Comparison Between the Biological Content of certain Periodical Literature and of the Kansas High School Course of Study

by

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Introduction

This study proposes to compare the biological content of periodical literature with that of the Kansas High School Course of Study. It assumes that Editors of magazines publish only that literature in which the public is interested, and, that the public is most interested in that literature which treats of its social desires and social needs. If these premises be granted true, then the articles appearing in widely circulated magazines of a general nature give an index to the social desires and social needs of our people. Hence those topics most often and most fully discussed in articles of such magazines ought, after proper eliminations, to aid us in evaluating the social worth of our High School Courses of Study. The phrase, "after proper eliminations", has been put in the preceding sentence very advisedly. Probably no really desirable course of Study could be built up or evaluated by means of selecting topics most often and most fully discussed in magazines. Likely no educator in the country would insist that the art of love making ought to be taught in our High Schools. Yet love stories are found more abundantly in our general purpose magazines than are

articles of any other class of literature. More principles of curriculum-building than one need to be used to construct a proper course of Study. Perhaps it may be laid down as a general rule that things so easily learned as the passion of love or the urge of sex need never be taught in any school.

The principles that have been used in this study for selecting biological data from the magazines revied are:

1. The principle of the frequency of the occurrence of anything.
2. The principle of the fulness with which a thing is discussed.
3. The principle that knowledge easily acquired outside the school need not be taught.

The principle of the truthfulness of things has not been used in this study in selecting material. At times, even in the best of our general purpose magazines, the veracity of the subject matter presented needs to be questioned. Editors often encourage leading investigators to present what they (the investigators) consider to be the truths of their studies.

In the appendix to this thesis are to be found extracts from several magazine articles. The purpose in presenting these extracts is to acquaint the reader

with the nature of the subject matter reviewed, and, also, to enable him to judge as to its veracity.

1. See appendix, page 142 161.

Chapter II.

Several investigations have been made in curriculum-building in the past few years whose methods of procedure have been quite similar to that used in this study. A number of the most elaborate of these investigations is rather fully described in Part II. of the 22nd Yearbook of the National Society for the Study of Education, and also in Gambrills' Experimental curriculum-making in the Social Studies. Perhaps one of the most widely known of these studies is the one made by Carleton W. Washburne, and his group of co-workers, at the Winnetka Schools. They attempted to build up scientifically what they called a "fact course" in the Social Sciences. To do this they read through a number of selected magazines and newspapers for the purpose of discovering all allusions made therein to persons, places, events, and dates. A list of these allusions was then compiled and the frequency of occurrence of each allusion was carefully tabulated with a view to ranking it in importance on this basis.[1] Finally the fact course was made by "incorporating all the items in a chronological, historical narrative, written with the exclusive purpose of explaining the tabulated allusions".[2]

1. Gambrill, J. M., Experimental Curriculum-making in the Social Sciences. McKinley Pub. Co. Philadelphia, Pa., Page 24

2. Ibid. page 25, middle paragraph.

A study somewhat similar to that worked out under the direction of Carleton W. Washburne was made by Harold O. Rugg of the Lincoln School of the Teacher's College, Columbia University. He attempted to construct a "Unified Social Science Curriculum" by selecting the problems, issues, questions, activities, etc, of contemporary life from the books of "frontier thinkers". Who these frontier thinkers were he sought to discover by asking each one of a group of 90 experts in the fields of Economy, Political Science, Sociology, History, and Journalism "to name 10 books in English of any date that he would analyze if he were compiling a statement of the problems and issues of the day". From the suggested list of books thus secured, and from a list reviewd in periodical literature, Rugg selected some 200 for analysis. The relative importance of the problems and issues treated was judged by the amount of discussion given to each. From these books a "list of 300 problems, 150 issues, and 2,000 generalizations and principles" was compiled. All these were then unified in a course of Study for the different school grades, and explained in pamphlets carefully written for that purpose.

1. These pamphlets may be secured from Dr. H. O. Rugg, Lincoln School of Teachers' College, Columbia University, New York City. A list of them is given in School and Society, May 15, 1926. Pages 614-15.

School and Society for March 24, 1923 contains the report of a study made by Charles W. Findley and Otis W. Caldwell of the Lincoln School of Teacher's College of Columbia University on the Biology of the Public Press. In the field of biology this is probably the most thorough research yet made in tentative curriculum-building. The following quotations are taken from the report referred to above:

"Seventeen full months "issues of representative daily newspapers were secured, making a total of 492 different papers and approximately 1,400 pages. These papers ordinarily reach several millions of readers. All of the papers were examined, and all biological articles other than those which were paid advertisements, or regularly recurring commercial stock reports, were collected and classified. Mere biological allusions were omitted, thus limiting the collection to articles clearly biological, and to news of editorial value. A total of 3,061 such articles was secured, these having an average column length per article of over 8 inches".

"The other main divisions (of topics discussed in the papers) besides health, in decreasing order of their numerical importance are, animals, plants, food,

1. Caldwell, Otis W., School and Society, March 24, 1923. Page 309.

organization of products, general nature, evolution, and fictitious biology".

"A study of the tabulated number and length of articles shows the outstanding importance of the first four groups--health, animals, plants, and food. The average length of articles upon general nature and evolution is slightly greater than that of the first four groups, but the total number of such articles is relatively small".

"The articles found are of the same general types in all parts of the country, with local variations readily accounted for by special local situations".

"Health biology, which appears in largest quantity, thus relates interestingly to recent conclusions reached by national educational committees to the effect that health is the first aim of education".

"Biology pertaining to health, animal life, plant life, and food is easily the dominant biological interest of the public, as far as this investigation presents dependable data".[1]

"Finally, if these topics are those of common occurrence, should not some or many of them, or others in similar articles, be used as significant situations in presentation of topics of instruction in biology?"[2]

1. Caldwell, Otis W., School and Society, March 24, 1923 Page 310.

2. Ibid Page 311.

In School Science and Mathematics for November 1925, L. Thomas Hopkins, Professor of Education in the University of Colorado, reports a study made by him of Science articles appearing in certain magazines and newspapers in a part of the years 1923 and 1924. In this study he assumed that "the subject matter for Science curricula for High Schools should enable pupils to perform better those desirable activities in which they are now engaged". He also assumed that reading current literature was one of the desirable activities. He, therefore, set for himself the task of discovering what science knowledge High School pupils needed to read intelligently, the daily newspapers and a selected list of magazines. The magazines and newspapers used in making this research were those found most frequently in the homes of Denver High School pupils. The names of the dailies used are:

The Rocky Mountain News

The Denver Times

The Denver Express

The Denver Post

The names of the magazines are:

Popular Mechanics

Scientific American

Ladies Home Journal

Good Housekeeping

Saturday Evening Post

Literary Digest

Country Gentleman

Farm Journal

Every issue of the dailies for a month in 1924 and every other number of the magazines for the year 1923 was examined for data. The author reports that "the first and most apparent inference to be drawn from this study is that biology is the most important of all secondary school sciences from the standpoint of educational values. Physics would follow next in order, with chemistry third, geology fourth, and astronomy fifth. This conclusion is based upon the principle that the greater the frequency of occurrence of anything in the life of an individual the greater is the necessity that he know something about it".[1] "For biology the topics which are of major importance in secondary school science courses are public health, knowledge of animal and plant life, foods, natural resources, and evolution"[2] This latter statement coincides with that made by Findley and Caldwell in the Biology of the Public Press.

1. Hopkins, L. T. School Science and Mathematics, November 1925. Page 797.

2. Ibid. Page 799.

Other researches somewhat similar to the one made for this thesis are reported in a monograph entitled "Curriculum Investigations" written by Prof. Franklin Bobbitt and a corps of co-workers.[1] The study nearest related to the one made for this thesis is found in Chapter II. of the monograph. Prof. Bobbitt analyzed the Readers Guide to Periodical Literature for the years 1919, 1920, and 1921 to discover "what man is thinking about, what he is dealing with, and what activities he is performing". He says that "the things of most frequent discussion are probably matters of great moment in human existence. We cannot be equally certain that the matters of infrequent mention are of little moment. There can be certainty only as the testimony is corroborated by the evidence from other sources"[2]

About 11,000 topics were discovered in the Guide and these were grouped under such headings as Government, Education, Transportation, etc. The relative importance of each of these groups was determined by the frequency with which topics concerning them were discussed in the magazines.

1. Bobbitt, Franklin, and others, Curriculum Investigations, Supplementary Educational Monograps, No. 31. University of Chicago Press, Chicago, Illinois November 1926.

2. Ibid. Page 7.

Topics of Government, Nations and States, and Education were most often found in the Guide and topics of Mathematics were the least often found. Concerning this method of ranking in importance the groups of subject matter in magazines Prof. Bobbitt says;--
"There are several reasons why the number of articles dealing with some of these topics is large and the number of articles dealing with other topics are small.

1. All other things being equal, the topics of largest intrinsic importance will probably tend to gravitate toward the head of the list. We cannot be entirely sure of this. Because of the general pettiness and immediacy of native human interests, there are reasons to think that the reverse might be the case. In the aggregate, man seems to prefer to dwell on the little things that make up his existence from hour to hour and is reluctant to dwell on the things that are large and high and intrinsically important. He will attend to the large things when they reach the point where they worry him, and not because of their inherent importance. It seems a fact, that, in general, so long as the things of fundamental importance are not presenting one with problems, one scarcely attends to them in any way.

2. All other things being equal, the things that are giving us trouble are the things that

we are likely to talk about most.

3. All other things being equal, topics of native interest receive attention more frequently than do matters that appeal to derived interests.

4. Things bristling with immediate problems of which people are generally aware are far more frequently discussed than are things which involve problems more remote and visible only to the specialized few".[1]

1. Curriculum Investigations, Pages 9 and 10.

Chapter III.

The purpose of this study is:

1. To discover the biological content of non-specialized American Magazines.
2. To evaluate by means of this content the Kansas High School course of Study in Biology.
3. To suggest possible improvements in that course of Study.

A choice of magazines for the purpose of this survey was made after examining about 50 of our best known publications. The basis for selection of those used was that of content. Most magazines specialize in particular fields of thought and cater to special classes of people as, teachers, ministers, farmers, mechanics, or scientists. Since it was desired to know only what the general public demanded in the way of reading matter, all specialized magazines were eliminated from the list used in this survey. The following seemed most suitable for review:

1. American Magazine
2. Atlantic Monthly
3. Harper's Magazine
4. Literary Digest
5. McClure's Magazine
6. Scribner's Magazine
7. World's Work
8. Saturday Evening Post
9. Cosmopolitan

The last two named were later discarded because only a few copies of each were available in the libraries of Lawrence. However, it was felt that the first seven would furnish all the information desired. Therefore all numbers of these were examined for the five years

from 1921 to 1925 inclusively except McClure's. All numbers of this magazine for 1921 and 1922 were missing from the libraries here as were also five numbers for 1924 and 1925. An attempt to secure 1926 numbers in lieu of those missing resulted in finding only one copy- that for January.

The data collected on reviewing the magazines were recorded as shown in the form on the next page. Under the heading "Length" was stated the length of the article in column-inches. By column-inches is meant the length of the reading matter in any of the magazines as measured by the length and size of a column of reading matter in the Atlantic Monthly. Under "Ratio" was stated the ration in percent of the amount of reading matter in any article to that of the whole magazine. Under "Topics discussed" were listed all the topics of biology in the article. Under "Vocabulary" were given all biological terms.

Altogether 591 numbers of the magazines were surveyed and a total of 861 articles were read. The number of column-inches read, as measured by the column of reading matter in the Atlantic Monthly was 55,839. As had been done in other similar studies, an attempt was made to classify these articles under the headings of health, animal life, plant life, food, etc. This was difficult to do because many of the articles

contained material falling under several of these heads. The plan finally adopted for overcoming the difficulty was to outline each article read, thus isolating all topics found, after which they could be classified as desired.

Form for Collecting Data

Magazine	Mo.	Year	Author	Title & Outline of Article	Lenght	Ration	Topics discussed	Vocabulary
Harper's	Oct.	1921	L.S.Porter	Character in Spiders	32"	.015		
				I. Two spiders' web and nest of young described.			Structure of webs.	Spiders
				II. Testing the two spiders for maternal instinct.			Nest of these spiders	Nest
				1. Shook the nest-both spiders rushed to defend nest.				Web
				2. Later shook the nest again. Both spiders rushes to defend it again			Character in these Spiders	Arachnes Eggs
				3. Tore the nest nearly from the web. One spider rushed to defend it again--the other ran away to hide.				Prenatal Brood
				III. One spider was a coward--the other a brave defender.				
				IV. Moralizations				

In the following pages under the column headed "Kansas Course" are listed all the topics given in the Kansas Courses of Study for High School Biology. Under the column headed "Magazine Content" are listed all the topics found in the articles I have read that are--

1. Identical with those in the Course of Study.
2. Similar to those in the Course of Study
3. Valuable for understanding the articles read in the magazines.

