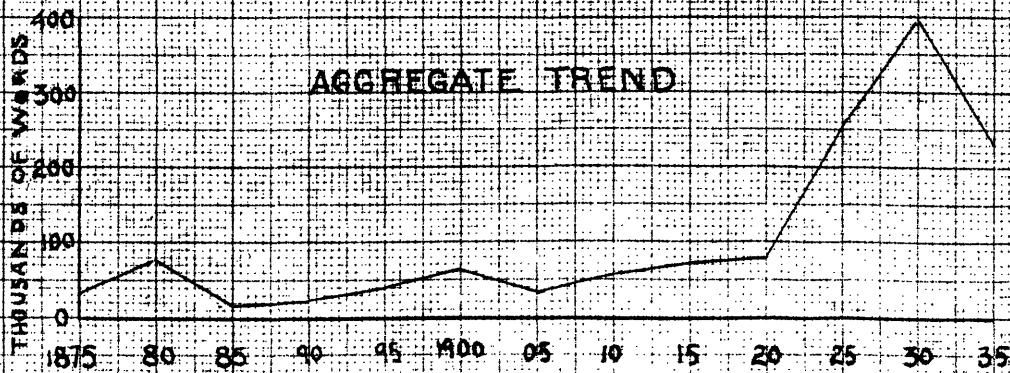
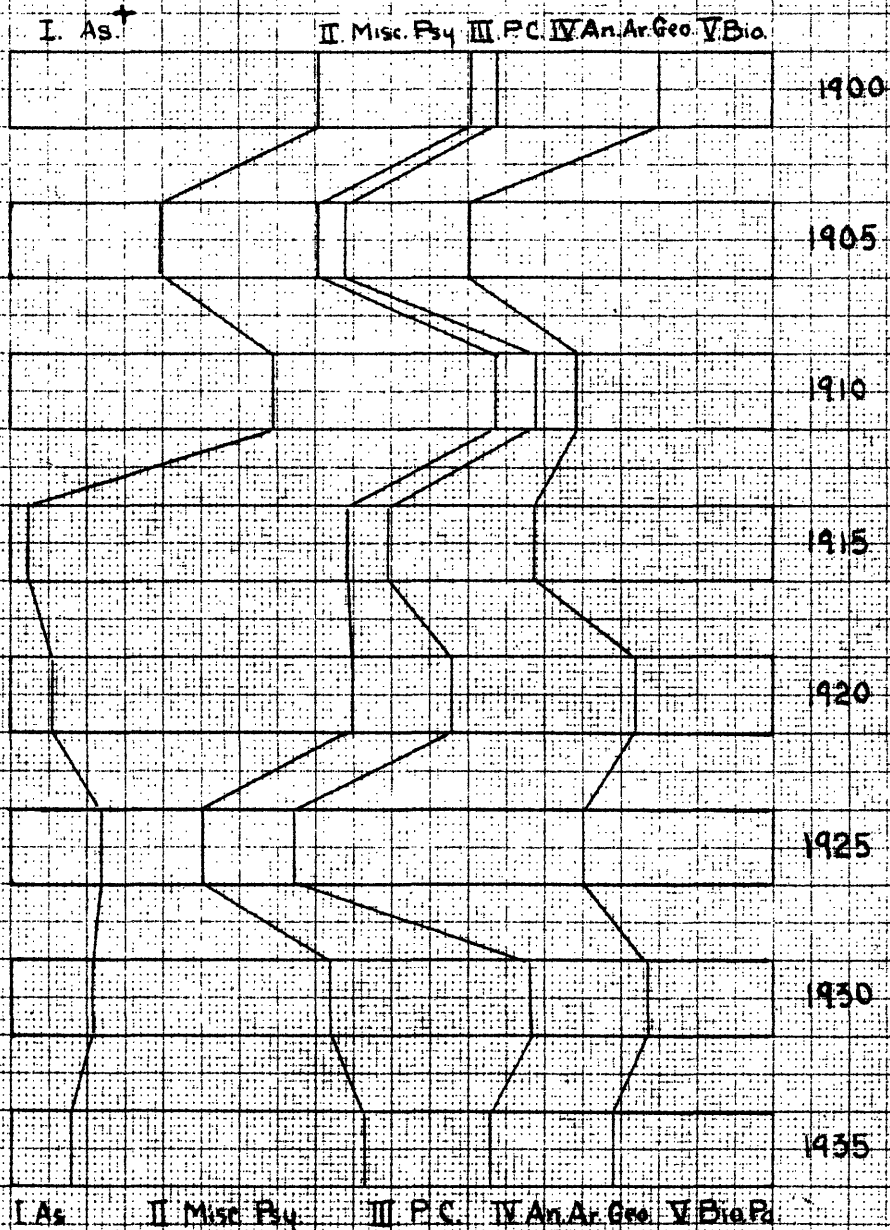
⁵ Propaganda and the News (McGraw Hill, 1936), p. 92.

⁶ "Delirium Gyrams" Harvard Alumni Bulletin, June 22, 1934.
pp. 1038-1043.

III. STATISTICAL ANALYSIS OF WORDAGE

CHART I

GROUP PERCENTAGE TRENDS



† Key: I. Astronomy; II. Miscellaneous, Psychology; III. Physics and Chemistry; IV. Anthropology, Geology and Archeology; V. Biology and Pathology.

CHART II

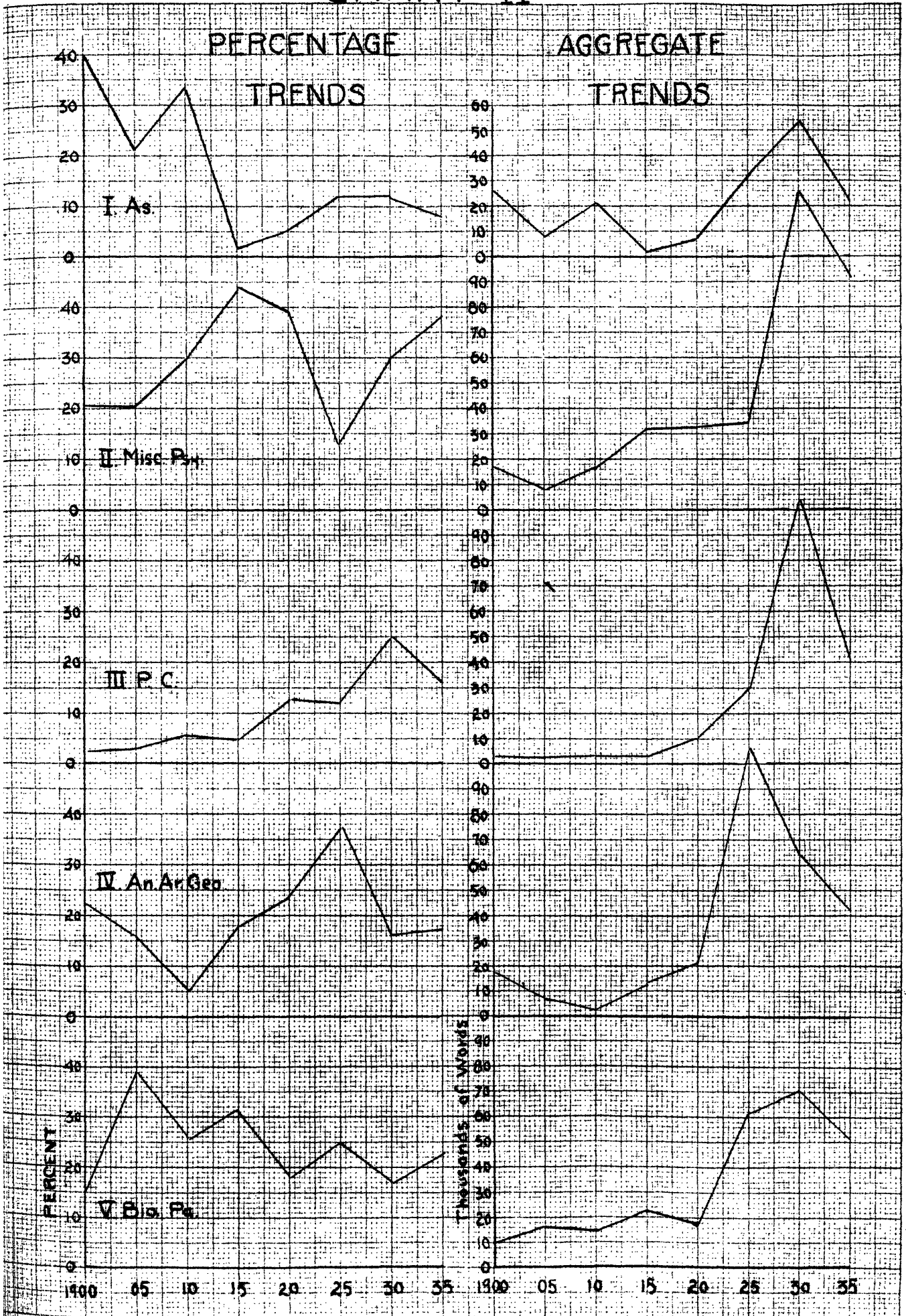


TABLE A

CLASSIFIED AGGREGATE WORD COUNTS: 1875-1935

The following table gives word counts by subject for each year at five year intervals. Through 1920 the figures are for the New York Tribune. In 1924 the Herald and the Tribune were merged, and from 1925 on, the figures are for the New York Herald Tribune.

Year	P.S.S*	As	P	C	Pa	An
1875	19,000	**	**	**	**	**
1880	**	20,800	10,800	19,000	5,000	1,100
1885	1,500	**	**	**	**	**
1890	140	**	**	**	5,100	**
1895	**	4,260	2,450	4,550	11,100	1,540
1900	**	26,400	0	1,700	7,500	2,460
1905	**	7,900	1,000	190	12,500	0
1910	**	20,700	3,090	252	10,500	126
1915	**	4,950	0	3,400	15,100	6,100
1920	**	4,410	8,440	2,200	4,760	5,300
1925	**	30,300	15,300	15,600	38,100	8,130
1930	**	46,600	76,000	30,000	32,500	24,400
1935	**	18,700	25,800	11,600	36,600	10,500

* The following abbreviations are followed throughout the tables: P.S.S.: Proceedings of the Scientific Societies; As: astronomy; P: physics; C: chemistry; Pa: pathology; An: anthropology; Geo: geology; Misc: miscellany; Bio: biology; Ar: archeology; Psy: psychology.

** Classification disregarded for that year.

TABLE A
(Continued)

CLASSIFIED AGGREGATE WORD COUNTS: 1875-1935

Year	Geo	Misc	Bio	Ar	Psy	Total
1875	**	9,600	**	**	**	28,600
1880	7,000	18,800	**	**	**	82,500
1885	**	3,000	**	**	**	4,500
1890	**	15,940	**	**	**	21,200
1895	2,240	17,100	**	1,890	**	45,130
1900	9,000	13,700	2,260	3,020	**	66,040
1905	3,530	8,060	3,780	2,840	**	39,800
1910	2,780	17,300	4,540	0	0	59,288
1915	4,900	27,800	7,300	2,080	3,500	71,130
1920	13,700	32,400	10,100	630	320	82,260
1925	51,100	32,700	25,600	37,000	1,750	255,580
1930	16,700	122,200	37,200	26,000	4,200	415,800
1935	19,700	88,400	13,500	9,150	2,440	236,390

TABLE B
 PERCENTAGES BY SUBJECT OF TOTAL YEARLY WORD COUNTS

This table presents classified word counts as percentages of the total word count for each year considered. The figures are computed directly from Table A.

