

Notwithstanding the large number of books that have already been published on evolution, the author of the above work believes that there is still a need for another which will present the subject, not as a theory that is on trial, but as an established principle in terms of which men must be taught to think. The popular tendency to regard evolution and Darwinism as synonymous terms is the result of the historical development of the theory largely on the basis of facts derived from organic nature, and its wider application as a philosophical principle has been thereby obscured. To correct this misconception the earlier chapters of the present work are devoted to an exposition of cosmic, geological and atomic evolution, this last leading to a brief and rather inadequate consideration of the origin of life, whence there is a natural transition to the discussion of organic evolution. Unfortunately, however, for the broader conception which the author seeks to emphasize, this last and more familiar side of the subject is given more than three times the amount of space granted inorganic evolution and this is all the more regrettable since the treatment of organic evolution does not compare altogether favorably with that to be found in other familiar works which naturally suggest themselves, especially since the illustrations are merely reproductions of well-known figures from Darwin, Wallace, Weismann and especially Romanes. Credit must be given, however, for a clear and concise statement of the various theories that have been advanced as an explanation for organic evolution, Darwinism and Neo-Darwinism, Lamarckism and Neo-Lamarckism, mutations, orthogenesis, entelechies, Bathmism and even the metaphysical subtleties of Bergson being briefly expounded and criticized.

The last hundred pages of the book are devoted to what the author terms superorganic evolution, under which heading are discussed mental, moral and social evolution, sufficient being said upon each of these topics to give the reader a fair idea of the trend of modern thought in connection with questions of the utmost importance to society.

The book is one that may be sincerely recommended. Like an earlier work by Dr. Herbert, "The First Principles of Heredity," it is the outcome of a series of lectures delivered to popular audiences, and, while clear and concise in statement, it is excellent reading. A well-selected bibliography is appended and also a glossary of unavoidable technical terms.

J. P. McM.

SPECIAL ARTICLES

ON FUNDAMENTAL METHODS OF ORIENTATION AND "IMAGINARY MAPS"

THE following paper presents a study of the reasons why civilized man is so apt to lose his bearings in unfamiliar regions. This question of orientation apparently has been neglected heretofore.

In an investigation of the "sense of direction" or the "sense of locality," it is important to classify the fundamental methods of orientation employed by living creatures. There appear to be two radically different methods; one used by civilized man, the other chiefly by living creatures of a lower order. The former, which employs the points of the compass, is acquired artificially by education. It is proposed to call this the *ego-centric method*. The latter is used not only by birds, beasts, fish, insects, etc., but also, in all probability, by young children and by a large proportion of mankind living in an uncivilized state. In this system of orientation the points of the compass play little, if any, part, and it may be designated as the *domi-centric method*. The selection of these terms by the author will be explained below.

The Ego-centric Method of Orientation.—Civilized man, by artificial training, has become accustomed to orient himself by the four points of the compass: north, east, south and west; and indeed wherever he may be, he usually finds his way by this method, except in the neighborhood of his dwelling place. In the immediate vicinity of the home the orientation nearly always relates to the home as a center of reference, irrespective of the points of the compass, and in this limited region the

method of orientation is largely domi-centric.

The orientation reference points in the *ego-centric method* are points on the horizon corresponding to the directions N., E., S. and W. Lines from these points always intersect at the ego, the intersection moving with the ego; hence the basis for the term given to this system of orientation.

pass as such, or of the extent of the world, know only the region which they have traversed. Thus it follows that from the time these creatures come into existence their movements, instead of being referred to points of the compass, relate to the place where they began their existence, and hence in early life their knowledge of space must necessarily be