Under the column hedded "References" are given citations to the magazine articles containing these topics. The following table gives the key to the references:

A. refers to the American Magazine
B. " " " Atlantic Monthly
C. " " " Harper's Magazine
D. " " " The Literary Digest
E. " " " McClure's Magazine
F. " " " Scribner's Magazine
G. " " " World's Work

The purpose here is to compare topic by topic the biological content of the Kansas Course of Study with that of the magazines read.

Chapter IV.

Table A

Kansas Course	Magazine Content	Reference
I. Insecta		
A. Orthoptera		
1. Adaptations	Adaptations	E. Jan. 1926 p. 456
2. Protections	Protections	" " " "
3. Locomotion	Locomotion	" " " "
4. Food-getting	Food-getting	" " " "
5. Breathing		
6. Body regions	Body regions	" " " "
7. Excretions	Excretions	
8. Nervous system		
9. Reproduction	Reproduction	E. Jan. 1926 p. 456
10. Life History	Life History	" " " "
11. Metamorphosis	Metamorphosis	" " " "
12. Economic importance	Economic importance	" " "
13. Classification	Classification	" " "
B. Hemiptera		
a. Cicada	a. Cicada	
1. Adaptations	1. Adaptations	D. Oct. 3, 1925 p.21
2. Protections	2.	
3. Locomotion	3.	
4. Food-getting	4. Food-getting	D. Oct. 3, 1925 p.21
5. Breathing	5.	

Kansas Course	Magazine Content	Reference
6. Body regions	6. B	
7. Excretions	7.	
8. Nervous system	8.	
9. Reproduction	9. Reproduction	D. June 9 1923 p. 25
10. Life History	10. Life History	" " " " "
11. Metamorphosis	11.	
12. Economic importance	12. Economic importance	D. June 9 1926 p. 256
13. Classification	13. Classification	" " " "
b. Plant louse		
c. Woolly aphis		
d. San Jose scale	San Jose scale	D. Jan 8 1921 p.29
C. Coleoptera		
a. Beetles in general	a. Beetles in general	F. Mar. 1925 p.477
1. Damage done by them.	1. Damage done by them.	C. Mar. 1925 p.435
2. Enemies	2. Enemies	C. May 1921 p. 789
b. Life history of Potato beetle.	b. Life history of the Pine Tree beetle	C. Nov. 1925 p.749 -752
	c. Life history of the Japanese Green beetle	D. Mar. 14 1925 p.26

Kansas Course	Magazine Content	Reference
D. Lepidoptera		
a. Butterfly	a. Pronuba moth	
1. Life history	1. Life history	D. July 24 1925 p.23
2. Economic importance of cabbage butterfly.	2.	
b. Codlin moth	b. Gypsy moth	
1. Life history	1. Life history	C. Mar. 1925 p.438
2. Importance	2. Importance	C. Mar. 1925 p.438
3. Enemies	3. Enemies	C. Mar. 1925 p. 439
E. Hymenoptera		
a. Honey Bee	a. Honey Bee	
1. Life history	1. Life History	C. July 1924 p.220
2. Adaptations	2. Adaptations	B. July 1925 p. 1
3. Importance	3. Importance	B. " " " "
4. Classes	4. Classes	C. " 1924 p.220
b. Ichneumion flies -Thalessa	Chalcid wasps	C. " 1924 p. 21
1. Life history	1. Life history	B. " 1923 p. 21
2. Adaptations	2. Adaptations	B. " " " "
3. Importance	3. Importance	B. " " " "
4. Class	4/	
c. Ants	Ants	
1. Life history	1. Life history	
2. Behavior	2. Behavior	A. Nov. 1922 p. 28
3. Adaptations	3. Adaptations	" " " "
4. Importance	4. Importance	" " " "
5. Class	5. Class	

Kansas Course	Magazine Content	Reference
F. Diptera		
a. Mosquito	Mosquito	
1. Life history	Life history	G. Apr. 1924 p.631
2. Adaptations	Adaptations	" " " "
3. Importance	Importance	G. Dec. 1921 p.169
4. Classification	Classification	G. Apr. 1924 p.631
5. Methods of control	Methods of control	G. Dec. 1921 p.169
b. Housefly	Petroleum fly	
1. Life history	1. Life history	D. Mar. 15 1924 p.24
2. Adaptations	2. Adaptations	D. " " " p.24
3. Importance	3. Importance	D. Apr. 23 1921 p.21
4. Classification		
5. Methods of control	5. Methods of control	D. Apr. 23 1921 p.21
G. Benefits to man of		
1. Lady beetle	1. Lady beetle	C. Mar. 1925 p. 436
2. Tachina fly	2. Locust fly	D. May 23, 1925 p.26
H. Detriment to man of		
1. Bed bugs		
2. Silver fish		
3. Clothes moth	3. Clothes moth	D. July 26 1924 p.25
I. Relation to disease of		
1. Bed bugs		
2. Lice		
3. Fleas	3. Fleas	D. Jan. 20 1923 p.27

Kansas Course	Magazine Content	Reference
J. Parasitism	Parasites	G. Marc. 1923 p.554-5
II. Crustaceans and related forms		
A. Crayfish	Crab	
1. Adaptations	1. Adaptations	G. Jan. 1921 p.229
2. Appendages	2. Appendages	G. " " "
3. Moltingprocess	3.	
4. Food	4. Food	G. Jan. 1921 p.229
5. Digestive system	5.	
6. Respiration	6. Respiration	D. Sept. 16 1922 p.60
7. Excretion	7.	
8. Circulatory system	8.	
9. Nervous system	9.	
10. Life history		
11. Economic importance	11. Economic Importance	D. Sept. 16 1922 p.60
B. Arachnida-spider	Daddy-long-legs, chiggers, spiders	
1. Adaptations	1. Adaptations	D. Dec. 22 1923 p.23
2. Appendages	2. Appendages	B. Nov. 1923 p. 642
3. Food	3. Food	B. " " "
4. Life history	4.	B. " " "
5. Economic importance	5. Importance	D. Apr. 18 1925 p. 24

Kansas Course	Magazine Content	Reference
C. Myriapod		
1. Adaptation		
2. Appendages		
3. Food		
4. Life History		
5. Economic importance		
III. Fish		
A. Body		
1. Coverings	1. Coverings	D. Feb. 28 1925 p.72
2. Appendages	2. Appendages	" " " " "
3. Locomotio	3.	
B. Processes, etc.,		
1. Respiration	1. Respiration	D. Feb. 28 1925 p.72
2. Circulation	2.	
3. Digestion	3.	
4. Nervous system	4.	
5. Food and food-getting	5. Food getting	A. July 1922 p. 60
6. Egg laying habits	6. Egg laying habits	C. Aug. 1923 p. 352
7. Care of young	7. Care of young	A. July 1922 p.60
D. Life history of an eel	Life history of an eel	D. Feb. 23 1924 p 27
E. Economic importance	Economic importance	E. Mar. 1924 p. 11
F. Migrations of fish	Migrations of fish	D. Aug. 30 1924 p.19

Kansas Course	Magazine Content	Reference
G. Fish protection		
H. Fish propagation		
IV. Amphibians		
A. Frog	Salamander & Frog	
1. Habitat	1. Habitat	D. Apr. 1922 p.62
2. Adaptations	2. Adaptations	" " " "
a. Locomotion	a. Locomotion	" " " "
b. Food getting	b. Food getting	" " " "
c. Respiration	c. Respiration	D. " " "
d. Excretion	d.	
e. Sensation	e.	
f. Reproduction	f. Reproduction	" " " "
g. Digestion		
3. Life Histroy	3. Life History	D. Apr. 1922 p. 62
4. Economic Importance	4. Economic Importance	" " " " "
B. Toad	Tree-toad	
1. Life history	1. Life history	B. Mar. 1921 p.306
2. Heredity	2. Heredity (man)	B. Nov. 1922 p.577
3. Economic Importance		
V. Reptiles		
1. Characteristics	1. Character-istics	C. Oct. 1923 p.594
2. Adaptations	2. Adaptations	D. Mar. 17 1923 p66
3. Life history	3. Life history	

Kansas Course	Magazine Content	Reference
4. Economic Importance	a. Turtle	C. Aug. 1923 p. 353
5. Reptiles treated of	b. Allegators	C. Oct. 1923 p. 594
a. Turtles	4. Economic Importance	D. Sept. 15 1923 p.54
b. Chameleon	5. Reptiles Described	
c. Horned Toad	a. Turtles	C. Aug. 1923 p. 353
d. Gila monster	b. Chameleon	D. Mar. 17 1923 p.66
e. Rattle-snakes	c. Horned toad	C. Apr. 1922 p.652
f. Python	d.	
g. Alligators	e. Rattle snakes	D. Aug. 12 1922 p.62
	f. Python	D. Mar. 27 1924 p. 50
	g. Alligators	C. Oct. 1923 p. 594
VI. Birds		
1. Characteristics	1. Characteristics	B. May 1921 p. 631
2. Appendages	2. Appendages	A. Jan. 1922 p. 33
3. Shape of body	3. Shape of body	G. Dec. 1924 p. 193
4. Coverings	4. Coverings	G. Dec. 1922 p. 206
5. Nest building	5. Nesting habits	B. May 1921 p. 631
6. Food getting	6. Food getting	B. Dec. 1922 p.810
7. Bathing	7. Bathing	C. May 1921 p. 789
8. Migration	8. Migration	D. May 19 1923 p.22
9. Methods of attracting	9. Methods of attracting	A. July 1925 p. 26

Kansas Course	Magazine Content	Reference
10. Care of	10. Care of	A. July 1925 p.26
11. Economic Importance	11. Economic Importance	C. May 1921 p. 791
12. Bird protection	12. Bird Protection	G. Dec. 1922 p. 206
VIII. Mammals		
A. Distinguishing characters		
B. Domesticated mammals		
1. Horse	1. Horses and Donkeys	C. Jan. 1921 p. 168
2. Cow	2. Camels	" " " " "
3. Sheep	3. Dogs	" " " " "
4. Pig		
5. Economic importance		C " " " "
C. Fur bearing mammals		
1. Bat	1. Bat	B. Dec. 1922 p. 739 D. Oct. 6 1923 p. 76
2. Beaver	2. Beaver	G. Mar. 1924 p. 496
3. Skunk	3. Skunk	G. Mar. 1924 p. 497 D. Oct. 6 1923 p. 76
4. Muskrat	4. Muskrat	G. Mar. 1924 p. 496
5. Weasel	5. Wolverine	G. June 1921 p. 165
6. Mink	6. Mink	G. Mar. 1924 p. 498
7. Gopher	7. Fox	G. Mar. 1924 p. 498
8. Economic importance	8. Economic importance	G. Mar. 1924 p. 494

Kansas Course	Magazine Content	Reference
VIII. Protozoa		
A. Distinguishing feathres	A. Distinguishing features	B. Oct. 1923 p. 492
B. Habitat	B. Habitat	B. " " "
C. Changes in shape	C. Encystment	B. Oct. 1923 p. 498
D. Response to stimuli	D. Response to stimuli	D. June 4 1921 p. 28
E. Organs	E. Organs	B. Oct. 1923 p. 497
E. Cells	E. Cells	C. Aug. 1925 p. 347
F. Life processes		
1. Food getting	1. Food getting	B. Oct. 1923 p. 499
2. Digestion	2.	
3. Assimilation	3.	
4. Oxidation	4.	
5. Exeretion	5.	
6. Growth	6. Growth	B. Oct. 1923 p. 498
7. Reproduction	7. Reproduction	B. Oct. 1923 p. 492 D. Sept. 3 1921 p.26
8. Sensation	8.	
9. Locomotion	9. Locomotion	B. Oct. 1923 p. 497
G. Structure	G. Structure	B. " " " "
H. Protozoa as a cause of disease	H. Protozoa as a cause of disease	G. Mar. 1923 p.554
I. Amoeba	I.	
J. Paramecium	J. Paramecium	E. Aug. 1925 p.577