Year	P.S.S.	As	P	C	Pa	An
1875	66.4	**	**	**	**	**
1880	**	25.3	13.2	22.3	6.2	1.5
1885	33.4	**	**	**	**	**
1890	.8	**	**	**	24.0	**
1895	**	9.5	5.4	10.1	24.5	3.4
1900	**	40.1	0	2.5	11.3	3.7
1905	**	19.8	2.7	.5	31.2	0
1910	**	34.7	5.2	.4	17.8	.2
1915	**	1.3	0	4.8	21.3	8.6
1920	**	5.4	10.2	2.7	5.7	6.2
1925	**	12.0	6.0	6.1	14.9	3.2
1930	**	11.3	18.3	7.3	7.9	5.7
1935	**	7.9	10.9	4.9	15.5	4.4

TABLE B
(Continued)

PERCENTAGES BY SUBJECT OF TOTAL YEARLY WORD COUNTS

Year	Geo	Misc	Bio	Ar	Psy	Total
1875	**	33.6	**	**	**	100
1880	8.6	22.9	**	**	**	100
1885	**	66.6	**	**	**	100
1890	**	75.2	**	**	**	100
1895	5.0	37.9	**	4.2	**	100
1900	13.6	20.8	3.4	4.6	**	100
1905	8.9	20.2	9.5	7.2	**	100
1910	4.7	29.3	7.7	0	0	100
1915	6.9	38.9	10.3	2.9	5.0	100
1920	16.7	39.3	12.3	1.0	.5	100
1925	20.0	12.7	10.0	14.5	.6	100
1930	4.1	29.2	9.0	6.2	1.0	100
1935	8.4	37.4	5.7	3.9	1.0	100

TABLE C

GROUP AGGREGATE WORD COUNTS: 1900-1935

The word counts shown in Table A are regrouped here for reasons given in a discussion of all the tables appearing at the end of this section.

Year	I	II	III	IV	V	Total
1900	26,400	13,700	1,700	14,480	9,760	66,040
1905	7,900	8,060	1,190	6,370	16,280	39,800
1910	20,700	17,300	3,342	2,906	15,040	59,288
1915	950	31,200	3,400	13,080	22,400	71,030
1920	4,410	32,720	10,640	19,630	14,860	82,260
1925	30,300	34,450	30,900	96,230	63,700	255,580
1930	46,600	126,400	106,000	67,100	69,700	415,800
1935	18,700	90,840	37,400	39,350	50,100	236,390

KEY

- I: Astronomy
- II: Miscellany and Psychology
- III: Physics and Chemistry
- IV: Anthropology, Archeology and Geology
- V: Biology and Pathology

TABLE D
GROUP PERCENTAGES: 1900-1935

The group word counts shown in table C are shown here in terms of percentages of yearly totals.

Year	I	II	III	IV	V	Total
1900	40.1	20.8	2.5	21.9	14.7	100
1905	19.8	20.2	3.2	16.1	40.7	100
1910	34.7	29.3	5.6	4.9	25.5	100
1915	1.3	43.9	4.8	18.4	31.6	100
1920	5.4	39.8	12.9	23.9	18.0	100
1925	12.0	13.3	12.1	37.7	24.9	100
1930	11.3	30.2	25.6	16.0	16.9	100
1935	7.9	38.4	15.8	16.7	21.2	100

KEY

- I: Astronomy
- II: Miscellany and Psychology
- III: Physics and Chemistry
- IV: Anthropology, Archeology and Archeology
- V: Biology and Pathology

TABLE E
 ARITHMETIC INDEXES (UNWEIGHTED) OF CLASSIFIED
 AGGREGATE WORD COUNTS: 1900-1935

Computed directly from classified aggregate word counts, this table facilitates analysis of subject trends in terms of base years, which are arbitrarily selected. The base years are underlined.

Year	As	P	C	Pa	An
1900	<u>100</u>	0	<u>100</u>	<u>100</u>	<u>100</u>
1905	30	<u>100</u>	11	167	0
1910	79	309	15	140	5
1915	4	0	200	200	248
1920	17	844	130	63	216
1925	115	1,530	920	510	330
1930	176	7,600	1,760	435	990
1935	71	2,580	680	490	426

TABLE E
(Continued)

ARITHMETIC INDEXES (UNWEIGHTED) OF CLASSIFIED
AGGREGATE WORD COUNTS: 1900-1935

Year	Geo	Misc	Bio	Ar	Psy	Total
1900	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	0	<u>100</u>
1905	39	59	166	94	0	60
1910	31	122	200	0	0	90
1915	55	203	322	69	<u>100</u>	108
1920	152	236	445	20	9	125
1925	570	240	1,130	1,220	50	388
1930	186	890	1,640	860	120	630
1935	220	643	595	304	70	358

TABLE F

ARITHMETIC INDEXES (UNWEIGHTED) OF GROUPED AGGREGATE WORD COUNTS
1930-1935

These figures are computed from grouped aggregate word counts, and enable analysis of group trends in terms of the base years. 1900 was selected as the base year for each group.

Year	I	II	III	IV	V	Totals
1900	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
1905	30	59	70	44	167	60
1910	79	126	196	20	154	90
1915	4	228	200	90	230	108
1920	17	238	625	135	152	125
1925	115	252	1810	625	652	388
1930	176	925	6240	464	715	630
1935	71	663	2200	272	513	358

TABLE G

ARITHMETIC INDEX (WEIGHTED) OF GROUPED AGGREGATE WORD COUNTS
1900-1935

The total word count for 1900 was selected as the base year and the Group index numbers represent percentages of the total word count index numbers for each year. This permits study of the per cent relationships between groups as well as of trends within groups themselves.

Year	I	II	III	IV	V	Total (Index)	Total (Wordage)
1900	40	21	2	22	15	<u>100</u>	66,000
1905	12	12	2	10	24	60	39,800
1910	32	27	5	4	22	90	59,288
1915	1	48	5	20	34	108	71,030
1920	7	50	16	30	22	125	82,260
1925	46	52	47	147	96	388	255,580
1930	69	192	161	102	106	630	415,800
1935	28	137	57	60	76	358	236,390

Before attempting an analysis of the data set forth in the preceding pages, it is important to recognize the limitations on interpretation imposed by the nature of the material studied. The data can be no more reliable statistically than the accuracy with which science news can be measured. Science news prior to 1900 was treated in a manner entirely different from present methods. Moreover, prior to 1915, the small headlines and small type of the "Tribune" made it difficult to catch scientific items. It would be obviously impossible to read every headline for every year measured, and while every page was scanned the word counts registered in the tables undoubtedly do not represent total wordage of matter which would be included by the classifications laid down in the introduction. It is reasonable to assume, however, that the aggregate trend line on Chart I presents a fairly clear picture of the growth of science news. Following after 1915 headlines became larger, and typographical layout made easier the task of identifying science items.

A more fundamental difficulty in the measurement of science news is the heterogeneity of the material. The method of classification was followed as rigorously as possible. Many cases arose in which a scrambling of several branches of science prevented allocation to one of the subject groups. In these cases miscellany was the only recourse, and hence constitutes the unknown quantity as far as subject classifications are concerned. Nevertheless, even in cases where miscellany bulks fairly large, the wordage of subject classifications may not be invalidated, for the distribution of subject matter

within "Miscellany" is probably similar to that of the material which could be classified.

Quantitatively, prior to 1900, science news fluctuated erratically at a relatively small volume, though it must be remembered that newspapers were smaller then by at least two thirds than they are today. This is shown graphically on Chart I. The volume rises at an increasing rate until 1930, after which it declines. It will be noted that the 1930 figure is more than 500 percent greater than the 1900 total. The 1935 aggregate falls slightly short of the 1925 figure.

On Chart II it will be seen that each group has risen markedly since 1900, but Group I. and V., astronomy and pathology, have not increased as rapidly as the other groups. This accounts for the percentage declines registered for I. and V. Group IV. concerns the nature of the earth and ancient man; it seems to maintain a fairly steady level, the large volume in 1925 occasioned by spectacular discoveries in Egypt in connection with the opening of King Tut-ankh-Amen's tomb. The percentage rise of physics and chemistry is steady, while miscellany fluctuates widely. The latter percentage trend line indicates that a large amount of material in 1915, 1920, and 1935 was unclassifiable.

In Tables C. and D., and in Chart I., the subjects were grouped into five divisions. Psychology was so small in relation to the total that it was grouped with miscellany. Archeology, geology, and anthropology being closely related were placed together. This device is intended to create groups which, though not necessarily homogeneous

within themselves are at least fairly easy to distinguish from one another.

Having analyzed the growth curve of science news wordage, let us proceed to the qualitative aspects of the literature, giving an explanation, if possible, of the data tabulated above.

IV. QUALITATIVE ASPECTS OF SCIENCE NEWS

IV. QUALITATIVE ASPECTS OF SCIENCE NEWS

1875-1935

Much of the science news in the "New York Tribune" prior to 1900 appears, in the light of our present standards, to be childish. Science news as we know it today had not yet come into existence. Several writers have pointed to 1922 as the beginning of a new era in the reporting of science news. Mr. David Dietz, Science Editor of the Cleveland Press, comments:

"I would say that the development of serious and systematic scientific reporting dates since 1922. This, of course, does not mean that important scientific events did not break into print before that time. For example, before the close of the nineteenth century the newspapers printed the discovery of X-rays and of radium. But I am told by scientists whose memory goes back to those days that much of the stuff printed at that time was confused at its best and preposterous at its worst.

"It is unfair to the journalists of two or three decades ago to judge their treatment of events which were then current, in the light of what has happened in the intervening time. My own feeling is the newspaper coverage of scientific events was totally inadequate in almost every respect until about the year 1922."

We can then turn to a consideration of science news in the early days without being too critical of its faults.

In the 28,600 words of science news in 1875 can be seen the elements which foreshadow later developments. A large volume of that total, slightly more than 66 per cent consisted of what were listed in the index as "Proceedings of the Scientific Societies." These reports came from all parts of the country, and because the newspapers lacked rapid means of communication, they were sometimes printed several weeks after the meetings had been held. Sometimes these items were grouped together and occupied space up to a column and a half.

Most of these reports consisted of the names of the scientists who presented papers at the meeting and the subjects of their papers. In most cases no real attempt was made to select from the mass of material available that which would be of most interest to readers or which would be of greatest import to science. The meetings were reported in straight narrative order, and presumably the papers which interested the reporter most received the most space.

Some of the "leads" on stories of that time illustrate a method of approach which would be amusing to reporters of the present day. For example, one story of the convention of the National Academy of Sciences in Washington began thus:¹

"Another cool but delightful spring day has favored the meeting of the National Academy, and there are several new faces in the audience since yesterday."

A report of a later session of the same convention states:²

"Today was the most interesting of the three days of this meeting. As rule the last day of such gatherings is a scene of worry and hurry. Such was not the present case."