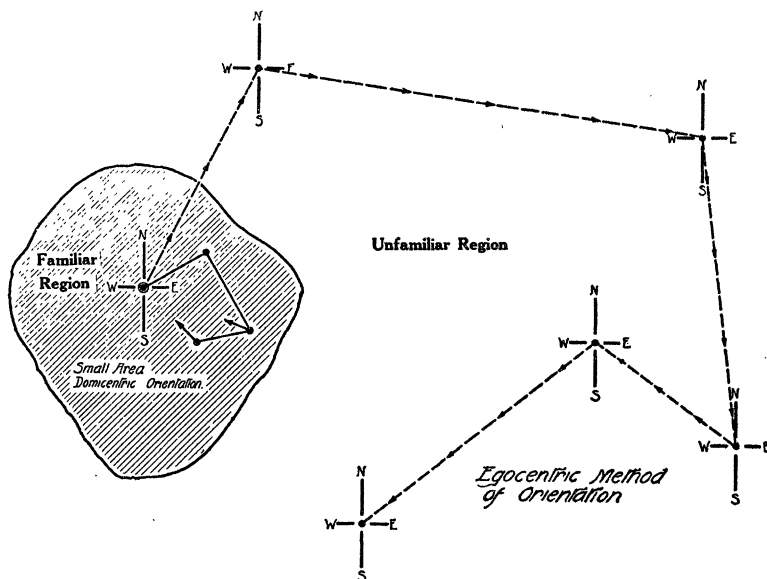


FIG. 1. Ego-centric Method of Orientation. In the unfamiliar region the reference points are objects or points on the horizon corresponding to the direction N., E., S. or W.

It is, of course, well known that when a man is wandering through any maze-like region, such as a primeval forest, the compass gives the direction from the man toward the north, or more strictly, the north magnetic pole, and to all other parts of the compass, but not the direction to the man's starting point; thus the ego-centric method is not a system *per se* which will direct the individual to his home. This system of orientation, therefore, (a) leads man to think of space in relation to the cardinal points of the compass; (b) it can be used to direct an individual home only when the path which he has passed over is known. The method is illustrated by Fig. 1.

The Domicentric Method of Orientation.—All living creatures, other than civilized man, having no knowledge of the points of the com-

related to the place of birth. This system of orientation, centering at the home and irrespective of the points of compass, has been called the *domicentric method*, and is illustrated by Fig. 2. The Esquimaux, Indians, etc., evidently have a method of orientation which is not definitely in any one class, but is rather a combination of the two methods already mentioned.

If the home of any animal is changed for a considerable period of time to a region away from its former habitation, thenceforth all movements will be referred to the last principal reference point, or home. In this case the *domicenter* has changed.

It is well here to emphasize the entirely different mental concept of civilized human beings, on the one hand, and of other living

creatures, on the other, relating to space on the earth's surface. The former look outward towards the horizon, the latter look backward toward their starting point. To the first no opportunity is offered for expertness through experience, to the second is given an opportunity for a reflex mechanism. In the ego-centric method, it is as if the man were attached to the four cardinal points of the compass by elastic threads of indefinite lengths, which present no basis whatever (lines or angles) for a trigonometric figure that relates to the home.

responsible at times for man's confusion when attempting to find his way, as will be shown. In the other, the domi-centric system of orientation, experience continually leads an animal to greater expertness in finding its way home, and the conditions are present for a reflex mechanism.

The Imaginary Orientation Map.—There is a feature of the *ego-centric method* of orientation which seems to show that the use of this system leads to loss of bearings. It is found that either through loose early education or through later impressions persons

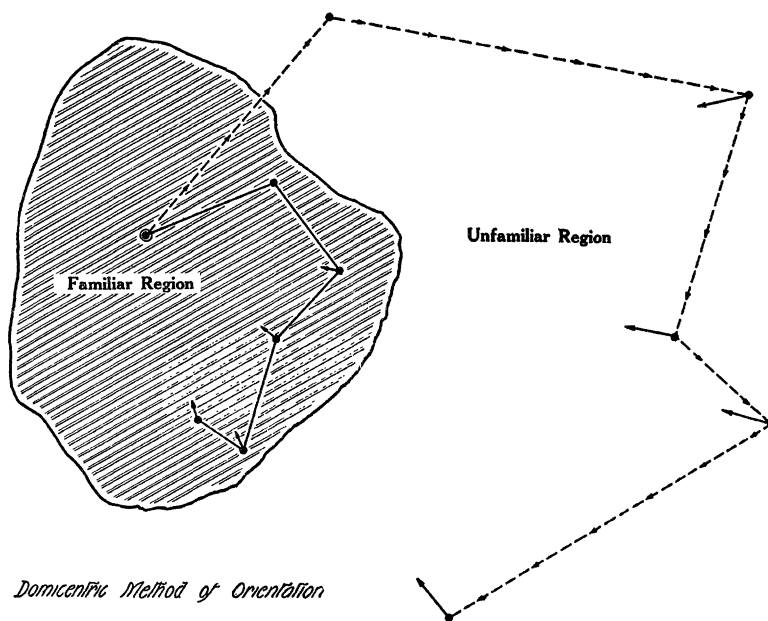


FIG. 2. Domicentric Method of Orientation. The chief reference point is always the starting point, or home. Around about are usually many minor reference points; familiar objects which give a definite reaction relating to the home.