Kansas Course	Magazine Content	Reference
IX. Metazoa		
A. Gonium		
B. Volvox		
C. Division of labor		
D. Sponges		
1. Structure		
2. Reproduction		
3. Economic importance		
4. Relation to other animals		
E. Coelenterates		
1. Hydra	1. Sea-Anemone	
a. Structure	a. Structure	D. May 23 1925 p.68
b. Locomotion	b. Locomotion	
c. Nutrition	c. Nutrition	
d. Respiration		
e. Excretion		
f. Reproduction		
g. Irritability	g. Irritability	D. May 23 1925 p.68
2. Hydroids		
a. Sea-anemone	Sea-anemone	D. May 23 1925 p.68
b. Coral		
F. Economic importance	Economic importance	D. May 23 1925 p.68
X. Echinoderms--Starfish		
A. Adaptations		
B. Structure		

Kansas Course	Magazine Content	Reference
C. Life history		
D. Regeneration		
XI. Worm Group		
A. Earthworm		
1. Adaptations	1. Adaptations	D. June 24 1922 p.54
2. Locomotion	2.	
3. Protection	3. Protection	D. June 24 1924 p.54
4. Structure	4.	
5. Economic Importance	5. Economic Importance	A. Oct. 1924 p. 50
B. Tapeworm	Hookworm	G. Aug. 1922 p. 354
C. Trichina	Liver fluke	G. May 1923 p. 103
	Leeches	A. Oct. 1924 p. 51
XII. Mollusks		
A. Structure	A.	
B. Pearls & Pearl formation	B. Pearls & pearl formation	D. Aug. 20 1921 p. 48
C. Economic Importance	C. Economic Importance	D. Mar. 15 1924 p.23
	D. "	D. Aug. 16 1924 p.25

Kansas Course	Magazine Content	Reference
I. Life of Flowering Plants		
A. Adaptations		
B. Responses to	B. Responses to	
1. Light	1. Light	B. Dec. 1922 p.780
2. Heat	2. Heat	B. Dec. 1922 p.782
3. Water	3.	
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3. Structure of respiratory organs	3. Structure of res. organs	C. June 1925 p.139
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3. Flower terms		
G. Pollination	G. Pollination	D. May 13 1922 p.24
H. Fertilization		
I. Inflorescence		
J. Economic value of flowers		

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A. Conditions of growth	A. Conditions of growth	A. May 1923 p. 45
B. Uses of seeds	B. Uses of seeds	" " " " "
C. Dormancy	C. Lonvevity	A May 1923 p. 45
D. Study of corn seed		
E. Foods in seeds		
1. Derivation		
2. Classification		
3. Where stored		
F. Digestion of food in seeds		
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H. Seed selection	H. Seed selection	A. Feb. 1925 p. 44
I. Seed testing		
J. Soils for seeds		
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2. Formation of		
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K. Soil water		
1. Free		
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3. Amount necessary for a crop.		
L. Fertilizers		
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4. Irrigation		
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B. Types of fruit		
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C. Form of roots	C. Form of roots	
D. Work of roots	D. Work of roots	D. Sept. 2 1922 p.26
E. Osmosis		
F. Economic importance		
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O. Economic value	O.	D. June 24 1922 p.22
P. Peculiar uses	P. Peculiar uses	D. Sept. 13 1925 p.27
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B. Spirogyra	B. Blue-green algae	B. Oct. 1925 p. 513
VIII. Bacteria		
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1. Considered in industries		
2. Considered in decay		
3. Considered in disease	Considered in disease.	G. Dec. 1921 p.169

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B. Shape	B. Shape	D. Aug. 25 1923 p.24
C. Size	C. Size	D. " 22 1925 p.21
D. Growth	D. Growth	" " " " " "
E. Life processes	E. Life processes	D. Aug. 25 1923 p.24
F. Sanitation		
G. Methods of control		D. Dec. 22 1923 p.24 G. Dec. 1922 p.168
H. Vaccines		D. Apr. 9 1921 p. 22
I. Antitoxins	I. Antitoxins	D. June 27 1925 p.24
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2. Preservation	2.	
3. Economic importance	3. Economic importance	D. Feb. 9 1924 p.56 D. Sept 9 1922 p.24
B. Yeast plant	B. Yeast	
C. Bread mold	C.	
D. Mushrooms	D. Mushrooms	D. June 24 1922 p.54
E. Lichens	E.	
X. Mosses and their allies.		
XI. Ferns and their allies		
A. Life history	A. Sex phenomena	B. Oct 1923 p. 523
B. Structure		
C. Economic importance		

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A. Characteristics	A. Characteristics	G. Nov. 1925 p. 37
B. Relation to water supply	B. Relation to water supply	G. May 1923 p. 60
C. Relation to erosion	C. Relation to erosion	G. " " " "
D. Forest regions of U. S	D. Forest regions of U. S.	G. " " " "
E. Destruction of forests	E. Destruction of forests	G. " " " "
F. Forestry	F. Forestry	G. " " " "
G. City trees	G. City trees	D. Apr. 12 1924 p.64 A. June 1922 p. 24
H. Lumbering	H. Lumbering	G. May 1923 p. 60
XIII. Peculiartities of plant life		
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B. Plant breeding	B. Plant breeding	D. Feb. 16 1924 p.28 D. Nov. 3 1923 p.68
C. Plant conservation	C. Plant conservation.	D. Sept 5 1925 p. 27

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D. Plant leaf (inside)	D. Plant leaf (inside)	C. Ju. 1925 p.139
E. Plant-one celled	E. Plant-one celled	
F. Plant process	F. Plant process	C. June 1925 p.189 D. Sept. 2 1922 p. 26

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I. Common Biological Terms		
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B. Relations existing		
1. Between plants & plants	1.	
2. Between animals & animals.	2. Between animals & animals	B. Oct. 1923 p. 492 C. Apr. 1922 p.647
3. Between plants & animals.	3. Between plants & animals	D. Sept. 12 1925 p.54
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1. Motion	1. Motion	B. Oct. 1923 p.523
2. Nutrition	2. Nutrition	C. June 1925 p. 139
3. Respiration	3. Respiration	C. " " " "
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5. Sensation	5. Sensation	B. Dec. 1922 p.775
6. Reproduction	6. Reproduction	F. Aug. 1925 p.144
D. Life organization		
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2. Tissues	2. Tissues	C. Aug. 1925 p.347 B. Oct. 1925 p.508
3 Organs	3. Organs	B. Dec. 1922 p.775
4. Organ system	4. Organ system	B. Oct. 1923 p.523 B. " " " "
5. Organism	5. Organism	B. Oct. 1925 p.508
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2. Invertebrate		
3. Phaneroganas		
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J. Environment		
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2. What plants get from it	2. Effect	D. Jan. 12 1924 p.25
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2. Conservation of energy		
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3. Nitrogen	3. Nitrogen	
M. Compounds		
1. Starch		
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4. Proteins	4. Proteins	A. Nov. 1921 p. 13
5. Fats	5. Fats	A. " " " "
6. Mineral foods	6. Minerals	A. " " " "
N. Osmosis	Osmosis	D. Dec. 12 1925 p.71

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I. Man as an animal		
A. Digestive organs	A. Digestive organs	D. Apr. 4 1925 p.88
B. Food	B. Food	C. Mar. 1921 p.495 D. Oct. 6 1923 p.29
C. Digestion	C. Digestion	D. Apr. 4 1925 p.88
D. Absorption	D. Absorption	D. " " " " "
E. Source of foods	E. Source of foods	D. Oct. 6 1923 p.29
F. Preparation of foods	F. Preparation of foods	D. Aug. 16 1924 p22 D. June 24 1922 p22
G. Pure good laws	G.	
H. Effect of alcohol on digestion	H. Effects of alcohol	E. Jan. 1926 p. 327
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II. Movement		
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B. Movement		
C. Joints		
D. Fatigue	D. Fatugue	D. Apr. 28 1923 p.27
E. Physical training	E. Physical training	G. May 1922 p. 110
F. Respiration		
G. Circulation	G. Blood	A. Oct. 1924 p. 29 D. July 30 1921 p.24
H. Excretion	H. Elimination	D. Dec. 20 1924 p.22 D. Apr. 4 1925 p. 88
III. Nervous system		
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C. Sense organs		
D. Brain	D. Brain	A. Nov. 1922 p. 13
E. Effects of alcohol on nervous system	E.	
F. Effects of tobacco on nervous system	F. Effects of tobacco	D. Ju. 7 1923 p.30
IV. Biology of disease		
A. Cause of disease	A. Cause of disease	D. Mar. 28 1925 p. 26
B. Biological "	B. Biological "	D. Jan. 22 1921 p.
C. Communicable "	C. Communicable "	D. Feb.23 1924 p. 28
D. Tuberculosis	D. Tuberculosis	D. Jan. 12 1924 p.66
E. Treatment of sickness		
F. Influenza	F. Influenza	D. Dec. 19 1925 p.23 D. Mar. 3 1923 p.26
G. Malaria	G. Yellow Fever	G. Dec. 1921 p.169
H. Source of malarial parasites	H. Source of malarial parasites	G. " " " "
V. Prevention of diseases		
A. Preventable diseases	A. Preventable diseases	G. Mar. 1923 p. 514 A. Mar. 1924 p. 41 D. Mar 1 1924 p. 28
B. Patent medicines	B. Patent medicines	G. Mar. 1923 p. 514
C. Alcohol and disease	C.Alcohol effects	C. Jan. 1921 p.186
D. Quarantine		
E. Vaccination	E. Vaccination	D. Apr. 9 1921 p.22 D. Mar. 12 1921 p.26

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F. Antitoxin	F. Antitoxin	D. June 27 1925 p.24
G. Disinfection	G. Disinfection	D. Ju. 18 1925 p.22
H. Epidemics after wars	H. Epidemicsaafter wars	D. Dec. 19 1925 p.25
I. Public Health Measures	I. Public Health Measures	D. May 26 1923 p.24
VI. Biology and Human progress		
A. Scientific discoveries	A. Scientific discoveries	F. Aug. 1925 p.144
B. Applications of these discoveries	B. Applications of these discoveries	F. " " "
C. Genetics and human progress	C. Genetics and human progress	F. " " "
D. Environment and human progress	D. Variation	D. Sept. 5 1925 p.23
	Heredity	B. Nov. 1922 p. 577
	Evolution	E. Mar. 28 1923 p.19
		B. Apr. 1924 p. 485
		C. June 1922 p. 68
L. New discoveries in regard to germ diseases.		
A. T. B.	A. T. B.	D. Apr. 9 1921 p.22
B. Vaccination	B. Vaccination	D. Mar. 1924 p. 24
C. Prevention of plague	C. Prevention of plague	D. Feb. 28 1925 p.21
D. Hookworms in dogs	D. Hookworm control	D. Nov. 1 1924 p.28
E. Epidemics of measles	D. Epidemics of measles	D. Feb. 23 1924 p.28
	F. Scarlet feber	C. Dec. 1924 p. 107

The following is a classified list of the topics of a biological nature discovered in the survey of the magazines mentioned in this study. No topic is entered here that was not quite fully discussed in the articles. No topic was considered "quite fully discussed" unless three or more column-inches of space in the magazines were devoted to it. The tabulation accompanying each topic in the list gives the number of times it was found discussed in all the magazines surveyed.

In the list the topics given have been classified as nearly as possible to the way the same topics or similar ones have been classified in the Kansas Course of Study.