The writer goes on to describe the speakers and their methods

of expression with little information as to what they had to say.

In a few cases the press reports of these meetings dealt with abstruse matters an explanation of which present day reporters would hesitate to attempt. The first of such items found in the 1875 "Tribune" originated at a meeting of the Connecticut Academy of Arts and Sciences:³

"...Professor Norton resumed a discussion on the subject of molecular physics. Professor Norton's late studies have embraced an extended and rigid score of experiments - tests of his theory and deductions. While Maxwell, Tyndall and others make vibratory motion of the ultimate particles the origin of molecular forces, Professor Norton considers these forces as originating in the ethereal envelopes by which he conceives the ultimate particles to be surrounded. The molecule he regards as a primitive atom with an envelope of electric ether which itself is immersed in a second envelope of luminiferous ether. The 'atomettes' of this mutually repel each other and from this fundamental property of repulsion may be deduced all other forms of physical force and all classes of physical phenomenon. The luminiferous ether is concerned more directly in the phenomenon of heat, light, and perhaps, gravitation; while the electric ether seems necessary to explain electricity and magnetism. Following out this hypothesis Professor Norton has discussed the molecular constitution and mechanical properties of bodies, heat, light, electricity, magnetism, gravity, chemical action and molecular forces and finally has confirmed his deductions by experiments."

The writer concludes with an apology for having attempt-

ed such a difficult subject:

"While this class of studies is too abstruse to be of general interest, the results are of the highest importance."

The year 1875 may be taken as characteristic of science news in the "Tribune" up to 1877, when there was started a column appearing every Sunday under the heading "Science for the People." That column continued over a five year period, and accounts very largely for the 82,500 words registered for 1880. The proceedings of the scientific societies, as indicated by the index for that year published by the "Tribune" fall off to an insignificant part of the whole. There were of course articles in addition to the above mentioned classes, but the "Science for the People" column displaced to a large measure the sort of items noted in 1875.

"Science for the People" consisted of a miscellaneous grouping of all kinds of material ranging from highly theoretical discussions at one end of the spectrum to household gadgets at the other. The theoretical discussions were oftentimes handled in rigorous text-book style, with apparently no effort whatever at popularization. In general the column consisted of small sections with separate headings, taking in aggregate about two columns. In one column there might be one item referring to the secular variation of the moon along with one describing a method of making glue.

The wonder and mystery had already been vaguely recognized as selling points of science. One writer speaks of the "shadowy realm between the known and the unknown" and says "there, it seems...lay ultimate realizations, subtle, far-reaching, and wonderful."

A quotation from one of the "Science for the People" columns will give some idea of the complexity of subjects dealt with:

"The value deduced for the secular acceleration of the moon's mean motion is 10.1447 and it is remarked that the numerical value is founded on the assumed numerical value of the solar parallax - depending on the inverse cube of the parallax."

The material classified as miscellany, on the other hand, includes most of the items which could be classified as even semi-scientific. The nature of the stories was, however, so heterogeneous that not much importance can be attached to statistics representing space devoted to chemistry, physics, astronomy, and so on. In spite of the difficulty of applying a rigid definition of science news for 1880, the following facts are indicated: that astronomy and chemistry take the lead in amount of space, and that miscellany, including such things as exploring expeditions, collapsable boats, ocean telegraphy, methods of preserving wood, etc., accounts for a large portion of the total space taken by "Science for the People." A significant fact to be noted about the science news of the whole period prior to 1900 is that frequent reference is made to "Nature", "Science", "Scientific American", and other scientific journals.

With "Science for the People" discontinued three years before 1885, the space devoted to science declined severely. The total for 1885, 4,500 words, undoubtedly is too low, because the index, which was followed in preference to examining every page, may not have been so inclusive as those for previous years. Nevertheless, the figure indicates a

definite diminution in volume. In the material found, there was indication that a number of individuals had not relaxed their interest in bringing science before the public. An article forty-three column inches long, entitled "Science as a Hobgoblin" - A plea for the Practical" discussed the status of scientific education as follows:

"Let us not be accused of decrying classical learning. We admire it, but we are not ready to be devoured by it."

Demanding that "scientific education be placed on a genuinely equal footing" with other branches of instruction, the article continues:

"By default in the schools, the public mind is cheated of its relish for science. The popular taste is not prepared to appreciate even elementary discussions of scientific themes. Nor is the obstacle here so much a popular incapacity to comprehend discussions duly simplified, as a popular sentiment against science, which disinclines to listen, is impatient of slight intellectual effort, and makes a fashion of another class of themes. Were the populace convinced beforehand by due courses of training in schools that the sciences possess the absorbing interest claimed for them, the fashion would incline to scientific books and lectures as it now avoids them. We are glad, however, to see signs of improvement. Lectures of the scientific order receive much encouragement, though on their own merits they seldom become the fashion; and popular books on science pay expense of publication, though their sales are overshadowed by every species of literary venture."

Another example of the great difference between the treatment of stories of that period and today's science stories is given by the following extract from a report of a National Academy meeting in Washington, April 22nd:

"Ten papers were offered for reading in the National Academy of Sciences today. Goldwin Smith appeared for the first time. Tomorrow is the day for the election of new members. There are eight vacancies which can be filled in one year. The first paper read today was by General Comstock of the United States Army on 'The Ratio of the Meter to the Yard.'"

"Professor Abbe, of the Signal Service, read a paper by Professor Loomis of Yale College on 'the progressive movement of storm areas, or areas of low pressure.' The movement of storm areas, he said, has been attributed to drift in a current, as water of a river is carried, all advancing in the same direction. But it is found that the average direction of a storm does not coincide with the direction of the wind, but with the force and direction of the special wind of the moment, and even then there is no evidence of exact agreement."

One writer indicates a preference for more understandable discussions by writing in his story:

"It was a relief to the audience after technical topics to listen to a paper by Professor C.A. Young on the new star in Andromeda."

There are three things noteworthy about the year 1890 in the "Tribune": one large supplement devoted to an account of the opening of the British Institute; a nearly complete

disappearance of the "Proceedings of the Scientific Societies"; and the prominence given to the field of medicine. The account of the British Institute was a survey of marine engineering and allied fields during the previous ten years, and accounts for 185 of the 196 column inches listed as miscellany for that year.

The year's total is still very small compared with the number of words to be devoted later to science. Only one item was listed under physics, and had to do with the study of lightning. The remainder for that year was classified as "medicine" which would include pathology, biology and allied fields. Several items under that heading were labelled "Medical and Sanitary Notes." They are analogous to the popular medicine and hygiene columns appearing in newspapers within the last ten years.

By 1895 science news treatment was still in the experimental stages, though the volume of space given science news was increasing. The bulk of the material still consisted of Sunday features, written in more or less the text-book style which characterizes the material up to roughly 1905. A number of new columns, or new headings for scientific material were noted, including "Science and Mechanics" and "Medical and Sanitary Notes" appearing irregularly, and containing a varied assortment of semi-scientific information. There is yet no evidence that the writers attempted to select material easily adapted to popularization, though there are signs of a changing attitude toward the presentation of science. A four-column article entitled "The Making of a

Newspaper" declares:⁴

"The invariable law of a newspaper is to be interesting. Suppose you tell all the truths of science in a way that bores the reader; what is the good? The truths don't stay in the mind, and nobody thinks the better of you because you have told the truth tediously. The telling must be vivid and animating..."

The writers of that day had not learned to be as vivid as later ones became, however. The lead from one of the items in the "Science and Mechanics" column illustrates the point.⁵ Under the head: "Exploring the Upper Air - What We Want to Know, and How We May Hope to Get It There" the item begins:

"Meteorologists believe that a great deal of useful information may be obtained by an intelligent and systematic exploration of the upper air."

On reading a similar lead in a newspaper of today we might be tempted to remark "So What?"

A pair of items which are in sharp contrast to those of today relate to the eclipse of the moon. Just three days before the eclipse was to take place, an inside page bore a three inch advance⁶ with a small cut describing the appearance of the moon during the event. The day after the eclipse another three inch item appeared, with the same cut, stating simply that the eclipse had taken place.⁷

Science news treatment does not markedly change during the last year of the 19th century. The beginnings of a widening horizon for the science writer are, however, indicated. The proceedings of the societies are written in a more pro-

fessional manner, and a greater diversity of subject matter is handled. An eclipse of the sun on March 28th accounts in a measure for the predominance of astronomical material registered that year. The large volume of "miscellany" indicates grouping of several subjects in one story. Two new headings, "Scientific Books", and "Science in the Home", presage the development of columns devoted to "household" applied science and reviews of contributions to scientific literature.

Having declined in total volume by nearly 40 percent from 1900, 1905 indicates no advance in the adequacy or variety of the material handled. The writer had not yet completely freed himself from the text-book style, and a large volume of the material was disorganized, if judged by present standards.

There is no spurt in the volume of science news in the year 1910, but a widening out of subject matter is noticeable. As the public began to realize the tremendous future automobile transportation held, the newspapers were quick to respond with large columns devoted to explanations of their design, construction and operation, and advice to prospective auto purchasers. Flying was beginning to receive widespread attention, and a number of interesting items on aviation appeared. A Sunday feature article⁸ presented "A Brief Glossary of Technical Aviation Terms in Growing Use." Weekly weather maps provided by the government Weather Bureau began to appear. The possible use of airplanes during war was imaginatively described in a Sunday supplement.

The eyes of newspaper readers were turned toward the skies for another reason, however, in May, when Halley's Comet passed near the earth. No less than 218 column inches out of the month total of 233, were registered for astronomy, and all had reference to the Comet. A barrage of small items ranging from three to ten inches provided the advance information on the event, 46 inches in April, and 54 in May prior to the occurrence. On May 18th, the day after the event, 218 inches appeared. For three days after the comet had indifferently continued its path through space, the "Tribune" carried a few follow-up stories, after which the story was "dead."

We might expect that the tremendous volume of war news which filled the front pages of the newspaper press from 1915 on, would displace scientific news to some extent. The actual figures show, nevertheless, a linear increase from 1905 to 1920. One might surmise that scientific news, though increasing in volume, experienced a decline by percent; but in the absence of data on the size of the "Tribune", this is only a guess. The science news for 1915, moreover, did not seem to be influenced by the war fever, except insofar as items on pathology and medicine brought in war epidemics and research stimulated by disease prevention in connection with the war. There were of course stories of war machines, ammunition, and so on, but these were largely non-scientific in nature.

Evidence that scientists did not yet feel that their judgments on practical problems would carry much weight

with the public occurs in a full-page Sunday feature⁹ on the merits of artificial as opposed to natural ice. The pros and cons are discussed in a general way, and under a subhead: "Scientific Statements Leave the Public Mind Untouched" the writer states:

"Other physicians and chemists who looked into the question of disease bacteria in ice reached the same conclusions, but they warned the ice men that the verdict of science was not sufficient at that time to restore public confidence in ice."

Science in the home made its appearance on the pages of the "Tribune" in 1920 in a weekly column called the "Tribune Institute." This column carried information about all kinds of household appliances, such as new types of fireless cookers, iceless iceboxes, and vacuum cleaners, as well as food values and recipes. The lead taken by "miscellany" for this year is largely accounted for by this column. At least 39 per cent of the material was unclassifiable or ranged over a wide variety of subjects.