In the case of insects, birds, mammals, etc., which orient themselves domi-centrally, it is as if the living creature were attached to its home by one very strong elastic thread of definite length. Hence, in this case, all changes of position of the creatures can be referred at any moment, to definite distances and angles, forming a simple trigonometric figure which gives the direction to the home.

In the two types of orientation methods, the use of one, the ego-centric system, actually is

are apt to acquire erroneous ideas of the directions *toward very distant places of the earth*, frequently becoming gradually accustomed to think of the points of the compass which correspond to these distant places with a large error of direction, amounting in some cases to as much as 180° , or diametrically opposite to the correct location. This leads to the conception of a mental image of an orientation map that is entirely imaginary, and erroneous. This imaginary orientation map appears to be

similar to, if not actually connected with, punctuation, the visualization process. It will be found by questioning various individuals, that the orientation of many persons for very far distant points, as they usually think of these places, is in error to the extent of 30° , 90° or even 180° (or half circle). Fig. 3 is a diagram drawn to illustrate what is meant by an "imaginary map." In this figure the solid lines represent the map as it actually is. The dotted lines represent the map as the subject is accustomed to think of it. An important fact in this connection has been found, namely, that those individuals who have "imaginary

been attempted. A few of the more common types will be given which will help to emphasize the fact that this so-called imaginary map which accompanies the "ego-centric" or cardinal point method of orientation unquestionably contributes to the difficulty that man experiences in finding his way home in an unfamiliar region.

Various Types of Imaginary Maps.—The common types are described below. A complete classification would be difficult since the types must grade into one another, but most of those mentioned appear to be common forms.

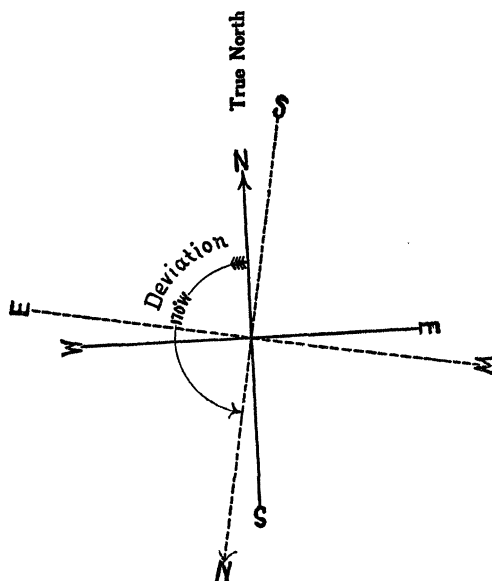


FIG. 3. Diagram to Explain the Imaginary Orientation Map. The solid lines indicate the points of the compass, and is the map which the subject knows to be correct. The dotted lines indicate the map as the subject is accustomed to think of it when far distant places are casually thought of.

maps," are readily confused in regard to locality, are apt to become lost in the forests, and usually are subject to confusion as to direction when emerging from theaters, subways, etc. On the other hand, those individuals who through careful early education or from travel are accustomed to *think* of far distant places in the proper directions, are much less apt to be confused in regard to locality. This is readily evident from the accompanying statistics. An extensive analysis of the precise forms of the erroneous conceptions with respect to the direction toward distant places has not

The types will be classed as individuals.

Type A.—Those persons who have an "imaginary map" of fairly consistent "deviation" from the correct direction for the entire circuit of the compass. (A common type.) The "deviation" refers to very distant places, and in this class amounts to from 20° to 180° . It is the angle between the true directions of distant places and the directions that the subject casually thinks these places lie in.

Type B.—Those who have different "imaginary maps" in different localities. The following example of an actual case will illustrate

this type, which should include different parts of a large city as well as different localities in the country.

The map of E. F. H. represents a noteworthy case of Type *B*, but probably not uncommon. His average deviation (for distant places) at 116th Street in the City of New York is 156° west, the average variation of the mean of one set of observations of four distant places being only 5° . At 42d Street in the same city, his imaginary map is about 90° wrong, that is, the deviation is 90° , and at 14th Street the imaginary map disappears. Likewise his orientation is 90° wrong at Toronto, Canada, correct at Chicago, and nearly correct in country districts away from cities. Mr. E. F. H. is almost always confused as to the direction toward his home when coming out of theaters and often when coming out of subways.

Type C.—Those who imagine north as directly in front of them. Thus the deviation of the imaginary map is determined entirely by the direction in which they may be facing, the east being at the right hand, the west left hand. The imaginary map is consistent, that is, all places have nearly the correct relation to the north, and turns with the subject. (Common type.)