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Animal Biology

I. Insects

A. Orthoptera

a. Praying mantes

1. Meaning of its name	1
2. Other names	1
3. Relatives	1
4. Protective coloration	1
5. Body structure	1
6. Food	1
7. Food catching habits	1
8. Fighting habits	1
9. Means of defense	1
10. Eggs and egg cases	1
11. Egg laying habits	1
12. Hatching of the young	1
13. Enemies	1
14. Usefulness to man	1

b. Katydids

1. Sense organs	1
2. Song	11
3. Singing apparatus	11
4. Season of singing	1
5. Reason for singing	1
6. Syllables that seem to be sung	1

c. Wood roach

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2. Life History 1

d. Grasshoppers

1. Destructiveness 111

2. Life histroy 11

3. Methods of control 1111

4. Protective coloration 1

5. Power of reproduction 1

6. Great plagues of grasshoppers 11

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2. Fighting habits of mole-crickets 1

3. Digging ability of mole-crickets 1

4. Adaptation mole-crickets have 1

5. Musci of the common cricket 1

6. Music of the tree cricket 1

7. Sweet sap made by the singing mole for the female 1

f. Other cockroaches (short descriptions) 1111

B. Hemiptera and Homoptera

a. Chinch-bugs

1. Migrating habits 1

2. Methods of control 11

3. Damage done by chinch-bugs 11

4. Story of introduction 11

b. Cicadas

1. Swarms of the 17 year locusts 11

2. Life history 11

3. Enemies 1

4. Destructiveness 1

5. Means of control 1

6. Music and music apparatus 111

c. Tree-hoppers

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d. Lantern-flies (Fulgorids)

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2. Cottony-cushion scale 11

e. Grape Phylloxera 11

f. Hylobates--Life history 1

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2. Method of producing light 1

3. Purpose for flashing their lights 1

b. Lady birds

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2. Kinds 111

c. Death watches

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2. Reason for having its name 1

d. Engraver beetles

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2. Food 1

3. Burrows 11

e. Japanese Beetles

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2. Destructiveness 111

3. Life history 11

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f. Potato beetles

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g. Red Top Forest beetles

1. Destructiveness 11

2. Description 11

h. Pea-weevils

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i. Sugar cane beetles--destructiveness 1

j. Bark beetles--control 1

k. Pine tree weevil

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2. Life history 11

3. Instincts 1

l. Boll weevils

1. Introduction America 11

3. Peach moths

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b. Description 11

c. Methods of control 11

4. Codlin moths

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b. Description 111

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d. Methods of control 111

5. Pronuba moths

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b. Relation to Yucca plant 1

6. Sphinx moth

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7. Clothes moths

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2. Methods control 11

8. Army worms--destructiveness 1

9. Measuring worms

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E. Hymenoptera

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3. Method of ventilating their hives 11

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6. Body structure of queens 11
7. Body structure of drones 11
8. Method of making wax 111
9. Method of making honey 11
10. Honey comb purpose and structure 11
11. Stinging apparatus 1
12. Kinds of bees in a hive 111
13. Life history of each kind 111
14. Slaves and pets 1
15. Swarming and mating flight 11
16. Structure of sexual organs of queen and drone 1
17. Egg fertilization 1
18. Winter home 1
19. Language of bees 11
20. Length of life 1
21. Queen battles 1
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6. Credulity 11
7. Janitors 11

8. Enemies 1

9. Battles 1111

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11. Aphid-cows 111

12. Slavery 111

13. Nursing work 1

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Eciton ants 11

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Leaf-cutting ants 1

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17. Formic acid shooting ants 1

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4. Habits of a Social wasp 1

5. Habits of Painted nest wasps 1

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7. Life history 11

8. Chalcids wasps 1

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4. Life history 1111

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2. Habitat 11

3. Methods of control 11

4. Disease it is responsible for 11

c. Hessian flies

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d. Houseflies

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2. Rate of reproduction 1

3. Fly fungus 1

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e. Craneflies

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7. Structure of their bodies 1

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10. Warning signals 1

11. Manner of invading houses 1

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13. Enemies 1

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3. Battles between Hermit crabs 1

4. Commensalism, etc. among Hermit crabs 1

5. Barracoutas

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b. Strength 1

6. Bonitas

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b. Relatives 11

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7. Gold fishes

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b. Eggs--number and egg-laying habits 1

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d. Gold fish farm 1

8. Fat-back fishes

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b. Methods of catching them 1

c. School of them 1

d. Use made of the fat 1

9. Lungfishes

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c. Food 1

d. Relatives 1

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11. Parrot fishes

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12. Tunas--strength 1

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14. Sharks

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5. Poisonous fish 11

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8. Noises made by fishes 1

9. Fish protection 111

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11. Ambergris

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b. Method of obtaining it 1

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d. Cause of its production 1

12. Origin of deep-sea fish 1

13. Phosphorescence of deep-sea fish 1

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5. Noise frogs make 11111

6. Life history 1111

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11. Farming alligators 1

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c. Habitat 1

d. Habits of the rhinoceros iguana 1

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b. Poisonous blood 1

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i. Poison fangs and their growth, etc. 11

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F. Cuckoos

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2. Description of these kinds 1
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H. Ibises

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2. Soaring and sleeping habits 11
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b. Mother bird lays the eggs 1

c. Father bird builds the nest 1

d. Father bird gets broody 1

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2. Chest ballooning habit 1

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	4. How to, when to and why fight it	11
Q.	Cancer	
	1. Causes	111
	2. Treatment	111
	3. Characteristics of the disease	111
	4. Time of appearance and place	11
	5. Symptoms of disease	1
	6. Antiquity of the disease	1
	7. Relation to meat eating	1
R.	Rickets	
	1. Causes of rickets	111
	2. Cures	11111
S.	Goiter	
	1. Cause	111
	2. Cures	111
	3. Prevalence	11
T.	Diphtheria	
	1. Treatment	1
	2. Cats as carriers	1
	3. Producing diphteria serum	1

U. Diabetis

1. Nature 111
2. Kinds 1
3. Cause 11
4. Cures 11111

V. Survey

1. Nautre 11
2. Cause 11111
3. Cures 11111

W. Snoring

1. Causes 1
2. Cures 1

X. Syphilis

1. Causative organism 11
2. Course 1
3. Treatment 1111
4. History 1

Y. Hookworms

1. Cures 111
2. Effects 1111
3. Infection 11
4. Dr. Hall's experiments 1

Z. Other diseases, etc.

1. Heart disease 1
2. Headaches and their many causes 1
3. Focal infections 1111
4. Deafmutism 1

F. Medical Science stations 1

G. Biological causes of death 111

H. Cause of fever phenomena 1

XXVIII. Miscellaneous biology topics

A. Agriculture

1. War on pests 11111 11

2. Poultry improvement 11

3. Agricultural improvement 11111 11

4. Temperament of animals and food 1

B. Drugs and drug addiction

1. Relation between use of alcohol and drugs 1

2. Drugs used 1111

3. Drug measures of prohibition 11

4. Drug plants 111

5. Age of drug users 1

6. Food supply and drug taking 1

7. Dreams of drug takers 1

8. Cocaine

a. Effects and effects of withdrawl 11

b. Number of addicts 11

c. Method of acquiring the habit 11

d. Treatment for the habit 1

9. Opium

a. Government's and opium traffic 1111

b. Increase in use 111

c. Effects 111

10. Prohibition laws and their enforcement 11111 11

C. Genetics

1. Cells

a. Structure of cells-body and germ 111

b. Kinds of cells 111

c. Process of fertilization and function 1111

e. Growth and life time of cells 111

f. Body's use of dead cells 1

g. Mechanics of heredity 11111 1

h. Mendel's laws 111111 11111 11111

i. Sex determination 111

j. Sex-linked characters 11

k. Phenomena of twinning 11

l. Mutations 1111

D. Parthenogenesis 11

E. Orthogenesis 11111

F. White Indians of Carien 111

G. Embryology of

1. A child 11

2. A butterfly 1

3. A chicken 1

H. Structure of an egg 1

I. The Chrysalis an adaptive stage of life 1

J. Evolution

1. Prehistoric men

a.	Pithecoanthropus	11111 11
b.	Neanderthal	11111 11
c.	Piltsdown	11111
d.	Heidelberg	11111
e.	Australopithecus	111
f.	Ekungston	1
g.	Neolithic	1
h.	Cromagnon	111
i.	Prehistoric men of California and Florida	11
j.	Rhodesian man	11
k.	Gibralter	1
2.	Prehistoric animals (given under animal topics	1111
3.	"Connecting links" between animal groups	
a.	Periophthamus fish	1
b.	Climbing perch	1
c.	Clarias fish	1
d.	Robber crab	1
e.	Platypus or duckbill	1
4.	Comparative anatomy of men and animals	
a.	Feet	11
b.	Skulls	111
c.	Vocal organs	1
d.	Vestigial organs	11
5.	Effect of environment on developing animals	11
6.	Acquired characteristics	

a. Recent experiments to prove 11111

b. Effect of parent's ages on children 11

c. Leaders of this theory 111

d. Variations 111

e. Origin of species 11111

7. Blood test proof of evolution 11

8. Role of Endocrine glands in evolution 11

9. Pictures of man's ancestors 1

10. Great Scientists

a. Darwin 11111 11111 111

b. Lamarck 11111 1

c. De Vries 111

d. Mendel 11111 11111 11111

e. Agassig 111

f. Weissman 11111 1

g. Galton 11111 1

h. Huxley 111

i. Burroughs 111

j. Haeckel 1111

k. Goddard 111

l. Davenport 1111

m. Reed 111

n. Gorgas 1111

o. Malthus 111

11. Articles on Fundmentalism 11111 1

K. Problems of Eugenics 1111

L. Problem of over population and its solution 111

M.	Origin of sex	1
N.	Theories of life	
	1. Mechanistic and its leaders	11
	2. Vitalistic and its leaders	11
O.	Differences between living and non-living things	11
P.	Methods life has of surviving	11
Q.	Production of artificial life	11
R.	Death biologically considered	11
S.	Deep sea life	1
T.	Biographies of men	
	1. Burroughs	1111
	2. Pasteur	1
	3. Fabre	1
	4. Gorgas	111

In table C. are listed the groups and sub-groups of biology discussed in the magazines surveyed. As will be remembered from a former statement the amount of biology reviewed for this study occupied 55839 column-inches of space.[1] In columns II. and III. of this table is stated the portion of this space devoted to each group and sub-group of biology as listed. In columns Iv. and V. is stated the same thing in percentages. In column VI. is given the frequency with which each of these groups and sub-groups are discussed.

1. See page of this thesis.

Table C.

I	II	III	IV	V	VI
Biology Divisions	Total Dis.	Sep Dis.	Total Per.	Sep Per.	Frequem
A. Animal Biology	29262	29262	52.40	52.40	1798
B. Human Biology	16096		28.82		
1. Health		13838		24.80	504
2. Eugenics		1918		3.44	40
3. Food		340		.61	66
C. General Biology	7080		12.69		
1. Evolution		3582		6.41	101
2. Biology Principles, etc		1192		3.13	12
3. Great Biologists		930		1.66	92
4. Agricultlural Biology		720		1.26	17
5. Heredity and Genetics		674		1.20	33
D. Plant Biology	3401	3401	6.09	6.09	181
Totals	55839	55839	100.00	100.00	2844

Of the biological subjects discussed in the magazines surveyed, probably the most difficult ones to read are those listed in the table below. The number of articles discussing each of these subjects, the number of column inches devoted to the discussion of each, and the percentage this number is of 55839 are given in columns I, II, and III respectively.

Table D.

	I	II	III
1. Eugenics	13	1918	3.4 +
2. Evolution	30	3582	6.4 +
3. Heredity and Genetics	14	674	1.2

On this and the following pages is given a list of the biological vocabulary as found in the magazines read.

Table E.

Vocabulary of animals.