Pages devoted exclusively to the automobile had been developing during the previous years, and were gradually reaching a volume level comparable with that of today. (Automobile news, classed roughly as engineering, was not measured in this study.) Extended treatment of radio had not yet made its appearance; the readers were to wait two years before the "Tribune" initiated amateur radio pages, which took their place beside auto pages as regular features. The auto sections appeared regularly, contained series of art-

icles on particular phases of engine construction and design, and were considerably more scientific than those of five years before. The trend line for the year is unstable, and indicates a rather sporadic appearance of long articles. Later, regular science columns have the effect of stabilizing yearly trend lines.

By 1925 the volume of science had more than doubled the 1920 mark. The opening of King Tut-ankh-Amen's tomb provided a fertile field for popularization, and consequently weights the archeology-anthropology-geology group very heavily. Nearly 35 per cent of the year's volume is accounted for by archeology and geology alone. We see in this year a continuance of the widening area of scientific subject matter available for intelligent popularization.

That popular science of 1930 had possibly emphasized the mysterious and magical features of the subject is evidenced by an editorial¹⁰ which mentions the "stature of the scientist:"

"The only important harm from too much praise or too much publicity for science is one that menaces science itself. Already the stature of the scientist in public imagination threatens to sink from mighty magician to practitioner of sleight of hand.

"The probable culprit, however, is neither science nor the popularizer, but the curiosity of the reading public, which demands an unending supply of interesting things that seem just to have happened. Radio, popular science publications, and increasing scientific instruction in the schools have provided the scientific interest. Laboratories

cannot help becoming factories of news, often stimulated to overproduction by eager seekers after publicity. But, after all the real progress of discovery and the real flow of the public mind are little disturbed."

Whether or not the scientist had come to be regarded a magician, the 1930 volume of scientific news definitely indicates that more attention than ever before was being centered on his revelations. The science writer was in no sense limited in his choice of material. So many fields of human endeavor were touched by the discoveries and techniques of modern science that there was hardly an event of major importance into which science could not be injected. Scientific crime detection, "scientific" ways of eliminating unemployment, scientific means of testing whether race horses are doped - scientific disease prevention - these and hundreds of other techniques were stimulating science both in straight news stories and in Sunday features. The influence was even felt in the light, humorous, human interest stories. The latter indicate that writers had acquired the virtuosity requisite for using pseudo-science to make people laugh. To quote a typical illustration:¹¹

Science to Detect
Lair of Bullfrog
in Bronx Wilds

Jonah, Bass Singing Sleep
Disturber, Desired as Pet
by Two Jersey Residents

"Jonah, the bellowing bullfrog of the Bronx, on whose head a price has been placed by the residents of the Bronx River Parkway and whose face and profile are visible in

every Westchester postoffice along with his Bertillon classification and his record as a croaker with an intent to disturb, has become the object of attention from fanciers all over New Jersey, where frogs who can sing bull bass are now as rare as the buffalo."

One of the articles written by Professor H. H. Sheldon, Professor of Physics at New York University, for a Sunday feature page¹² shows that science had literally invaded the field of drama. The article was entitled "Can Science Compete with the Drama on Broadway?" and concerned a scientific show sponsored by the New York Electrical Society, the New York Section of the American Institute of Electrical Engineers, and the Museum of Peaceful Arts. Professor Sheldon writes:

"We have seen something of the growing popular interest in science in the demand which has made the Science and Industry column in the "Herald Tribune" possible; in the Einstein riot at the Museum of Natural History last winter; in the growing attendance at the popular science lectures given by such organizations as the New York Electrical Society..."

Advertisers were not blind to the value of a stamp of scientific approval on their products. In a story of an interview with Einstein¹³ the great mathematician declared that he had been offered thousands of dollars by American firms to endorse disinfectants, haberdashery, musical instruments, and so on.

Special columns on science became numerous in 1930; notably among them was "Foundations of Philosophy," which

handled in a very competent way the philosophical implications of new advances in mathematical and astrophysical theory, providing essential background material and making it both interesting and informative. The influence of Sunday feature material is registered in the large amount of "miscellany" registered in the data for that year.

The material of 1935 is not noticeably different in quality from that of 1930; it is needless to multiply illustrations of the many fields covered and the ingenuity of the science writers. The decline in volume in 1935 is very marked, however; Chart I in this study shows the 1935 level to be 57 per cent of that for 1930. This falling off also appears in figures compiled by the "Herald Tribune." Referring to these data, Mr. O'Neill writes:

"The data available (figures for average Sunday space, 1931-1935, for the "Herald Tribune" and the "New York Times) indicate that science is not receiving increasing attention. It is now receiving 50 and 62 per cent respectively of the space it received five years ago in these papers. Although the economic situation has improved to a great extent since 1932, (if we can believe our business statisticians) there has been no appreciable improvement in the actual amount of space devoted to science news, but instead, an appreciable decrease in the relative amount of space - percentage of the total space available for reading matter - since that time."

The reason for the decline represented in these figures may appear as we take a backward glance at the last fifty years and attempt an explanation of the general trend.

In spite of the dangers of our generalizations, it is necessary to account in some way for the amazing process of intellectual expansion we have witnessed.

The industrial revolution has been explained on the basis of what the sociologist calls the electro-machine. The reason for the ever widening scientific horizon, in like manner, can be traced to several major inventions and discoveries during the early part of this century. There can be no doubt that the development of the automobile, the airplane, and the radio are the points of departure to a wider concept of science. In these focal points from the start there was centered a profound public interest and curiosity. The public first learned that the automobile was not merely a plaything, but a powerful means of large scale transportation. Becoming curious as to the mechanism of automobile engines, newspaper readers learned in a vague way the rudiments of engine construction, and were prepared thereby for information on other branches of science and engineering.

The same thing is more or less true of the radio and the airplane. The most important single event in the establishment of aviation news was Lindbergh's flight. Receiving as it did a tremendous amount of newspaper space, it "made" aviation.

Perhaps the biggest factor in the developments of newspapers was the war, which brought with it an internationalizing of the news, a realization that science was a tremendously powerful agent of destruction as well as construction, and a stimulus to intensified popular demand for high tension headlines. The war had accustomed readers to news of the

first magnitude day after day, and when the armistice was signed the papers had to continue injections of stimulants in strong doses on their front pages. The post war doldrums may have found a public disgusted with the blood and thunder of battle; but the public appetite was nevertheless ready for strong meat, and it had to be satiated. In the absence of war news, the papers searched for other possibilities. We may argue that the post war diet was not good for the reader, but he took to it avidly. Science was not the least of the possibilities for sensationalisation, and even now the scientist is just on the threshold of newer and more startling discoveries than ever before.

Concomitant with the increasing availability of easily exploitable news came a new and more pungent newspaper style. Back in 1875 people had time to take the paper home, laboriously pore over the small headlines, and read text-book discussions. Today newspapers are skimmed, not studied. Fast-moving, live news calls for a different, faster mode of expression.

Retrenchment of space in the newspapers following 1930 brought about by the depression at least partially accounts for the severe decline in science news volume since that year. Financial stringency imposed by the loss of advertising compelled papers to curtail much of their news. They were forced back to the traditional program of politics, business, sudden death and crime. The science feature article, one of the relatively late comers, was the first to be relegated. The furor about technological unemployment may also have prejudiced the copy-reader against science news.

In reference to the "Tribune" statistics on wordage after

1930, Mr. O'Neill writes:

"The story these figures tell is a sad commentary on the composition of our newspapers today. These figures indicate that our Sunday newspapers ('Herald Tribune' and 'Times') devote between one-half and three-quarters of one per cent of their total reading matter space to science, and about three per cent to all technical subjects, radio, aviation, automobiles, and science. Very little scientific or technical information is presented under the first three headings, most of this space being devoted to the entertainment or commercial aspects of the subject...

"There has been a decrease in the space devoted to science and technical subjects since 1931. In my most hopeful moments I like to think of this as a transient drop due to economic conditions, but when I revert to logical thinking, I find it just another indication of the trend of responsible leaders away from all rational thought processes and toward the emotional and illogical ways of thinking that must prevail if we are to continue our efforts to keep in operation an equally illogical and irrational economic system."

REFERENCES

- ¹ New York Tribune, 1875, April 21-6-6.*
- ² Ibid., 1875, April 24-2-1.
- ³ Ibid., 1875, July 7.

* In this notation the first figure indicates the day of the month; the second, the page; and the third, the column.

- 4 Ibid., 1895, January 21-4-4.
- 5 Ibid., 1895, July 15-9-3.
- 6 Ibid., 1895, August 31-5-4.
- 7 Ibid., 1895, September 4-12-4.
- 8 Ibid., 1910, October 23.
- 9 Ibid., 1910, April 25, sec. 4, p.3.
- 10 Herald Tribune, 1930, January 2-26-3.
- 11 Ibid., 1930, August 15-7-1.
- 12 Ibid., 1930, November 16-IV-1-4
- 13 Ibid., 1930, November 23-3-3.

V. THE PROBLEM OF POPULARIZATION

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From the study of word counts discussed above, we have seen the phenomenal development of science news to such a stage that its importance to a relatively large part of the population is almost universally acknowledged. There is no direct gauge of the number of newspaper readers who have become "science conscious". Indirect evidence of public interest in science is available at every hand, however, such as attendance at popular science lectures, activities of educational institutions in giving science courses a larger role in curricula, and the greater part being played by scientific knowledge as applied to all kinds of pursuits from weather prediction to conservation of natural resources. The response of newspaper editors in effecting more adequate coverage of this widening field, is a significant piece of indirect evidence in support of the enormously increased lay interest in science. It is precisely the response of the newspapers with which we are concerned in this study. The testimony of editors, scientists, educators, and news writers is illuminating. Mr. H. B. Rathbone,¹ Dean of the Department of Journalism at New York University, writes the following:

"That science is receiving more space is readily demonstrable. Twenty or thirty years ago, the reporting of science news was done by reporters in no way equipped to understand the facts involved. Today, the great press associations and the great metropolitan newspapers specialize in science

reporting and engage individuals who have adequate scientific training to write on science topics and to report the meetings of the learned societies."

Dr. Austin H. Clark,² Press Director of the American Academy for the Advancement of Science, concurs with this:

"Any form of human activity is appreciated in proportion to the amount of space devoted to it in the newspapers, just as the importance of any firm or corporation is judged by the relative size of its advertisements."

Mr. Waldemar Kaempffert, Science Editor of the New York Times commends the work of the press:

"The newspapers are doing better scientific reporting than at any time in their history. But there is still much to be done. The great news of our day is undoubtedly the news of science. Very slowly newspaper publishers are realizing that fact. A conception of their laxity in the past may be formed when it is realized that it took thirteen years for the public to learn of Einstein's theory of relativity through them. This is by no means an isolated instance. I doubt if anything like that could occur nowadays."