1. Adjutant (bird)
2. Agouti
3. Albacore
4. Albatross
5. Alewives
6. Amberjacks
7. Alligators
8. Amoeba
9. Ampella
10. Ammonites
11. Anaconda
12. Angleworm
13. Angelfish
14. Anteater
15. Antelope
16. Ants
17. Anopholes
18. Apes
19. Aphids
20. Archeopteryx
21. Argoli
22. Armadillo
23. armyworm
24. ass
25. ascaris
26. axotyl
27. baboon
28. bacillus
29. bacteria
30. badger
31. bagworm
32. barracouta
33. barnacle
34. basha
35. bass
36. bat
37. bedbug
38. beaver
39. bear
40. beetle
41. bighorn
42. Bird of Paradise
43. bison
44. boar
45. Boa constrictor
46. boblink
47. boll-weevil
48. bonefish
49. bonita
50. booby
51. bowerbird
52. blackbird
53. blackfish
54. blesstock
55. bloodhound
56. bluebird
57. bluejay
58. bee
59. brown-tail moth
60. buck
61. bug
62. buffalo
63. bullhead
64. butterfly
65. burro

66. bustard
67. buzzard
68. caddisfly
69. camel
70. canary
71. cankerworm
72. cardinal
73. caribou
74. cassowary
75. cat
76. catamount
77. catbird
78. catfish
79. caterpillar
80. chalcis fly
81. chameleon
82. cheetah
83. chick-a-dee
84. chicken
85. chigger
86. chimpanzee
87. chinchbieg
88. chipmunk
89. chuckwill
90. chubb
91. cicada
92. civet cat
93. clam
94. clamcracker
95. clarias
96. coati mudi
97. cobra
98. cochineal
99. cock-of-the-rock
100. cockroaches
101. cod
102. codlin
103. condor
104. coney
105. cottie
106. copperhead
107. coral
108. coral snake
109. cormborer
110. cormorant
111. cottony cushion scale
112. cougar
113. cow
114. cow bird
115. coyote
116. crab
117. crane
118. cranefly
119. crappie
120. crayfish
121. cricket
122. crinoid
123. crocodile
124. crossbill
125. croton bug
126. crow
127. cukoo
128. culex
129. curlew
130. curculio
131. cuttlefish
132. daddy-long-legs
133. deer
134. desmids
135. devilfish
136. diatoms
137. dick-dick
138. dinosaur
139. dodo
140. dog
141. dogfish

142. dolphin
143. donkey
144. doe
145. dragonfly
146. drone
147. dryptosaurus
148. duck
149. eel
150. egret
151. Eider-duck
152. elephant
153. elk
154. elm
155. falcon
156. fer-de-lance
157. finch
158. firefly
159. flatworm
160. flamingo
161. fleas
162. fly
163. flycatcher
164. flying fish
165. foraminifera
166. fox
167. frigate bird
168. frog
169. frogfish
170. fruitfly
171. fulgored fly
172. gadfly
173. gannet
174. gaur
175. gazelle
176. gecko
177. geese
178. gerenuk
179. gibbon
180. giraffe
181. goat
182. goby
183. goldfish
184. gopher
185. goral
186. gorilla
187. goshawk
188. glowworm
189. grasshoper
190. grebe
191. grilse
192. grossbeak
193. grouper
194. grouse
195. gnat
196. gnu
197. guillemot
198. guinea pig
199. gull
200. gunnard
201. guppy
203. glyptodon
204. gypsy moth
205. harlequin
206. hartebeeste
207. harvest mites
208. hawks
209. haddock
210. hedgehog
211. Hessian fly
212. herring
213. heron
214. hippopotamus
215. horned toad
216. hornfly
217. horses
218. hookworm
219. humming bird
220. huhia
221. hydra
222. hydroid
223. hyena

224. jackal
225. jay
226. jaguar
227. jelly fish
228. johnny dory
229. junglecocks
230. kangaroo
231. kangaroo rats
232. katydid
233. kestrel
234. killdeer
235. kingfisher
235. kingfisher
236. kite
237. kiwi
238. kodu
239. kongoni
240. ladybird
241. laphiodont
242. lapwing
243. larva
244. leafhopper
245. lemming
246. lemur
247. leopard
248. lice
249. limpet
250. lion
251. lizard
252. llama
253. lobster
254. locust
255. longspur
256. loon
257. lungfish
258. lynx
259. macaw
260. mackerel
261. magpie
262. mallard
263. mammoth
264. man-o-war-bird
265. mantis
266. maori bird
267. matmot
268. marten
269. mayfly
270. meadowlark
271. membracid
272. mice
273. midge
274. milliped
275. mink
276. minnow
277. megatheron
278. moccasin snake
279. mole
280. mollusk
281. monkey
282. mongoose
283. moose
284. moosebird
285. moray
286. mosquito
287. moth
288. mountain lion
289. mastodon
290. mountjack
291. mudfish
292. mourning dove
293. murre
294. muskox
295. muskellounge
296. muskrat
297. ocelet
298. octopus

299. oolichan
300. opalina
301. opossum
302. orang-utan
303. oriole
304. oryx
305. osprey
306. ostrich
307. otter
308. ouzel
309. ovenbird
310. ovibos
311. oxwarble
312. owl
313. oyster
314. okapi
315. pampane
316. panther
317. paramecium
parrakeet (318)
319. parr
320. parrot
321. parrotfish
322. partridge
323. passenger pigeon
324. peacock
325. Peccary
326. pelican
327. penguin
328. perch
329. periwinkle
330. petrel
332. pewee
333. pig
334. pigeon
335. pike
336. Piltdown man
337. Pinesèskin moth
338. pipefish
339. pipèt
340. pithecanthropus
341. phalarope
342. pheasant
343. phycole
344. phoebe
345. phylloxera
346. phoenix bird
347. pigfish
348. pickeral
349. plaice
350. plover
351. polecat
352. pollock
353. pombe
354. porgy
355. plantlice
356. platypus
357. Prairèe dog
358. primate
359. protozoa
360 proboscidian
361. prawns
362. pronunba
363. puffer fish
364. puma
365. python
366. quail
367. rabbit
368. raccoon
369. rail
370. rat
371. red-bug
372. red-dog
373. red-head
374. red-poll
375. red-start

376. red-wing
377. reindeer
378. remiges
379. rhinoceros
380. robin
381 roebuck
382. rooks
383. rotifer
384. sailfish
385. salamander
386. sandpiper
387. sandworm
388. sawfish
389. saurian
390. scale
391. scorpion
392. sea-anemone
393. sea-cow
394. sea-horse
395. seal
396. sea-lily
397. sea-lion
sea-mice (398)
399. sea-nettle
400. sea-pink
401. sea-squirt
402. sea-slug
403. sea urchin
404. sea-worm
405. secretary bird
406. shark
407. shearwater
408. sheep
409. shipworm
410. shrew
411. shrimp
412. silkworm
413. sivapithecus
414. skate
415. skunk
416. skylark
sleeperfish (417)
418. sloth
419. snail
420. snake
421. snipe
422. snowbird
423. sole
424. songsparrow
425. songsparrow
426. spider
427. sponge
428. squid
429. squirrel
430. stag
431. starfish
432. starling
434. stegomya
435. stegosaurus
436. stoat
437. stonefly
438. stork
439. sucker
440. swallow
441. swan
swift (442)
443. swordfish
444. tadpole
445. tanamou
446. tartantula
447. tapeworm
448. tapir
449. tarpon
450. termite
451. tern
452. thrush
453. tickbird
454. titanoceros

455. titiara
456. toad
457. tona
458. trachador
459. tree-cricket
460. tree-roach
461. triceratops
462. tit
463. totoise
464. trilobite
465. triton
466. trogon
467. turkey
468. turtle
469. tyrantassaurus
470. vampire
471. virec
472. vulture

Vocabulary of plants

473. acacia
474. achillea
475. acorn
476. agar
477. alfalfa
478. algea
479. aminita
480. anemone
481. Anne's lace
482. arbor-vitae
483. arbutea
484. artichoke
485. arum
486. ash
487. aster
488. avacado
489. bacteria
490. balm of Gilead
491. balsam
392. bamboo
493. banana
494. basswood
495. beans
496. beech
496. bead's tongue
497. bears
498. birch
499. blackberry
500. blueberry
501. boneset
502. bouncing bet
503. bracken
504. breadfruit
505. broccolé
506. Brussel's sprouts
507. bunchberry
508. buttercup
509. cabbage
510. cactus
511. carib-grass
512. cassena
513. cat-tail
514. cedar
515. celery
516. chaulmoogra tree
517. chestnut
518. chrysanthemum
519. clethra
520. clover
521. coconut
522. coffee tree
523. cohosh
524. coltsfoot
525. columbiane
corn (526)
527. cosmos

528. cotton
529. cucumber
530. cowlily
531. cypress
532. daisy
533. dahlia
534. dandelion
535. Duruma wheat
536. elderberry
537. elm
538. euglena
539. fern
540. fir
541. foxglove
542. fungus
543. gallardia
544. gentian
546. ginko tree
547. grape
548. gum tree
549. hackberry
550. haw
551. hawthorn
552. hemlock
553. hepatica
554. hibiscus
555. hickory
556. holly
557. hollyhock
558. horsechestnut
559. honeysuckle
560. huckleberry
561. hyacinth
562. Iris
563. jacinth
564. Jack-in-the-pulpit
565. Jacob's ladder
566. jasamine
567. kale
568. kelp
569. kohlrabi
570. laurel
571. lichen
572. lilac
573. lily-of-the-valley
574. linden
575. liquidambar
576. liverwort
577. lobelia
578. locust
579. loganberry
579. lombardy poplar
581. lotus
582. mangrove
583. mango
584. maple
585. marigold
586. marquis
587. magnolia
588. mildew
589. mimosa
590. monk's-hood
591. mosaic
592. moss
593. mould
594. mushroom
595. myrtle
596. napier grass
597. narcissus
598. natal-grags
599. nettle
600. oak
601. oleander
602. onion
603. orange
604. orchid
605. oxalis
606. paint-brush

607. palm
608. palmetto
609. parsley
610. partridge-pea
611. passion-flower
612. pear
613. peas
614. pine
615. pineapple
616. pitcher-plant
617. pickerel-weed
618. phlox
619. poison ivy
620. poinsetta
621. poplar
622. poppy
623. potato
624. primrose
625. puffball
626. pumpkin
627. petunia
628. quince
629. raspberry
630. red-wood
631. reed
632. Rhodesian grass
633. rock plant
634. rush
635. rust
636. sagebrush
637. sedge
638. sea-weed
639. senna
640. scum
641. smut
642. solanum
643. soapweed
645. spagnum
645. spice-bush
646. spiderwort
647. spinach
648. spruce
649. squash
650. Sudan grass
651. sumac
652. sundew
653. sunflower
654. Sweet alyssum
655. Sweet-gum
656. Sweet-peas
657. sycamore
658. tamarack
659. thyme
660. trillium
661. trumpet-creeper
662. tulip
663. twin-berry
664. twin-flower
665. vervain
666. vetch
667. violet
668. walnut
669. willow
670. yeast

Vocabulary of General terms.

671. abdomen
6721. abscess
673. absorption
674. acontia
675. adenoids
676. adhesions
677. adipose
678. adolescence
679. adrenalin
680. agglutination
681. albumen
682. albinium

683. alcohol
684. alimentary
685. altruism
686. alveolar
687. ambergris
688. amphibian
689. ametropic
690. anatomy
691. anemic
692. anesthetic
693. aneurism
694. animalicule
695. anopholes
696. anthozoa
697. anthrox
698. anthropology
699. anthropoid
700. annual
701. antenna
702. antibody
703. antigen
704. antiscorbutic
705. antler
706. antiseptic
707. antitoxin
708. antirhachit
709. bacillus
710. bacteria
711. bacteriophage
712. bactrochology
713. basilisk
714. beverage
715. biennial
716. bilateral
717. bile
718. biology
719. biped
720. blood pressure
721. bone
722. botulus
723. bracts
724. bronchitis
725. caffeïn
726. calory
cancer (727)
728. canidae
729. canine
730. cannibal
731. capillary
732. carbo-hydrate
733. carrier
734. carrion
735. carnivores
736. cataract
737. catkin
738. caterpillar
739. calyx
740. cell
741. cellulose
742. chalcidae
743. chilblains
744. chlorophyll
745. chromosomes
746. chrysales
747. coagulation
748. cocoon
749. colloids
750. coma
751. commensalism
752. conjugation
753. convulsion
754. copra
755. corpuscles
756. constipation
757. dandruff
758. dementia
precox
789. dentine
790. dentition
791. dermatitis
792. dermatology

793. dextrin
794. diarrhoea
795. dicotyledon
796. dietetics
797. digestion
798. dinosaur
799. dominant
800. diagnose
801. dyspepsia
802. dyastole
803. dyzygotic
804. dysentery
805. emaciated
806. emetic
807. embryo
808. enamel
809. endoctrine
810. entomology
811. engootic
812. enzymes
813. eothropus
814. epidemic
815. epigenesis
816. epithleium
817. ethnology
818. eusthachians
819. evolution
820. exzema
821. facet
822. fangs
823. fat
824. funa
825. fecundity
826. feline
827. femor
828. fertilize
829. fetal
830. flagellate
831. flora
832. focal infection
833. foetus
834. fomite
835. forum magunm
836. fossil
837. fraternal
838. frost-bite
839. gallinule
840. gallinaceous
841. gall-stones
842. ganglia
843. gastric
844. gastritis
845. germ-plasm
846. germs-cells
847. germs
848. genes
849. genetic
850. geneaology
851. gill
852. gill-cleft
853. glandular
854. globigerina
855. gluten
856. glycerides
857. goiter
858. gout
859. gorgonian
860. graft
861. grub
862. haemaglobin
863. harmones
864. Harmonculus
865. heart
866. heidelberg man
867. hemiptera
868. herbivorous
869. heredity
870. herptologist
871. hexopoda
872. hemolysis
873. heliotropism
874. hermaphrodite
875. hibernation