Mr. John J. O'Neill, Science Editor of the New York Herald Tribune, speaks of the specialization in science reporting:

"The bulk of science news in our large newspapers is being handled by men who specialize in this work. They are primarily newspapermen with an aptitude for science, and all of them find a distinct pleasure in their work. They have been associated as a group in covering the conventions of the scientific societies for the past seven years or so, but

some of them have been writing science for much longer periods. These men have built up an extensive background of knowledge in the work of scientists in the various departments and through conscientious efforts to make reports as accurate as possible have earned the confidence and co-operation of the scientific societies and individual scientists. This situation makes it easier to improve the degree of accuracy in science stories. These men do not, and cannot, handle all the science news in the paper, but under their leadership and with their co-operation the standard is being raised on all science news. The great handicap in securing more satisfactory representation of science in the newspapers is the attitude of city editors, managing editors and publishers, most of whom have come up through political channels and tolerate rather than welcome science news."

The growing emphasis on science has been attended by a more mature attitude toward the aims of the scientist on the part of the higher grade of newspaper readers. Revelations forced on us by the products of today's laboratories would, in the nineteenth century, have been dismissed as impossible or ridiculous. In this age, the scientist and technical man has acquired an aura of authenticity. Faiths in a benevolent divine authority may have waned during the last fifty years; willingly or no, the scientist has come to realize that when all else fails, he is the court of last appeal. The Macon disaster last year, and the havoc wrought by the New England floods during March of this year bear witness to this fact. It was the technical men who were called upon to explain the troubles and provide the solution to the problems.

Mr. J. W. N. Sullivan,³ writing in Atlantic Monthly, declares:

On the whole...the general reaction of the lay mind to the teachings of science is one of uncritical credulity. We may summarize this aspect of the influence on the layman by saying that there is now a general tendency to regard the scientific man as the one trustworthy authority."

Recognition of the market for science news did not result immediately in the employment of specialists to cover the field, but at least there are evidences early in the century of a clarified view of the problem, forecasting, in a measure, the development which was to take place. An editorial⁴ appearing in "Current Literature" in 1902 is indicative of the newspapers' attentiveness to this circumstance:

"No newspaper hesitates to deal with scientific subjects, even the most abstruse. At the present day science is no luxury for the favored few; the masses of general readers are ripe for its teachings, and there is no condition of our many-sided life that is not touched in some way by its discoveries."

The editorial continues with reference to the manner in which "science suffers" when stories are inaccurate:

"Sunday newspapers are, perhaps, the greatest offenders in this matter, simply because the persons best fitted for the work do not usually contribute articles to this department of journalism...It is too much to expect that each newspaper should have a scientific editor among its many associates, but it should be insisted upon that when a proof-reader is dealing with a scientific name, he should verify it, if he is not already

acquainted with it."

The policies of the larger papers in handling science news, while not indicating the general attitude of the press as a whole, do point to the fact that the leading metropolitan dailies have assumed a very definite obligation to present in their columns science that is accurate, readable, and significant. Mr. John J. O'Neill, gives the following opinion:

"It is the policy of the "Herald Tribune" to strive to give as complete a science news service as is given by any other newspaper, but to give it in a briefer, snappier, and more easily understood style. It is the desire of the news department men to give a more complete science news service than any other newspaper, but the executive departments are not fired by any holy zeal in the interests of science which would make an expansion of the science news service possible. This, I am sure, is not unique with the "Herald Tribune," but is symptomatic of a universal situation."

The policy of "The Christian Science Monitor" is set forth in the statement of Mr. Herbert B. Nichols, the Natural Science Editor:

"As to the natural science policy of 'The Christian Science Monitor,' we ask two questions of every scientific story likely to appear in our columns: 1. Does it illustrate how physical science is helping to overcome lack and physical limitations? 2. Will it serve to keep our readers informed on the general progress of important scientific developments?

"As you see, this policy does not allow us to delve deeply into theory, nor spend much space on so-called 'purely scientific' research which does not show promise of some

practical value to civilization as a whole."

It would be impossible to outline completely the reasons for the tendency toward good science reporting by the press during the last fifty years. In the first place, so many agencies have taken part in the development that complete discussion of any one of them would constitute a large chapter in the story. The scientific educational institutions, the press associations, the learned societies, and free lance writers of all varieties, have participated in bringing science to the public. We can, however, go beyond the generalization that "science has become an integral part of civilization" and trace, perhaps sketchily, the main contributing factors.

The hobby interest in science, and man's innate curiosity for the unusual, the spectacular, are the fundamental reasons behind reader interest in science. The earliest science writers, as we have seen, were not prepared to discuss technical subjects competently, and much of their material was used merely to "pep up" Sunday feature sections. The gaudy and exaggerated aspects of this type of writing no doubt constituted its great appeal. The hobby interest in science as we know it today was immensely stimulated by the automobile, and the radio.

Mr. Kaempffert speaks from wide experience in the following:

"Important factors in the improvement of science reporting have been the introduction of such inventions as the automobile, the kodak, and radio. When I first began to write on science and engineering I had to explain what a carbureter was. Now a whole technical vocabulary has passed into the

vernacular -- a great help. Similarly the kodak has imparted some of the principles of photo-chemistry, and radio broadcasting has familiarized the public with electrons, condensers, transformers, and the like."

Another stimulus to lay interest has been the rising generation of students who have become accustomed to technical nomenclature in the classroom, and sometimes embarrassed their elders by the facility in discussing in the vernacular the merits of free-wheeling, heterodyne circuits, synthetic rubber, and so on.

To quote from Mr. Benjamin Gruenberg⁵ in "Science and the Public Mind":

"Adults without special knowledge are baffled by the various mechanisms and are sometimes humiliated by the presence of youngsters who easily manage the new devices, and who glibly discuss pressure areas in relation to weather, dominant or recessive genes, and call the victims by their names." (This appears in chapter: "Content of science for the layman").

While in the main the scientists themselves have confined their professional reading to the technical magazines, they also have found it necessary to keep up with scientific affairs in a general way through the newspapers. The importance of discoveries and inventions at present cuts across all borderlines between branches of research. To familiarize himself with the advances in fields other than his own, the scientific man has had recourse to the newspapers.

Professor Robley D. Evans, Professor of Physics at the Massachusetts Institute of Technology, substantiates the fact:

"The scientist is interested in the press reports about fields other than his own. This constitutes his only source of information about subjects outside his chosen field. On the whole he is dissatisfied with material in his own field because he wants more accurate information."

When science news gathered momentum, and science writers began to take genuine pride in their profession, acquiring real skill, the character of their work did much to direct public attention to science. Dr. Clark ² refers to this in one of his many articles on the subject:

"It is chiefly because of the extraordinary ability of these writers on science that the relative amount of science printed in the papers is rapidly increasing at the expense of other types of material, and correlatively that public appreciation of science is rapidly increasing."

Another manifestation of the fact that science has achieved the interest of a large reader group than ever before is the development of pulp magazines which have dealt with highly imaginative speculations as the possible applications of scientific knowledge. "Amazing Stories", and "Astounding Stories" besides containing lurid material of a non-technical nature, have drawn freely on news from the laboratories, transmuting it into the most fanciful tales of horror and mystery, and extending the locale into the furthest reaches of the universe. The comic strip in the "Boston Herald," "Buck Rogers", has to do with the lives of a group of "earth people in the twenty-first century A.D. Dr. Huer, one of the main characters, acts the role of the glorified scientist of the future, and is in much the same

class as fictionalized science in pulp magazines.

While this highly popularized form of science has arisen concomitantly with increased science news in newspapers, it has no doubt had widespread effects on young minds in the formative stage, initiating readers to science on a low intellectual level, to be sure, but at least providing the basis for a more intelligent interest.

Having covered partially at least the major factors contributing to a more adequate treatment of science news in the press, we come to a far more important question, that of determining the general attitude on the part of scientists and editors toward the adequacy of popularization as currently practiced by the newspapers. Involving the whole complicated philosophy of science as opposed to the philosophy of the press, this problem does not permit a rigid or complete answer. Within limits, however, it is possible to outline the opinions of scientists on various types of stories and their method of treatment, as well as the mechanical difficulties encountered by the science writers in translating their material from technical language to journalese.

It will be recognized from the start that scientific information when written for popular consumption, undergoes a fundamental change. It passes through the hands of first a scientist, and second, a craftsman who is just as definitely a specialist as the scientist. The scientist is the fact-finder; the craftsman, a specialist with words, selects and adapts these findings. Professor Smith⁶ makes reference to the difficulty of popularization:

"When ideas originating in the laboratory or in the study obtain a wide currency, they are almost always transformed and to some extent deformed. Not only are they generally oversimplified and made cruder, but they often give rise to myths and legends with little recognizable relationship to the seminal thought that has furnished the catchword. But these myths, these false ideas, often turn the whole course of human thought and influence the progress of civilization more than the discoveries of authentic facts."

First, popularization must be defined, at least in a general way. We may consider by means of the following headings the treatment of most news stories concerned with science as classified in this study:

1. Stories which merely transcribe the statements of the scientist literally, which do not go beyond straight facts, and which make no attempt at simple analogies to scientific phenomena.

2. Stories which make use of simple mechanical analogies, omitting material not easily understandable by the layman, and which also do not go beyond the facts.

3. Stories in which scientific facts are distorted by exaggerated analogies, and in which the imaginative implications are emphasized to enhance reader interest. These stories sometimes have two faults: that of mis-stating facts and that of unjustifiably hypothesizing on the basis of mis-statements.

Of course all kinds of variations on these main types occur, so that it would be impossible to state definitely

whether an individual story were treated in one manner or another. Headlines introduce another complexity. Grammatically different in construction, they are, however, generically in the same category with the sentence, but markedly condensed. It will have to suffice to leave them for the most part out of the discussion, and draw for them the same conclusions as we shall draw for the stories themselves.

The literal, straight science story naturally appeals to the intelligent, discriminating mind, and is perfectly satisfactory to the scientist and those who have a genuine, well-informed interest in scientific advances. It must be recognized, however, that newspaper readers in the large are not satisfied with the plain, undiluted, uninterpreted facts, and will refuse to read a story that is not dressed up or tied into their daily lives and interests. It is this fact which compels the writer in most cases to bring his subject down to the level of everyday life by relating a discovery to some colorful personality or some object in which public attention is for the moment centered. In this connection Dr. Clark⁷ writes:

"The successful exposition of science in the daily press and in the popular science magazines is essentially the presentation of advances resulting from experimentation and deduction in the primitive language of human emotions and personalities.

"Every scientific article written for popular consumption must be tied to some personality, and in addition to being tied to some personality, it must have as a keynote love, hate, gain, loss, mystery, or some other basic

emotional concept."

To quote again from Mr. Gruenberg⁸:

"While there has been great improvement, the disposition among the journalists in general is still to draw upon the sensational or exciting."