876. histeridae
877. homology
878. homo-sapiens
879. horticulture
880. humidity
881. hybrid
882. hygiene
883. hylobates
884. hymenoptera
885. hypodermic
886. hyperacidity
887. hysteria
888. immunity
889. infusoria
890. inhibition
891. infection
892. iodine
893. incubation
894. inoculation
895. insomnia
896. instinct
897. intracellular
898. insulin
899. ithyology
900. juvenescence
901. katatonia
902. kidney
903. lactic
904. larva
905. larynx
906. legume
907. lesion
908. leucocytes
909. lepidoptera
910. ligament
911. liver
912. lores
913. lymph
914. maggot
915. mammal
916. mammary
917. mandible
918. marsupial
919. massage
920. mastoid
921. maturity
922. maxilliped
923. metamorphosis
924. metabolism
925. microbe
926. miceooeganism
927. migraine
928. mollusk
929. monozygotic
930. molt
931. mongrel
932. moron
933. morphological
934. muscles
935. mucus
936. mycelium
937. mycoplasm
938. mutation
939. must
940. narcotic
941. nasal
942. nausea
943. nematode
944. neolithic
945. neo-Darwinison
946. neuron
947. neurasthenia
948. neurology
949. nerves
950. neurotic
951. neuroptera
952. nicotine
953. nitrogenous
954. nostril
955. nuptial
956. nymph

medulla
micleus

957. obovate
958. obesity
959. obstetrical
960. odontoglossa
961. olfactory
962. ooze
963. ophidian
964. orchid
965. organism
966. ornithology
967. orthogenesis
968. orthopedis
969. orthoptera
970. osteopath
971. ovary
972. oviparous
973. ovum
974. oxidize
975. palate
976. palcontology
977. pancreas
978. pandemic
979. papilla
980. parasite
981. paralysis
982. paresis
983. parenchyma
984. paranoia
985. parotid
986. pasteurize
987. parthenogenesis
988. pathology
989. pectoral
990. pepsin
991. perennial
992. peritoneum
993. peristalsis
994. peyote
995. phagocytosis
996. phloem
997. phoridídae
998. phosphorescent
999. physiology
1001. pigment
1002. piscatorial
1003. pistil
1004. pithecanthropens
1005. pituitary
1006. plasma
1007. plasmodia
1008. plastid
1009. polistes
1010. pollen
1011. polybia
1012. predatory.
1013. prenatal
1014. prehensile
1015. primate
1016. progeny
1017. prognathum
1018. prophylactic
1019. propolis
1020. protein
1121. protozoa
1022. protoplasm
1023. psychiatry
1024. psychopath
1025. pseudopoda
1026. ptomaine
1027. pupa
1028. pus
1029. pyloris
1030. rabies
1031. racemo
1032. recessive
1033. rectum
1034. reflex
1035. regeneration
1036. renal

1037. reproduction
1038. reptile
1039. retina
1040. respiration
1041. resin
1042. rodent
1043. rookery
1044. rhyzome
1045. saliva
1046. sanitation
1047. scarab
1048. sclerotic
1049. schlerenchyma
1050. scólytes
1051. sebacious
1052. seborrhea
1053. secretion
1054. senescence
1055. senile
1056. septum
1057. serum
1058. sex
1059. sieve-cells
1060. simian
1061. somatic
1062. somnolent
1063. spawn
1064. species
1065. spine
1066. spleen
1067. sperm
1068. spoor
1069. spore
1070. sporific
1071. stamen
1072. staminate
1073. staphilinidae
1074. sterilize
1075. stolen
1076. stomata
1077. stridulation
1078. subluxation
1079. suprarenal
1080. talon
1081. taxidermist
1082. tegument
1083. tendril
1084. tentacle
1085. tetanus
1086. therapy
1087. thorax
1088. thrombin
1089. thyroid
1090. tonsil
1091. toxemia
1092. toxin
1093. toxology
1094. trachea
1095. trauma
1096. trigonidea
1097. transfusion
1098. transpiration
1099. trypanosome
1100. tuber
1101. tumor
1102. unicellular
1103. ulcer
1104. urinary
1105. uvula
1106. vaccination
1107. variation
1108. vestige
1109. vitality
1110. vitamins
1111. wart
1112. wattle
1113. wax
1114. xesurus
1115. xylophagus

1116. zoology
1117. zoophyte
1118. zymotic

Vocabulary of men

1119. Agassiz
1120. Agramonte
1121. Audubon
1122. Bantu
1123. Beecher
1124. Bryan
1125. Burroughs
1126. Carrol
1127. Correns
1128. Cuvier
1129. Darvin
1130. Davenport
1131. De Vries
1132. Dill
1134. Finley
1135. Fabre
1136. Freud
1137. Funk
1138. Galton
1139. Galvani
1140. Goddard
1141. Gorgas
1142. Geyer
1143. Galen
1144. Haeckel
1145. Hall
1146. Hornaday
1147. Hexley
1148. Jordon
1149. Kammerer
1150. Kellogg
1151. Huhlman
1152. Lamarck
1153. Laxear
1154. Leob
1155. Lucas
1156. Malthus
1157. Mendel
1158. Morgan
1159. Nogouchi
1160. Osborn
1161. Pearson
1162. Peckahm
1163. Pasteur
1164. Pavlow
1165. Reed
1166. Richardson
1167. Roentgen
1168. Ross
1169. Scopes
1170. Spencer
1171. Sternberg
1172. St. Hilaire
1173. Tschermack
1174. Tyndal
1175. Volta
1176. Weisman
1177. Wells

Chapter V.

In Chapter IV. of this thesis, Table A, are presented all the topics of biology found in the Kansas High School Course of Study. Opposite these in another column are presented the same topics, or similar ones, which have been discussed in the magazine articles reviewed. The purpose of making this comparison is to show in what respects our High School Course of Study prepares its students to read intelligently the biology of current periodical literature. In Table B. is presented a complete list of the topics in biology that were discussed in the magazines. The purpose here is to show in what respects our High School Course of Study does not prepare its students to read intelligently the biology of current periodical literature. In Table C. all the topics of biology discussed in the magazines are grouped under appropriate subjects and these subjects are then ranked in importance. The two principles used in ranking them are:

1. The amount of space devoted in the magazines to their discussion.
2. The frequency with which they are discussed in the magazines.

In Table D. the biology vocabulary of the magazines is listed.

Conclusions:

Several conclusions seem to be warranted by the

data secured in this study. Table C. seems to suggest these things:

1. Animal biology is the most important branch of biology found in our general purpose magazines. The most of the animal biology presented consists of Nature Study wherein are set forth descriptions of the appearances, habits, etc., of wild animals. It is this sort of biology that seems to appeal most of any to the leisure interests of people.

2. Human biology is the next most important branch of biology found in general purpose magazines. Under it the biology of health ranks as the most important sub-division, the biology of eugenics as the second most important sub-division, and the biology of food as the third, or least, important sub-division.

3. General biology is the next most important branch of biology found in general purpose magazines. Under this branch the sub-division ranking as first in importance is evolution, as second is biological principles, as third is biographies of Great Biologists, as fourth is agricultural biology, and as fifth is heredity and genetics.

4. Plant biology is the least important branch of biology found in general purpose magazines.

As to the question whether our High School Course of Study in General Biology prepares students taking it, to read intelligently the biology appearing in periodical literature the following conclusions seem justified:

If students are taught only that which is contained in the Kansas Course of Study for General Biology

1. They are prepared to read easily about 89% of the biology found in general purpose magazines.
2. They are prepared to read with difficulty 11% of the biology found in general purpose magazines. About 1/3 of this 11% they, probably could scarcely understand at all.[1]

The conclusions stated above would likely be true even thgouh High School students had taken all the courses in biological sciences offered in High Schools.

Suggestions:

In the light of the facts presented in this thesis it would seem probable that the Kansas High School Course of Study in the biological sciences could be improved by the addition of:

A. Topics explaining the meaning and nature of
   1. Eugenics
   2. Genetics
   3. Evolution

B. Topics treating more fully Nature Study of Animals.

Probably all these topics except those on genetics could be profitably added to the Course in General Biology.

1. Consult Table D. page 149. Test yourself on the extract of an article quoted in the Appendix on page 165.

Appendix

The purpose of quoting the following extract is to give the reader an idea of the subject matter found in a somewhat typical magazine article regarding insects.[1]

"In attempting to form an opinion of human beings, it is not an unusual proceeding to ask who are their relatives. Applying this test, it will be found that the mantis is of an order of insects of which you already know a good deal. It is one of the straight wings, the Orthoptera, and therefore a cousin to the grasshopper and the cockroach. The straight wings as you may remember, are divided into the jumpers and the runners. The mantis is a runner, but comes near being in the snail class, since it moves so slowly. Speed in running is not a part of its role.

It practices the same sort of deception as does the grasshopper and takes on a greenish color that it may hide in the leaves. In South America there is a sort of mantis that is given to brilliant colors. This is that it may hide from its enemies in the beautiful orchid clusters with which the trees abound.

The mantis has a hinge in the middle of its body, and the part in front of it has the appearance of a giraffe like neck. Like all insects it has six legs. The hind legs are oddly developed in the grasshopper, the object being jumping, but in cousin mantis it is the forelegs that are peculiar. They are very long, so big as to

be quite out of proportion to the rest of its body, and have two well developed elbows with barbs inside to help in gripping whatever they may seize. It is these arms that constitute the business end of a mantis. When the hinge bends in the middle, the front part of the mantis sits up straight. Then an odd thing is discovered. The mantis can turn its head about as can a human being and look from side to side. It is the only insect in the world that can do this. . . . . .

Solemnly and slowly it may advance, like a minister in his pulpit, until it has reached a point of vantage. Then it will rear itself, by dint of the hinges in its back, and lift its arms on high. There it will remain motionless as though in worship. Presently a katydid may fly past. Instantly there is a transformation. With lightening swiftness the mantis will strike with one of those poised arms. It will reach out a surprizing distance. When the arm comes back it will have in its elbow--with no danger of getting away, because of the barb--the struggling form of the katydid. . . . . .

If the mantis is caught in the hand, for instance, a very dirty sort of liquid immediately begins to flow from its mouth. This liquid is not only messy in the extreme, but it has a bad odor. The mantis knows this. That is the reason it uses it. It hopes that, by making itself disagreeable, it may gain its release. . . . . .

Other insects resort to this secretion of disagre-

eable liquids to drive away their enemies. Grasshoppers are notoricus for this practise. . . . . .

Anybody who has lived in the mantis country, all that region south of New Jersey, has seen its egg-masses, though he may not have known what they were. Sticking about on twigs or tree-trunks through the winter they may be found, an inch long, as big as a finger, yellow and fluted somewhat to resemble heads of wheat. Down the middle of them are two rows of light colored eggs, so arranged as to give the appearance of braid. It is an artistic delicately sculptured creation sticking there on the limb. . . . . .

"When egg-laying time comes, nature give the mantis materials with which to work. These are secreted from its body and are not unlike those from which the cook makes frosting for her cake. The mantis likewise has an egg-beater and works it most effectively. She developes a goodly quantity of froth. While this is still in a plastic state, she begins shaping her egg-case. The part of the froth that is toward the bottom is heavier than that at the top. She skims the lighter material off and puts it aside for a special purpose. She makes the case, looking like a head of wheat, out of the heavier material. She fashions the design very exactly, yet with seemingly carelessness, since she never even looks at her work. Then she places her eggs, some scores of them, like a braid of flaxen hair,

down the middle. She covers them with the lighter material that she has kept in reserve. Her frosting, in contact, with the air gradually hardens. Soon it is as tough and rugged as the shell of an almond. The eggs have been put away for the winter.

Nothing much happens until one bright day in the following June. Then of a sudden the egg cluster begins to come to life. Along the middle, where the lighter material was piled, a tiny creature with shockingly large eyes begins to show itself. Almost immediately scores of others appear. They work in squads. They are breaking through where the mother purposely made her structure weak. . . . .

And when the baby mantes begin to emerge there are sometimes hosts of tiny ants standing in wait. They fall upon the new-hatched and helpless little fellows and devour them in great numbers or carry them off to their burrows. Many more are eaten than escape.

Those that do get away pass through one or two moults, develop a hardened crust, get their elbow pincers to work, begin on lesser insects like gnats and mosquitoes, and are soon lusty and aggressive. It is then they turn the table on the ants and the eaters become the eaten. . . . .

No matter how greatly the mantes multiply, they would be no menace to man. In fact they are most helpful to him. They eat his enemies. They keep down the number of those insects that would destroy him".[1]

1. Du Puy, W. A. The Praying Mantis, McClures, January 1926, page 457

The purpose in quoting the following extract is to give the reader an idea of the sort of material that is appearing in the magazines regarding up-to-date health topics.

"Of all these infinitely small creatures, the most curious and interesting, on account of the services it may render us, would seem to be the bacteriophage, discovered and studied by D'Herelle, of the Pasteur Institute. The facts that led this eminent bacteriologist to his discovery were these: If we form an emulsion with bouillon of some of the discharges from bacillary dysentery, for instance, and filter it we obtain a limpid liquid devoid of visible germs, but if we add several drops of this apparently sterile filtrate to a culture of dysenteric bacilli, we find that in 18 to 24 hours the culture becomes clear--the bacilli have disappeared. They have been bacteriolized. Several drops of this clarified culture bring about in turn the bacteriolysis of a new culture, and this series may be thus continued indefinitely. . . . . The bacteriophage is an internal parasite of the bacterium and cannot be cultivated in pure bouillon. The attacked bacillus swells up, becomes spherical and finally bursts, freeing the parasites that have developed within it".[1]

1. Vaulx, Dr. R. de la, Germs own Germ, Literary Digest, August 22, 1925, page 22.

The purpose for quoting this extract is the same as for quoting the preceding extract.

"However, man is just obstinate enough to consider his stomach first. He knows that beans taken to excess more than once or twice a week will cause a loss of appetite due to the burning feeling in the stomach and formation of excess gas that creates the stuffed, belching sensation.

The discomfort, this irritant action on the stomach we find is due to an aromatic oil and a bitter alkaloid. To those susceptible to its effects a small amount causes trouble; to others a large amount brings discomfort. . . . Nuts also are recommended as substitutes for meat--and again chemical analysis proves they contain a large amount of protein and fat. Walnuts, pecans, hickory nuts, peanuts all have been urged for favor--but so far no race, civilized or barbarous, has ever adopted them as their sole diet. We have found as in beans, that there is an irritant chemical product in the kernel itself as well as in the skin covering it. These cause colics and headaches caused by disturbance of the digestion when nuts are taken in excess. This is particularly true of children who should not stuff themselves with peanuts because of their tendency to cause colic and diarrhea. . . . . .

Bananas don't agree with some folks for several reasons. Bananas are rich in sugar and starch, but the

starch is swallowed raw, and so it is hard to digest. We don't get the perfect ripe banana here in our northern clime. When it is under ripe it is indigestible; when over ripe it is very apt to set up a fermenting process in the stomach.

So in attempting to substitute for meat the cheap nutritious products such as beans, peas, corn-meal, nuts fruits, etc., we find that all these economical foods contain substances that irritate the average stomach, when taken in excess. So we place them in their proper role of accessory food to be used at occasional times, to give a change and zest to diet--which is their proper function".[1]

1. Author not given, Foods That Poison Some People, Literary Digest, October 6, 1923, page 29.

The reason for giving this extract is the same as that given for the two preceding extracts.

"The factors which enter into keeping alive of Yellow Fever are these: The mosquito is infected when in search of blood to stimulate her to deposit eggs. She can only be infected by biting yellow fever patients in the first three days of their illness, and such patients are never numerous in an endemic centre, where the fever burns slowly but steadily, unless the population be large. After sucking the blood from a human being suffering from yellow fever, the mosquito proceeds in a day or two, to lay eggs, and her chances of surviving this ordeal are not great. If she does survive for at least ten days she is capable of infecting a human being by taking a second blood meal, provided she finds one who is not immune. Then she may lay eggs a second time with another slender chance of survival. And always new mosquitoes must be infected from the human suffers during their first three days. From these facts it appears that yellow fever does not have a high factor of safety in its favor.

For centuries no means were found to combat this disease. Then quarantines were established, which were not always successful, because the flight of all well persons from an infected zone was precipitate. . . . . .

The Yellow Fever Board of the Army, by a series of

dangerous experiments upon a group of heroic volunteers, determined the controlling facts about the disease, and then Dr. Gorgas put them into practical application. Havana, which had been for centuries a source of infection in yellow fever was soon made entirely free of the disease, and in a few years all Cuba was free. After Havana came Rio de Janiero, and Vera Cruz. Of course new facts were brought to light as the work went on. Especially noteworthy were the results obtained by Dr. Nogouchi, of the Rockefeller Institute, in connection with yellow fever control work at Guayaquil, Ecuador, which demonstrated that the fever is caused by the bacteria Leptospiro Icteroides. This is a most important discovery, since it was generally supposed that the causative agent was a protozoan parasite comparable to the one which causes malaria.

The recent development in method of eradicating yellow fever mosquito is to let the adult mosquitoes alone and attack the breeding larvae in the water-tanks. Certain surface swimming minnows are use. The little fish are inexpensive and easily distributed. They grow fat and frisky on wrigglers. Oil was formerly much used, and is still necessary under some conditions. Close screening of water-tanks is effective when orders can be enforced. . . . . .

In yellow fever we have a disease carried from man to man by a single species of mosquito, formerly called Stegomyia fasciata, now, by some triumph of scientific

nomenclature, rechristened Aedes Calopus. This mosquito is to all intents and purposes a domestic animal. . . . . It lives in the houses of man, breeds in his water containers, and bits him by preference. It has been shown that the fastidious calopus will bite a white man or an Indian before it will bite a negro. But when hungry it will bite a rat or even a canary.

The Aedes calopus is a common carrier of yellow fever germs, or perhaps we should say, a medium of exchange. It takes these germs from one man and passes them on to another, meanwhile keeping the culture up to standard in its own body. Perhaps originally when Aedes Calopus was a wild insect it carried an organism very like the Leptospira Icteroides from one wild rodent to another. Perhaps the day came when some man accepted the exchange and the spirochaete of the rodent was able to adjust itself to the internal arrangements of a new host. Of course this is speculation, but Dr. Nogouchi has found bacteria very like Leptospiro Icteroides in wild rodents, and he has been able to kill healthy guinea pigs with the germs of human yellow fever.[1]

1. Spinden, H. J. Yellow Fever-First and Last, World's Work, Vol. 43, Dec. 1921, page 169.

This extract is quoted to show an author's over-strained attempt to write in popular style.

"In this article the author takes his readers on an imaginative journey with him through a clover leaf. He reduces his readers to one-ten thousandths of an inch in size and speaks of all space relations of the leaf as compared to their sizes.

"Beneath us we feel the throb of the mighty protoplasmic engines; we have glimpses of great streams coursing beneath the shining, waterproof surface of the top, which undulates for two and a half miles to the canon that is over the midrib. All this plateau is covered by a forest of the white spines that rise like giant masts of crystals fifteen hundred feet above the network of dark veins.

Before we venture into the terrifying interior of this monstrous place, be assured that we are not playing with a fantasia. Small as we have made ourselves, we are not nearly small enough to penetrate the last secrets of a leaf. Our vision is still far too course to see even the most puffed-out molecule of starch or sugar, which would be to our gross microbic eyes only 1/250 of an inch in diameter. Now small as we are, we have descended only to those limits a microscope can reach, and are still like great blinking monsters before the ultimate facts of a leaf's structure.

We wish to go in. But we are altogether too large to enter through the upper side of the leaf, for no space there would admit a finger. The only opening on the edge is a blow-hole that is spouting out water-vapor and that offers no inlet. We peer along the under side. About a hundred yards away is hole that looks promising. Fortunately there is a thousand-foot spine, rooted beyond the opening and growing across it, close along the under surface, which offers us a rough bridge. We scramble along on this huge, sparkling log, below the under surface of the leaf, till we are beneath the mouth of a cave. At first we are almost blown down by a blast of oxygen that is rushing out, and then are almost sucked up by a current of carbon dioxide. At the edge of these currents we find a place where we may swing ourselves by our hands up to an oval aperture that is heaving in an alarming manner. We can feel the surge of sap in the bulging guard-cells, which sway the wall of the cavernous mouth to and fro; they might quickly swell across the opening and crush us. Luckily at just this moment they are slowly drawing apart.

We venture between them when the opening becomes five feet wide. We find ourselves at the bottom of a funnel whose wall rises steep and slippery forty feet above us. Up this we clamber. Here at last is quiet and security, for we are in an open space some fifty feet wide and a

hundred high, whose sides are composed of a dozen or more irregular blocks. Imagine some houses, with elastic walls, wedged tightly but not accurately together to inclose a great chamber, and you will have an idea of the surroundings that close us in. The walls of these houses are about six inches thick, but so nearly transparent that we can make out fairly well what lies behind them: globes and disks, ten feet or more in diameter, that are suspended in a liquid, that are slightly in motion, and that look busy. "Bu$sy" is a queer word, but it conveys the impression made upon any visitor to the interior of a leaf.

These globes are the cells that manufacture sugar-and that is all we know about them. The chemist, after his most searching investigations, is still as unable to peer into the workings of these factories as we are now with our human eyesight sharpened seven hundred thousand times. We can only gaze and repeat, 'They make sugar'. In the course of a summer they will manufacture enough sweet food to form a layer half a mile deep over the whole leaf.

If we wish to explore the way lies open above. We had best take our bearings so that we shall not get lost in the galleries that ramify among the big cells. Our forty foot climb up into this chamber was through the under surface of the leaf; we are now in its soft interior. Above us lies the thickness of the leaf--perhaps six hundred feet--which is packed nearly full

of the house like blocks through whose walls we have been looking. These are the green cells; half a dozen layers of them are between us and the top surface of the leaf; all around us they stretch, out to the very edges--a million or more of them. We are going to climb up through them, and if passages open sideways, we must keep good track of our directions or we shall never find our way back.

Through the air-passages we poke our way between the pulsing walls of the cells and mount toward the upper side of the leaf. The cells become more narrow, more close packed, more green until, when we have struggled upward four hundred feet, we come to the base of a close array of them that are much longer, wedged tight together, like so many flexible boxes, reaching to the upper surface. They deserve their name of the "palisade" cells. At one point we can squeeze another hundred feet through an air-channel, but here it ends and we must stop.

Familiarity with these more active upper cells shows somewhat of their inside. The sugar making disks, smaller and flatter here, swim in a liquid. But the liquid is only the lining of the cell. All the interior is filled with sap, which holds the liquid against the wall.

If sugar making is a secret, ten times a secret is this liquid, which we never tire of watching, viewing it as though through the glass of an aquarium. It is in

constant motion, sometimes swirling by a mile a minute, sometimes busied with little whirlpools; now it is of the faintest green color, and now yellowish; here it is a thin, translucent jelly, and there is filled with fibers and rods, globes, and crystals. It is protoplasm. It is life. Whatever other wonders we see in a leaf are explainable to some degreeby the chemist, but man has not spoken the first syllable that shall help to interpret protoplasm. . . . . Here is a strange cell that contains, as if it were a show case in a museum, a glittering, spiked crystal five feet in diameter. Was it lugged up here from the roots or was it formed here as a waste product? Here are pipes several inches in diameter through which protoplasm pours from cell tocell. We are bewildered by the currents all about us: air circulating everywhere, free oxygen being driven out, carbon dioxide being drawn in, water pumped to every quarter, sugar carried out for transportation to the roots that need the food, sugar transformed to starch and back to sugar again. . . . . There are special cells to distil the waterproofing for the outside of the top; there are others that transform sugar to cellulose and build walls with it; there are the guard cells that regulate the intake and outgo at pores. A leaf compounds and transmits the most delicately adjusted kinds of carbo-hydrates and proteins, of oils and fats, and coloring-matters and alkaloids and

digestive fluids and acids and many products that are quite beyond detection".[1]

1. Ward, Henshaw, The Clover Leaf, Harpers, July 1925, page 139.

This extract is quoted as an example of clear description regarding the structure of bees.

"A bee needs so many tools in the day's work--such a variety of combs. brushes, pincers, shears, and what not--that her body is fairly covered with handy appliances. . . . . The leg of the bee-and I am not here forgetting that there are six of them--has a greater number of joints than has the leg of a human being. Midway between the knee and the joints of the foot there is another articulation, or knee, that is particularly interesting. In each of the three pairs of legs this knee is differently developed so as to furnish the bee with three sorts of very useful tools--pincers, crowbars, and comb.