This circumstance gives rise to the second type, a large part of which is now being very ably handled by the best science writers on large papers and press associations. Here the problem is mainly that of determining reasonably accurate popular analogies which most nearly approximate the scientific facts. The possibilities for inventiveness on the part of the writer in creating simple analogies are virtually unlimited. The writer can refer to Shrodinger's "psi" waves as a "humpty-dumpty phenomenon, Bohr's atom as a merry-go-round process, the neutron as one of the "building stones" of nature, the ignition of a giant fuse as a flash of lightning, or stress analysis instruments for airplanes as "earthquake recorders". This list could be expanded in great detail, but the point is clear. It may be argued that these devices do not convey to the reader a complete or accurate understanding of the subject. To the scientist they are manifestly unsatisfactory, because "understanding" a subject, to him, requires knowledge of technical language, a nomenclature which should be in every sense precise. At the same time, it must be realized that the layman, to be reached at all, must be approached on the level of his own informational equipment. In other words, if a story does not make a departure from scientific terminology, the average newspaper reader will not even

stop to read the first paragraph. The justification for analogies resided in this assumption, that the curiosity of the lay reader deserves to be satisfied just as much as the curiosity of the critical scientist. Similes and analogies are admittedly only approximations to facts and yet they constitute the writer's only means of projecting his material before the layman. If we believe that it is desirable to present science to the public, then we must present it in diluted form. It is unfortunate, but nevertheless a fact, that the spoon-feeding process is often the only available method. Some would hold that because the philosophy of experimental science is definitely not the philosophy of the national forum, attempts at newspaper popularizations should be entirely abandoned. This view reflects the attitude of the scientist who is furthest removed from public life, and is interested in developing his science for its own sake with no reference to applications in or its value to the work-a-day world; such a sentiment is probably shared by very few.

It is difficult also to make clear divisions between the second and third types. Nevertheless, we can readily identify many stories as belonging to type three. The literate world has not been immune to the gyrations of the less responsible members of newspaperdom, whose violations of the trust imposed on the press have occasioned aberrations in the reporting of science, much as they have produced garbled work in other fields. These are subversive of the best interests of conscientious scientists and writers. Prompted by the central motive of increasing circulation at the expense of their self-respect, if they have any, these irreconcilables consistently

distort science effectively and viciously, pandering to the unintelligent reader's greed for sensationalism. These distortions of news have been the best method of antagonizing scientists, and making them occasionally refuse completely to co-operate with reporters in the legitimate pursuit of news. An example of this sort of distortion occurred in a Los Angeles newspaper after the announcement of cosmic rays by Dr. Robert Millikan, a headline declaring boldly at the top of the story: "Secret of Life Revealed".

In the main there are two kinds of distortions, mis-statements and unjustifiable hypotheses on the basis of either statements or mis-statements. Many inaccuracies are no doubt made by reporters who miss the significant points of stories because they themselves fail to understand the subject completely. Reputable reporters are continually trying to root these errors out of their work by consulting scientists before stories go to press or by equipping themselves through the professional journals with fuller knowledge of scientific subjects. Increased co-operation between reporters, scientists and press representatives of technical societies has relieved matters considerably during the last decade. Reporters who cover a business convention one day and a technical convention the next, are in a less satisfactory situation. Moreover, there are good newspaper men and there are bad ones.

In the matter of extrapolating scientific data, the problem is much more complicated. One of the easiest ways of sensationalizing a science story is to inject into it high-flown predictions that very likely will make a scientist

appear ridiculous in the eyes of his colleagues. Rocket ships provide a convenient means for the popularizer to let his reader vicariously enjoy a trip to the moon in a stream-lined, steam-heated craft, depicted perhaps (in a Sunday feature) with all the skill of an expert draftsman. The scientist can also play the major and colorful role (in the Sunday sections) in tracking down a criminal on the evidence provided by the dust particles left by the unwary law-breaker. Popularization of this variety gives human ingenuity a free rein in painting glamorous pictures of the scientist surrounded by test tubes, microscopes, and other paraphernalia.

The reporter would many times like to hazard his own wild guesses as to the implications of certain discoveries. He can get his "facts" straight, and still be guilty of trying, with insufficient knowledge, to predict the possible applications of a new tool provided by science. The scientist's resentment against such predictions is wholly justified. Even the man who knows the most about a discovery may be entirely unable to discuss its implications.

Notwithstanding the difficulties of considering implications and applications, these interpretative and philosophical discussions have a real place in the newspapers. The layman has the right to be presented with more than the mere facts; he wants to know how they relate to him and what possibilities they have for the future. But when predictions of the possible uses of scientific data or discoveries are made in news columns, whether made by scientist or philosopher, they should be distinctly labelled as predictions.

Another circumstance which has undermined the faith of

the scientist in press reports is the often complete lack of critical judgment on the part of science writers in selecting what to "play up" or use for "leads". The scientist is more often than not surprised by what comes out in the papers the day following a convention. One example of the behavior of narrow-minded editors is given by Dr. E. E. Slosson⁹:

One of the surprising facts we have found out in the efforts of Science Service to aid the popular press in keeping up with scientific progress is that the hardest thing to sell to a newspaper is news. Old ideas go best, if dressed in a slightly novel guise, just as an old joke is surest to win a laugh from a crowd. The facts and the theories now being brought out in many of the sciences are so novel and revolutionary that they are rejected by the lay mind as inadmissible. That is not because they are incomprehensible but simply because they are unfamiliar. I have often tried to get over a strange idea by building up a gradual ramp from common ground to the point where it is an easy step to the new notion, but the editor is apt to cut off at the very point which the article was intended to convey, leaving only the conventional and commonplace material used as an approach to the novel information."

Most scientists are wholly in favor of vigorous accurate popularization; their sentiments as to the many forms it may take, however, are varied. Professor Robley D. Evans declares vigorously that "the reporters cannot be trusted." While stating that in general the faults of science reporting lie with the reporters themselves, he imposes, however, an obligation on the part of the scientists to aid the press

in securing accurate readable material. To quote: "Limitations on popularization are imposed by the skill of the scientist to popularize his stuff. Dr. Arthur H. Compton is the world's best at boiling things down to words of one syllable. I think all scientists should attempt to do the same thing... The man who understands science most completely can explain it most fully."

Dean Samuel C. Prescott of Massachusetts Institute of Technology makes the following comment:

"I think it is possible to popularize scientific discoveries so that the lay reader can understand, if a qualified rewrite man is employed who will take the trouble to get accurate information in the first place. Even a man without scientific training can do this, but probably some knowledge of science is desirable. In my opinion, matters of genuine importance and broad human interest should be reported, but with special care as to the correctness of statement and conclusions."

Another comment on the problem of popularization is presented by Mr. Gruenberg¹⁰:

"The popularization of science in the past, and down to this very day, may conceivably operate to the injury of science. It is not merely, as some scientists seem to fear, that the oversimplification of the specialist's ideas makes the specialist out to be rather simple minded or exposes him to foolish discussion by the ignorant. The danger lies in reducing science to a modern form of magic. Much of the popular science in the newspapers and in other media, is trivial and misleading. It arouses some awe and admiration perhaps,

but also credulity of the blindest sort...Science has enabled us to see right through the deceptions and illusions of unscrupulous mountebanks in the past imposed upon the gullible public...It is in turn able to perform miracles far more wonderful than anything dreamed of in the past. It not only makes bread more abundant, at least on the average, but it supplies an interesting circus and reveals hidden mysteries."

The opinion that the scientist cannot in most cases regard himself as capable of expressing his ideas for popular consumption is expressed by Dr. Clark,¹¹

"We who do our work in scientific institutions or in institutions of learning naturally see science from the English viewpoint. We like to flatter ourselves that we are engaged in a thoroughly respectable and even aristocratic occupation. It is a very satisfying and comforting belief, helping to smooth our path through life and doing no harm to anyone.

"But when we attempt to explain our work to others, through a medium, which, like the radio, reaches all classes and chiefly those classes of the population that are most widely different from the academic, we must see ourselves as others see us if we are to achieve success."

In an article already cited,⁷ Dr. Clark expands on this idea:

"Successful publicity for science is based first of all upon the recognition of people for what they are; it is futile to assume that we can make them over into what we would like them to be...The public as a whole sees the world in terms of personalities and emotions.

"We scientific men believe that we appreciate the world on the basis of determined facts. In this difference no question of intelligence is involved. Intelligence is the ability to correlate and co-ordinate the facts at one's command. The average newspaper reader, though he knows nothing of science, is by no means unintelligent. But he uses a language and has a habit of thought entirely different from ours."

Describing his difficulties in acting as the intermediary between scientist and reporter at one of the A.A.A.S. meetings at Harvard, Dr. Clark warns⁷:

"...just remember that the story has to please a hard-boiled editor and at the same time must not be so unfeelingly trivial as to offend the sensitivities of the author of the paper.

"Scylla, as represented by the unfeeling editors intent only on increasing the circulation of their papers among the hoi polloi, and Charybdis, as represented by the exaggerated sensitivities of introspective and egotistical scientific men, of whom I am one, are the two difficulties in the way of presenting science to the public through the medium of the press."

In a personal letter on the subject he summarizes the case thus:

"The popularization of science among the masses of people is a necessity, because for its further development science must have the confidence and support of the people as a whole. Particularly in a country where the bulk of scientific research is carried on by means of State and Federal appropriations is this true. Science is a commodity, with

sales value, just as much as peanuts or oysters, and a healthy expansion of the output depends in the same way on advertising. So far as the good of science is concerned, it does not really matter what kind of advertising it gets. It is quite possible for science to be benefited by an article that severely wounds the ego of the scientist quoted."

Mr. Herbert B. Nichols, Natural Science Editor of "The Christian Science Monitor" gives the following answer to the question:

"I think it is justifiable to popularize science in order to reach the non-professional reader who very often has a dormant curiosity equally as worthy of satisfaction as that of the professional scientist. However, this "popularization" should not go beyond the logical comparisons allowed in accurate reporting. The translation of scientific terms in common everyday English and the use of comparisons between scientific truths and experiences of everyday life, is a service decidedly advantageous to both science and the press."

Mr. Gobind B. Lal, Science Editor of Hearst Newspapers, vigorously comments on the subject in a letter:

"Of course it is justifiable to make science 'popular' to everybody. Unless you believe in keeping the people ignorant. Anyone who prefers knowledge to ignorance will inevitably believe in the widest popularization of science. There can be no other answer.

"There are no limits to popularization -- none whatever. Science is truth; otherwise it is not science. Society based on lies is not worth living in."

To generalize about the fields which have been most adaptable for popularization would not be particularly fruitful; it may be said, however, that the ease with which some stories can be translated for the unscientific layman has been only one of the factors influencing the space devoted to various branches of science. Mathematics, for example, is one of the most difficult subjects to popularize, and yet many science writers have been able to deal with it very competently. Dr. Clark⁷ mentions this fact:

"Mathematics is a difficult subject. But it is a subject with possibilities. So much mystery is involved in higher mathematics that even a professor cannot explain it so that anyone can understand it. Yet some very excellent reports of mathematical meetings have appeared in the press - written by a science writer who flunked mathematics while in college.

"Popular interest in a subject has no relation whatever to an understanding of that subject. All newspaper readers are interested in relativity, genes, cosmic rays, Manchukou, and the gold standard, but not one in a million has any idea what these things are."

In answer to questions on Einstein's popularity, Professor H. B. Phillips of the Department of Mathematics at Massachusetts Institute of Technology writes:

"The public's curiosity concerning Einstein's discoveries is largely due to clever publicity. They were told that only a dozen people in the world could understand Einstein's work and were naturally curious to know what could be so

difficult.

"This interest has to a certain extent been increased by Einstein's picturesque appearance. The usual scientist looks like an ordinary business man, while Einstein has the appearance of a stage genius."