On the first, or front, pair of legs, there is just below this joint a self-threading needle arrangement so equipped as to make a combination comb and scraper for keeping the antennae clean and in condition. It consists of a deep notch, constituting somewhat more than a half-circle, in the horny shell of the leg; and the open part of this notched is closed or bridged over, by means of a strong little piece of horny substance opening and closing by means of a hinge. The principle of this contrivance is, as I have said, that of a self threading needle--though it is more finely and mechanically made than most of man's contrivances. Its object is to allow the bee's antennae to be slipped into the notch when the

little bridge like piece is raised; and then to be held in place like a thread in the eye of a needle, as the little piece is dropped down and pressed into position. The interior of the notch is furnished with a comb, the fine long rounded teeth of which are set close together in a single row all around the half circle. The little horny piece which closes the opening does not carry any teeth, but has a sharpened edge. When the bee's feeler, or antenna, is slipped into the opening and drawn through, the little horny piece presses it down against the teeth. As a bee's feelers carry its 'smell hollows' and the finely, peculiarly designed hairs which serve somehow as a means of communication between bees, it is important that they be kept free from sticky substances and the accumulation of summer's dust. With these comb-and-scraper devices placed so conveniently on the front legs--one for each antenna to right and left--the bee can slip her feelers into these self-threading inventions alternately and so keep her means of communication in working order with a minimum of time and trouble.

Looking now at the middle pair of legs, and turning our attention to this same joint upon either one of them, we find a very different sort of arrangement. Sprouting out from beneath the hard shell of the leg, at the edge just above the joint, is a process or prong which I can describe best as being a diminutive elephant's tusk. It has the same curve, proportions, and general appearance of utility.

This is the bee's combination pick and crowbar; and she uses it particularly for loosening the close-packed pollen in her pollen basket-which she carries upon her hind pair of legs-and pushing it out in the cell in which it is to be stored.....

This brings us to the kind pair of legs of the bee, the longest, strongest, and most elaborate of the three pairs; and here we confine our attention to the pairs of knees which correspond to the ones we have been studying on the other two pairs of legs. The kind of legs behind of the bee differ from the others in the fact that they become much wider and spatulate toward their lower extremities, somewhat like a salior's trousers when well pressed. Rather they are like oars with broad generous blades. Of the three principal divisions of the leg, the upper are is round like the haft of the oar, and the next two are flattened so that each is like a black blade or paddle. The joint or knee we are considering unites these two broad, paddle-like sections of the leg. These are hinged together only at the one end or edge, the result being that when this particular knee is bent it opens a wide gaping mouth with sharp, serrated edges. This is the bee's combination shears and pincers. With these she seizes and disattaches the flattened wax which exudes from between the joints of her body, on the abdomen, and furnishes her with building material.....

The wax shears, as we have seen, are a develop-

ment of the joint itself; and now, for further interesting developments we must turn our attention to the board, paddle-like sections of the leg above and below this particular joint..... On the upper one is the pollen-basket. It is situated like a pocket, on the side of the leg away from the bee's body. On the lower one is the pollen reaping or gathering device; and this is on the side toward the bee's body. The pollen-basket is most frequently referred to as being on the bee's thigh or on her hip but this is far from being correct. It is on the tibia which is the section below the thigh; and the pollen-gathering device is on the section next below that..... A bee loads her left pollen-basket with her right leg, and her right with her left leg; and I dare say any one will see the difficulty in reaching a hip pocket by means of the opposite shin. Bees that carry their pollen in that position are poetical bees, not the work of a practical mechanics."

Stewart, C. D., The Bee's Knees, Atlantic Monthly, July 1925, Page 1

The extract quoted here is given to show the nature and the difficulty of reading matter appearing in the magazines regarding evolution.

....."Ages ago, perhaps five million or more years, the Primates began, in the process of evolution, to split into groups, separate and distinct, which developed into the progenitors of man, the modern ape, and the modern monkey.

In remote antiquity the Primate stem grew gradually away from the other orders of mammals. Various offshoots reached forth, tentative branches as it were. We know a few of the strange families of monkeys, extinct now for hundreds of thousands of years, that first resulted. These passed away, while the main stem, still groping its way, gave forth the first of the anthropoid apes. Gradually yet another stock was set apart and diverged, a humanoid stock consisting of what aptly might be termed experimental or tentative man.....

The human race as we see it today is a definite product of evolution, an ascendng evolution which established the predecessors of modern man as well as his immediate ancestors, but for at least a million years it was distinct and apart from the purely animal stock.

'Our ancestors or predecessors,' says Dr. Osborn, lived among the forests'. Undoubtly most of their time was spent on the ground. The trees, however, offered refuge from the storms and the danger, and the human

brain was quick to see such an advantage. This fact, together with the absence of any form of burial, amde fossil remains of the prehistorical man exceddingly rare. Upon death the humic acid of the forest leaves hastened decay of man's ancestors, while the skeltons of the ancestors of the horse, tapir, and the rhinoceros, living on the plains where the preserving elements had better play,are comparatively abundant.....

It is safe to assume that the action of glandular secretions in the humanoid stock, particularly the pituitary gland, was responsible for the rapid brain development and other structional changes the erect posture, shorter teeth, speech, and other characteristics that distinguish man from apes.

Knight, C. R., The Dawn of Man, McClures, March 1923
Page 19.

The subject matter contained in this extract is attractively set forth but is of questionable veracity.

"Crime is caused by a physical defect of the brain. This defect renders its victims so far below normal in emotion that he has little or no conscience, or so far above in emotion as to make him hysterically irresponsible. The latter, by reason of his will or eccentric behavior, is readily identified as crazy. But the emotionally subnormal man is very much more dangerous, both because he is so quiet that he is seldom suspected until after he has committed a crime, and because his type comprises nearly 100% of all criminals.

This discovery, that sub-normal emotional response is a genuine insanity and the cause of nearly all crime, is the tremendously important work of two men in Chicago. Their discovery has provided a rational and consistent explanation of every kind of crime, from petty larceny to murder. More striking still, it has made it possible to predict that certain specified people would commit certain specified crimes, and these predictions have come ~~tremendously~~ true..... In other words, there are all degrees of emotional response, just as there are all degrees of intelligence. But intelligence and emotion are function of two different pieces of physical mechanism, so that the same way of man may have a perfectly good machine to think with and a thoroughtly bad machine to feel with.....Suppose you were

in a class of elementary drawing and the instructor drew a square on the board and told you to copy it. Nothing could be more simple, and in a moment you would have a pretty fair copy of it on your piece of paper. And yet to perform that simple act required a series of operations much more complicated and much more wonderful than the performance of any machine devised by man, such as the radio or the telephone or the linotype or the automobile. What happened was this: The upper part of your mind (cortex) studied the drawing on the blackboard and observed certain things about it: (1) that the top and bottom lines were parallel, (2) that the side lines were parallel, (3) that all four lines were of the same length, (4) that the top and the bottom lines were horizontal, (5) that the side lines were perpendicular. The upper part of your mind having grasped all the essential facts, now signalled to the lower part of your mind, (the cerebellum), "I have now all of the imformation you need. Here it is."Then the lower part of your mind did several things. Being the seat of conscience it first weighted the question, "Shall I do as the instructor asked me to do, and copy that square? Is it right that I should copy it?" Having answered that question in all affirmative to the will the affectivity sets it off. Then it gave orders telegraphing them to the muscles by means of the nerves, that the muscles should in such a way as to grasp a pencil and trace on the paper, the design and the details

of which the upper mind had passed on to it.

Now every act of your daily like and life requires this marvelous and perfect cooperation of the intellect and the emotions, of the intellect and the affectivity and the will, and of the literally billions of responsive cells of the brain and the nerves and the muscles. That is to say, every conscience act requires this cooperation. Suppose you weresmoking it (a cigar) when the drawing instructor asked you to copy the square. The cigar was in your right hand when he asked you to do it. You have the bad habit of sticking the pencil in your mouth before using it. You werethinking that your cigar "drew" badly, and the the pencil was an unusually hard one, and that the drawing instructor was silly to ask a sensible person to draw a simple thing like a square and "Oh yes I'll draw it"and"ouch" your upper mind, flitting rapidly from one to another of four ides, telegraphed two of them similtaneously to the lower mind to lift the cigar (you had forgot it wasn't a pencil) to your lips to moisten it before you started drawing. Then you "came to" with a blistered tongue.

This sort of thing happens about two or three times a year to you. But suppose instead to occasionally "getting your wires crossed" you always had thom crossed? There are lots of people that way.

.....These are the only two functions of the lower mind (basal ganglia) that concern crime: the emotions, and the

will. All crime comes from a depot of the lower mind only, because all conscious acts require the exercise of the will, and all improper acts arise from improper emotions.....It is almost unbelievable that a grammar school graduate could look at this figure.

and then draw this:  and really believe he had copied what he saw, but it has been done independently by dozens of our young criminals in dead earnest. His thinking mind grasped the first figure perfectly, but his lower mind was defective, and grotesqnely misunderstood what the upper mind told it-and the muscles responded to their master, the lower mind, and drew the second figure.

Observe that the ~~forgiving and~~ forgoing ~~figure~~ drawing test is not a test of intelligence. It is a test of character.....There are many other tests of "affectivity."

Strother, French, The cause of Crime: Defective Brain, World's Work, July, 1924, Page 275.

The following extract is illustrative of an article that is compartively difficult to read.

"Other American cytologists then began to investigate numerous species of animals, and corroborated McClung's observations in wholesale fashion. In most insects, in many worms, and in all mammals studied, including man himself, the male was the sex determiner. Half the sperm-cells contained this sex chromosome, which became known as the X-chromosome, and half were without it. The egg-cells all contained it. When a sperm carrying an X chromosome fertilized an egg, a female was produced who had two X-chomosomes in her body-cells. When a sperm having no X-chromosome entered into fertilization an individual was formed with only an X chromosome of maternal origin in the body-cells, and this individual was a male.

In some instances the X chromosome was found to be an unpaired element which at the maturation of the germ-cells passed to one of the daughter cells undivided. Its behavior, therefore, could be studied easily. In other species the X had a mate, a Ychromosome; but even then the behavior of these particular elements during the formation of the germ-cells was different from that of the other chromosomes. As if conscious of the role they played, they hung back during cell division, joining their sister chromosomes at a later stage. The entrance and the exit of star performer

belonged to them, and they took them.

Here then are several great groups of organisms where the male controls the sex by virtue of producing two kinds of sperm. The female is a passive actor, for all eggs are alike. But nature showed no favoritism. She gave the female an opportunity to show her efficiency at this performance in moths, butterflies, and birds. There the sperms are all alike and the eggs are of two kinds. The determination of sex comes about in essentially the same old way.

If sex-control is a chromosome function similar in character to the chromosome control of other inherited traits, body qualities ought to be found that are transmitted by the particular chromosome which determines malesness and femaleness. Such a situation has been discovered, not once, but fifty or sixty times. In man, for instance, there are two recessive characters, a blood abnormality called hemophilia and color blindness, where the affliction is more common in males then in females, and where the heredity transmission is peculiar. They are not transmitted from father to son, nor do they appear in the son's descendants; yet the daughters of an affected man, though normal themselves, transmit the abnormality to half their sons.

This exceptional type of inheritance is understandable if the determiners of the traits are assumed to be located in the X chromosome, since the distribution of

the latter paralles their own distribution. When a color-blind man has children by a normal woman, the sons are normal because their X chromosomes come from the mother. The daughters are also normal because the normal X chromosome inherited from the mother dominates the defective X chromosome inherited from the father; but these daughters will have defective sons whenever these sons get their X chromosome heritage from a defective egg, because sons are dependent entirely on the mother for this part of their inheritance.....
.....There are at least fifty distressing dominant aborormalities of the skeleton, the skin, the eyes, and the nervous system. There are at least as many recessive conditions which are just as bad. What we need first and foremost is instruction for the physician as to what are the expectancies in the several cases. He ought to be able to say to the man with brachy-dactyly: Your children will have hands that are practically useless, no matter whom you marry. He ought to be able to say to the woman whose family indicates that she is carrying feeble-mindnesss: 'You are playing with fire if you marry a near relative or a man with a similar heritage.()... And he ought to be given the opportunity to say these things."

1. East, E. M., Heredity and Sex, Scribners, August, 1925-- page 144.

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