Adding that too much attention has been focused on certain spectacular results of Einstein's theories, even a vague understanding of which could only be obtained by reading an entire book, Professor Phillips continues:

"An exposition of mathematics sufficiently accurate to satisfy the scientist would be much too tedious for the layman. Almost any scientific subject studied by juniors or seniors at the Institute can only be understood after years of preliminary education. For those who have not had this preliminary education, it is not possible to present the subject in such a way that it is accurate and has news interest."

The quotations cited above exemplify in some detail the opposing views of scientists and writers. There is no major conflict between the groups; accurate popularization in general can be achieved. The scientist may not seek scientific information in the newspapers which is better handled in the professional journals. But he does recognize there are many newspaper readers who are not scientists, and whose demands for accuracy are secondary to his demands for readability and simplicity. Some scientists attending meetings will often tell the reporters before papers are read that the material is so highly technical as to be of no interest to newspaper readers.

One circumstance, however, which is not widely

recognized is that the handling of science news, when compared with that of other types of news, is not as bad as it might be. The columns of the daily press have not the space to educate the reader to a complete understanding of international politics, theology, art, drama, and all the other subjects treated in newspapers. Material of any sort must be simplified for the man who runs while he reads. Unfortunately, it is, that an accelerated tempo and widening geographical field of operations has enforced superficiality on the common mind, yet it is inevitable fact. Today's "average man" knows more about the world than the average man of past centuries; his knowledge is necessarily less thorough.

A question yet to be answered is how far the scientist should overstep his province of fact-finding and take part in the exposition of his discoveries before the common mind. A definite answer to this question is offered by Mr. Howard Blakeslee, Science Editor of the Associated Press¹²:

More important than any of the achievements of science are the philosophical implications for its discoveries - the need for leadership in thinking, leadership in the social and economic implications of his discoveries. In this leadership the scientists are not prominent. Their failure to guide the public in adjusting the problems of plenty which the scientists have created may account largely for our economic and social crisis. This failure is largely due to the fact that the scientists have been keeping out of the newspapers, out of the place where the public can get acquainted with them, out of the place where the masses can make up their minds what leadership to follow.

"The failure is largely due to a mechanical maladjustment, to the fact that the scientists do not speak the language of the newspapers, that is, of the national forum. This language requires emotional appeal."

Mr. Waldemar Kaempffert takes issue with this view:¹³

"...I see no reason why the scientist should become emotional and talk in the vulgate because the newspapers will then give his utterances more space.

"It is the business of the journalist and not of the scientist to present the discoveries of the laboratory so that the many can understand...We have passed the stage where gasping wonder can pass as popularization. What we need is more journalists trained in science and not more scientists with a flair for popular writing."

No matter how one regards the whole problem of presenting the discoveries of science for popular consumption, it will be agreed that it involves a compromise. There can be no clear-cut solution. It is somewhat analogous to explaining the binomial theorem to a second-grade grammar school student. For there to be an approach satisfactory to the scientist, the writer must have a deep regard for his requirements. And at the same time the scientist is obliged to co-operate with the press and to furnish the writer with the best explanation he can give. If both members of the partnership see the problem from all angles, the cause of science is furthered, the level of reporting is raised, and mutual animosities disappear.

REFERENCES

¹ In answer to requests for opinions and information a number of prominent editors, scientists, and educators have written personal letters making comment on this subject. Where no reference to books or periodicals is made, the material quoted is taken from these letters.

² "Selling Entomology" Scientific Monthly, June, 1931. Vol. 32, pp. 527-536.

³ "Science and the Layman" Atlantic, September, 1934. Vol. 154, pp. 330-337.

⁴ "Newspaper Science" Current Literature, December, 1902. Vol. 33, p. 677.

⁵ Science and the Public Mind, McGraw Hill, New York, 1935. p. 59.

⁶ History of Modern Culture, Henry Holt, New York, 1934. II, 149.

⁷ "Delirium Gyrams" Harvard Alumni Bulletin, June 22, 1934. pp. 1038-1043.

⁸ Science and the Public Mind, p. 94.

⁹ Ibid., p. 98.

¹⁰ "Science and the Layman" Scientific Monthly, May, 1935. Vol. 40, pp. 450-457.

¹¹ "Science and the Radio" Scientific Monthly, March, 1932. Vol. 34, pp. 268-272.

¹² "Scientific Men and the Newspapers" Science, June 14, 1935. Vol. 81, p. 591.

¹³ "Scientific Men and the Newspapers" Science, June 28, 1935. Vol. 81, p. 640.

VI. THE FUTURE OF SCIENCE NEWS

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The foregoing detailed outline of the elements of the science news permits a discussion of the place it will hold in the press of the future as well as an extrapolation of the growth curve drawn in Section III of this paper. Two trends to be distinguished are the development of more accurate news reporting and the development of interpretive news reporting. The former, as we have seen, has been promoted by co-operation between scientist and editor, and rests on the basis of a "science-conscious" public. Mr. Kaempffert's letter makes reference to this:

"If science reporting and science writing have improved only within recent years, it is because of the state of the public mind. In other words the colleges and universities must assume some responsibility for the general lack of scientific knowledge. The kind of reporting to be found in newspapers is correspondingly low. Not until science is taught as a cultural subject in colleges and universities, will it be possible for newspapers to expand their science departments as rapidly as I could wish."

The extent to which the level of news reporting can be raised in the future will be determined by the intellectual level of the newspaper readers. Professor Smith has devoted a large section to the layman's attitude toward science in "The History of Modern Culture;"¹

"...in modern times, as the leisure classes grow larger, as the pressure of economic struggle slightly relaxes,

as education diffuses the means of culture, the immaterial interests take a larger place in man's thought. And, in modern times, the interest in science has gradually encroached upon the domains of religion and of politics, and perhaps on those of art and poetry."

"Even more than the rise of science the rise of the reading public has moulded literature. As the literate class expands, it takes on lower and lower levels of intelligence and taste. The democratization of literature has meant also its vulgarization. The masses want books and newspapers that reflect their own simple interests, pander to their own crude tastes, and flatter their own low prejudices. Above all, they have demanded simplicity and comprehensibility."²

The prediction of an enlargement of space devoted to science in the future must be predicated on the assumption of a favorable environment for scientific enlightenment via the newspaper columns, yet the possibility of sustaining lay interest in cultural and scientific affairs in the future depends upon so many unknown quantities that a prediction is almost impossible. Our comments at this point must be preceded by many "ifs". War, the ogre of modern civilization, lurks in the background. We have seen the almost complete extinction of cultural and scientific pursuits during the great War, and we may predict with certainty that another would bring about a similar decadence of the pursuits of the "good life". Even if war is outlawed, there is no assurance that what we like to call progress will carry us to new moral heights and to greater intellectual achievement. Mr. O'Neill sounds a somewhat pessimistic note in his letter:

"If present social and economic trends continue science and other cultural subjects will land in the ash can. If scientists can step in and save us, the situation will get increasing attention in the newspapers, otherwise - curtains."

But assuming for the moment a future involving no catastrophes comparable with that depicted by Mr. H. G. Wells in "The Shape of Things to Come," and assuming a trend of social and economic affairs favorable to the recognition of the scientist as a public servant of great importance, science news will not increase unless the average level of intelligence is raised enough to comprehend the miracles of science. One may take science as a hobby, or as entertainment, but the entertainment value of science will reach a saturation point, remaining at a constant level unless the motives and philosophy of science are more generally understood. To quote from Mr. Gruenberg:³

"With all its defects, newspaper science is apparently meeting a real demand and rendering a useful service. Improvements must await at least in part the further education (chiefly through other agencies) of a public to demand and appreciate more substance and more illumination in its science news."

Education in science must not be in any sense narrow. If public interest in science is to grow, large numbers of the population must be aware of the advances as well as capable of understanding them.

"Science as a method of dealing with ever new problems or with old problems in new settings, must be democratized, must be removed from the custody of specialists, must be

assimilated by the entire population and made part of the common life."⁴

There are signs that the trend toward a greater lay understanding of science is not as rapid as we might wish. The scientist proceeds by leaps and keeps too many jumps ahead of the rest of mankind. Dr. Clark points to a cultural lag occasioned by the rapidity of scientific advance:⁵

"As things stand at present we are faced with a distinct and growing menace. We are developing a mechanistic and dehumanized culture which is rapidly becoming unintelligible and therefore irksome to the bulk of our population... We are beginning to show signs of philosophical indigestion. Mechanization is proceeding faster than our ability to incorporate it into our ideas of things as they ought to be... Dehumanized dial telephones do not, in spite of their increased efficiency (appeal to us).

"The chief requisite of science as it is portrayed today in the daily press is a return to fundamentals - more extended notices of these lines of science which after all come closest to us."

It is inescapable that the scientist should find himself on the frontiers of technology; perhaps we should not be too much concerned with a public lagging intellectually behind the pioneers of invention. The problem of educating the public must be faced, however, if progress is to be achieved. We may reasonably expect that the increased availability of knowledge will gradually bring about a greater sympathy for and understanding of science. With a philosophical note about the place of science in the world of the future, we may

consider the role of the newspapers of the future in bringing science before the public. Because the newspapers of the last century have been active in catering to the public tastes and exploiting forms of news which have "sales value", we may expect that editors of the future will not be slow to react to our hypothetical increased interest in science. If science becomes increasingly important in our daily lives, then quantitatively science will bulk larger in the press. Considerations in Sections III and IV seem to point in this direction. Likewise, the comments of men in positions to predict the behavior of newspapers indicate that the press of the future will assume a greater responsibility for rendering more accurate and readable science news. In his letter Mr. Kaempffert hazards the prediction:

"I think the time will come -- and by this I mean within the next fifty years -- when at least one full page will be devoted every day to science and engineering. This means a staff of competent men, well trained in science and technology. At present science editors are expected to range over far too wide a field. It is astonishing how well they do it.

The second trend mentioned in the treatment of science news, namely that of interpretive news, is a very important one, especially since the advent of radio newscasting threatens to bring about a radical change in newspapers of the immediate future. Predictions as to the science news of the future would be sadly inadequate if they did not take into account the trend of news treatment in general. Several writers make reference to this problem. Mr. Gruenberg, for

example, emphasizes the interpretive feature of newspaper science:⁶

"The need to simplify and the desire to be perfectly objective result in making much of the material as it is offered to the public extremely trivial, or at all events without any indication as to its significance, either as related to its underlying problems and historical developments or as related to the interpretation of conditions and phenomena. If science, as a mode of dealing with problems, is to be effectively assimilated by the public, it would seem necessary to supplement to journalistic functions of the newspapers with forms of comment that will bring out the philosophical and cultural implications of the 'news' as distinguished from the economic and technical applications."

In another part of his book⁷ he makes other comment pertinent to this problem:

"In the case of newspapers... it seems desirable to bring editors and journalists to a systematic consideration of socially and more useful ways of treating science as news, and of supplementing such use with suitable background and interpretive material. Perhaps some committee or other agency could take this matter up with the schools of journalism or with the professional associations or with selected individual editors. Some of the newspapers that are already doing excellent work in the handling of science might be induced to go further in developing for their readers the suggestions of science news as to possible implications, differences of interpretation, changes from the traditional theories,

possible effects and so on."

Science news, a special type of journalism, perhaps required interpretive treatment early in the development of newspaper style; but it is not the only branch of news tending in that direction. The dissemination of news by radio, or audible journalism, a happy term coined by Mr. J. Roscoe Drummond, Executive Editor of "The Christian Science Monitor," has already made inroads into the field formerly exclusive to the newspapers. To quote from a recent article by Mr. Drummond:⁸

"Today interpretative news writing is the conscious policy of many of the world's principal journals, and I venture to believe that many newspapers will find in the very visible future that the conventional forms of news reporting will be inadequate to sell their products... The readers of every local as well as every metropolitan newspaper are asking, 'Well, what does it mean?' And if the newspaper is not prepared to illuminate the foreground and background of the complicated news of the world it will find its readers demanding this service from other agencies."

One interesting recent example of the effect of radio newscasting was mentioned by Mr. Drummond in a speech "Radio and the Press" at a dinner of an undergraduate publication of Massachusetts Institute of Technology. "The broadcast," he stated, "of the Baer-Louis fight did not diminish the demand for analytical interpretive accounts in the next day's newspapers, but it did eliminate almost entirely reader-interest in the blow-by-blow story... I am inclined to feel that news broadcasting in the future is going to eliminate reader-interest in the blow-by-blow accounts of politics and economics,

as well as of prize fights, and it is going to put a premium on analytical and interpretive news, vividly, lucidly, and gracefully written."

In section IV the general trends of science news were carried through 1935; perhaps the growth curves can be extrapolated and correlated with other predicted changes in the newspaper of the future. We have said that the falling off of science in the news since 1930 is probably associated with financial stringency brought about by the depression. Provided the business cycle brings another heyday, it is reasonable that newspapers will again find space for science comparable to that of 1930, if not more.

Considering the aggregate growth by groups, we have seen that all groups were rising, but that astronomy, biology, and pathology were not rising as fast as the others. Astronomy is one of the variables which takes sudden spurts when the celestial drama reaches periodic climaxes. Interest in movements of the heavenly bodies is, however, as deeply rooted as the interest in the history of mankind. The new 200-inch telescope in California will definitely create another spectacular spurt of news in the near future.

Passing by "miscellany" as the unknown quantity in our statistical study, we come to physics and chemistry. These subjects have risen steadily by per cent since 1900, and if the physicist and chemist continue epoch-making discoveries, we may expect this phenomenal growth to continue.

From the beginnings, anthropology, archeology, and geology have constituted sure-fire material for the press;

a continuing horizontal percentage trend for this group is to be expected. With group V., biology and pathology, on the other hand, there are reasons to believe that its rate of growth will increase. Mr. Dietz writes:

"I see signs which indicate that biology and medicine will hold the center of the stage for the next two decades."

An understanding of the principles of biology perhaps requires more thorough ground-work than do physics and chemistry. True, the biologist has made tremendous advances in experimental techniques, but his discoveries have not yet been linked in all cases with things with which the public is familiar. The future holds a great deal no doubt, if we are to judge by the revolutionary experiments being made on the artificial fertilization of rabbits' ova, on the mapping of the chromosomes of the fruit fly, on the artificial hearts, and on the common cold virus.

Mathematics, a mystery as a rule to the man in the street, has invaded news columns to a slight degree in connection with physics and astronomy, and notably with the Einstein theory. As interpretive and philosophical discussions of science increase, writers will have to treat with mathematics to a greater degree, though the subject will never be handled as rigorously as others.

This study has necessarily included speculations, but we have tried to guard against making unwarranted generalizations. To conclude, we have covered a fifty year period of the growth of an important branch of news. The future development of science in the press is certain to be as interesting as its history up to the present.

REFERENCES

- 1 History of Modern Culture, Henry Holt, New York, 1934. II, 148.
- 2 Ibid., p. 277.
- 3 Science and the Public Mind, McGraw Hill, New York, 1935. p.100.
- 4 B.C. Gruenberg "Science and the Layman" Scientific Monthly,
May, 1935. Vol. 40, pp. 450-457.
- 5 "Science and the Newspaper Press in the United States"
Nature, February 9, 1935. Vol. 135, No. 3406, pp. 239-240.
- 6 Science and the Public Mind, p. 95.
- 7 Ibid., p. 178.
- 8 J. Roscoe Drummond, "Newspapers of Tomorrow - The Trend
from Spot to Interpretive News" Christian Science Monitor.

VII. APPENDIX

VII. APPENDIX

In the introduction of this paper were enumerated the main classifications in which the news stories generally considered as "science news" were placed. More detailed notes on the method of classification can be made on the basis of a list of subjects printed in a pamphlet published by Science Service. The alphabetical list, covering a wide range of subjects, is here appended, with notes as to how they were dealt with in this study.

Acoustics: P*

Aeronautics: X

Aerodynamics: P

Agriculture: X

Anatomy: Pa. The justification of this is that most articles having to do with human anatomy relate to pathological conditions.

Anthropology: An

Archeology: Ar

Astronomy: As

Aviation: X. This type of news has become departmentalized to a large extent, and occupies too much space to be treated in this study. In general it is semi-scientific in nature, and statistical treatment of it would require a different method of approach and

Abbreviations are as follows: Anthropology: An; Archeology: Ar; Astronomy: As; Biology: Bio; Chemistry: C; Geology: Geo; Pathology: Pa; Physics: P; Psychology: Psy; Miscellany: M; Subject not classified in this study: X.

an independent set of classifications within itself.

Bacteriology: Bio

Bio-chemistry: Bio and C. If these stories emphasized the part played by the chemist, they were grouped under C. If the emphasis was upon their importance to the study of biology, they were put under the former heading.

Biology: Bio

Biophysics: Bio

Botany: X. All but a very few stories relating to botany appear on "garden" pages in connection with household interests. Plant biology, when not so departmentalized, was grouped with Bio.

Chemistry: C

Cosmogony: P. A number of long interpretive stories concerning the nature of the universe were found. A few of them emphasized the mathematical aspects of the subject, but not to an extent to justify setting up Mathematics as a separate heading.

Dactylography: X.

Dentistry: Pa.

Dermatology: X.

Ecology: X

Endocrinology: Bio

Engineering: X

Entomology: Bio

Ethnology: An

Eugenics: Bio

Evolution: An

Geodesy: Geo
General Science: X
Genetics: Bio
Geology: Geo
Geophysics: Geo
~~Home~~ Economics: X
Horology: P
Hygiene: X
Ichthyology: Bio
Immunology: Pa
Invention: X
Marine Biology: Bio
Mathematics: M
Medicine: Pa or Bio
Metallurgy: X or C
Meteorology: P
Mining: X
Navigation: X
Neurology: Pa
Nomenclature: X
Nutrition: Pa or Bio
Ordnance: X
Ornithology: X
Oceanography: Geo
Paleobotany: Geo
Paleontology: Geo
Pharmacology: C, Pa, or Bio
Photography: P or C
Photomicrography: P

Physics: P

Physiology: Pa or Bio

Plant Physiology: see Botany

Psychology: Psy

Psychiatry: Psy

Public Health: X

Radio: X. Material on radio pages constitutes too large a part of the news to be within the scope of this study; when scientific radio news appeared in science columns, it was included.

Seismology: Geo

Sociology: X

Statistics: X

Surgery: Pa. See also Anatomy.

Textiles: X

Zo-ology: Bio

Zymology: C and P. See also biochemistry.

VIII. BIBLIOGRAPHY

VIII. BIBLIOGRAPHY

- Benjamin C. Gruenberg, Science and the Public Mind, McGraw Hill, New York, 1935.
- Preserved Smith, History of Modern Culture, Henry Holt, New York, 1934. Vol. II.
- Silas Bent, Ballyhoo, Boni and Liveright, New York, 1927.
- N. D. Cochran, E. W. Scripps, Harcourt, Brace and Company, New York, 1933.
- George H. Payne, History of Journalism in the United States, D. Appleton and Company, New York, 1920.
- James M. Lee, History of American Journalism, Houghton Mifflin, New York, 1917.
- Will Irwin, Propaganda and the News, McGraw Hill, New York, 1936.
- Austin H. Clark, "Selling Entomology" Scientific Monthly, June, 1931. Vol. 32, pp. 527-536.
- P. W. Wilson and E. B. Fred, "The Growth Curve of Scientific Literature" Scientific Monthly, September, 1935. Vol. 41, pp. 240-250.
- B. C. Gruenberg, "Science and the Layman" Scientific Monthly, May, 1935. Vol. 40, pp. 450-457.
- A. H. Clark, "Science and the Radio" Scientific Monthly, March, 1932. Vol. 34, pp. 268-272.
- A. H. Clark, "Radio Talks" Scientific Monthly, October, 1932. Vol. 35, pp. 352-359.
- "Popular Science" Catholic World, January, 1936. Vol. 142, pp. 389-393.
- Howard W. Blakeslee, "Scientific Men and the Newspapers" Science, June 14, 1935. Vol. 81, pp. 591.

- Waldemar Kaempffert, "Scientific Men and the Newspapers"
Science, June 28, 1935. Vol. 81, pp. 640
- J.W.N. Sullivan, "Science and the Layman" Atlantic,
 September, 1934. Vol. 154, pp. 330-337
- W. Kaempffert, "Science Changes Its Mind" Forum, August,
 1933. Vol. 90, pp. 104-108.
- A. H. Clark, "Delirium Gyrans" Harvard Alumni Bulletin,
 June 22, 1934. pp. 1038-1043.
- A. H. Clark, "Science and the Newspaper Press in the United
 States" Nature, February 9, 1935. Vol. 135, No. 3406,
 pp. 239-240.
- "Needless Obscurity in Scientific Publications" Popular
 Science, January, 1901. Vol. 58, pp. 324-326.
- "Newspaper Science" Current Literature, December, 1902.
 Vol. 33, p. 677.
- T. A. Rickard, "Plea for Greater Simplicity in the Language
 of Science" Scientific American, February, 1902.
 Vol. 53. p. 21839.
- "Conference on the Diffusion of Scientific Knowledge"
Science, May 29, 1933. Vol. 77, pp. 505.
- Robert A. Millikan, "Diffusion of Science" Scientific Monthly,
 September, 1932. Vol. 35, pp. 203-208.
- L. N. Diamond, "Interpreting Science to the Public" Scientific
 Monthly, April, 1935. Vol. 40, pp. 370-375.
- A. H. Clark, "Work of the Press" Science, February 9, 1934.
 Vol. 79, pp. 141-142.
- "Science in the News" Science, January 11, 1935. Vol. 81,
 pp. 46-47.
- R. Gregory, "Science in the Public Press" Science, October
 12, 1934, Vol.80, pp. 323-330.

Morris Fishbein, M.D., "Medical Education of the Public by Means of Newspapers." (Pamphlet)

H. W. Blakeslee, "The Associated Press and Science" Clinical Medicine and Surgery, October, 1931. Vol. 38, No. 10, pp. 701-711.

J. Roscoe Drummond, "Newspapers of Tomorrow - The Trend from Spot to Interpretive News," The Christian Science Monitor.

Watson Davis, "Science and the Press" - A speech delivered on February 19, 1936, before the Georgia Press Institute of the Georgia Press Association.