Type D.—Those to whom *all distant points* lie either toward the west or toward the east. For example *both* Madrid and San Francisco appear to lie to the west from an individual of this class residing in New York City. (Two well-defined cases.)

Type E.—Those who think of far distant points in approximately the correct direction, but to whom distant countries appear rotated. For example, to one individual while England appears in approximately the correct direction from New York, the entire British Islands are rotated about 180° ; both the English Channel and France appearing to lie to the north of the British Isles. (One case.)

Type F.—Those who have an imaginary map that differs consistently about 20–40 degrees from the correct one, apparently due to the influence of the direction of certain rivers and streets which for one reason and another have had a marked orientation influ-

ence on the subject. (Several cases.) It is possible that this is the same as type *A*, yet the cause of the confusion appears to be different.

Type G.—Those having an imaginary map that always makes certain streets in every city exactly north and south, others exactly east and west, with all diagonal streets 45° , as if lying northeast and southwest, or northwest and southeast. (Several cases.)

Another type is that of a person who has had an imaginary map, but who has gradually overcome it by education. In one case the subject had an imaginary map for four years while at college. At the present time in various cities, he is usually confused when coming out of theaters, etc., and it is possible that the former imaginary map is still latent and is frequently a source of confusion. There are other features of imaginary maps that do not so directly bear on the question of orientation. For example, there is one individual who always thinks of, or visualizes Europe as if it were but 20 to 40 miles off the Atlantic coast. Then, of course, the majority of people think of distant places as points on a plane, no allowance being made for the curvature of the earth.

Explanation and Importance of Imaginary Maps.—All of the above types, *A–G*, are taken from actual cases, the subjects being as a rule of very high type of intellectuality, university professors, graduate students, etc. The explanation which seems to be the most plausible one to account for this so-called “imaginary map,” is the persistence of early erroneous impressions concerning the direction of far distant places with respect to the home, the mistaken ideas arising from various causes. These impressions apparently take a firm hold during childhood. The matter is of some importance, since it accounts in a measure for the readiness of man to be confused with respect to a new environment, and to become “lost” in the woods or in any maze-like surrounding. An example of a practical bearing is as follows: The matter has a pertinent relation to the training of children who are to become soldiers, especially in countries where standing armies are maintained. In times of war, it is not im-

probable that the loss of more than one battle has been due to the utter confusion of officers or of small bodies of troops with respect to points of compass, due to the concentration of attention on the enemy in the height of action or during maneuvers at night.

geography, with the cardinal points of the compass marked in the room, and the maps in the books properly orientated, and the imaginary maps systematically corrected in childhood.

The proportion of people who have so-called "imaginary maps" is astonishingly large,

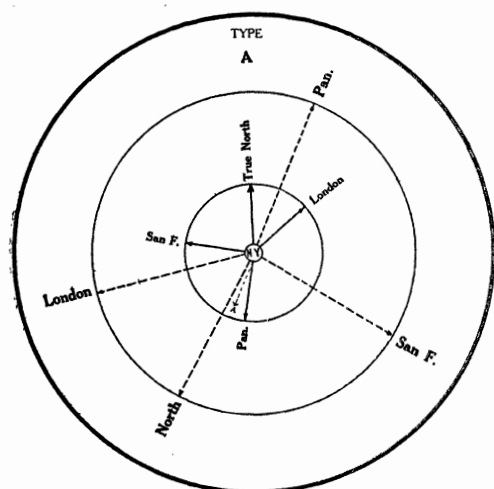


FIG. 4. Type A. Imaginary Map. The amount of deviation is the same amount under all conditions, and in all places.

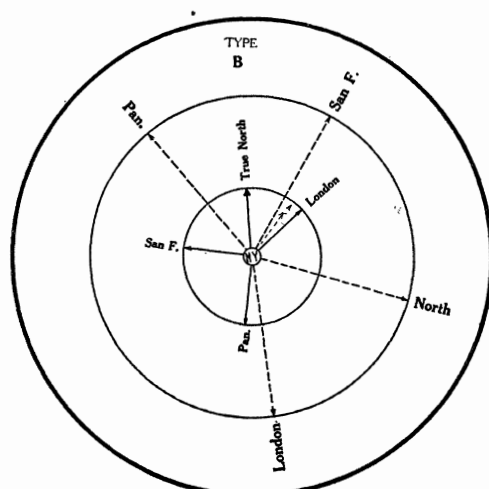


FIG. 5. Type B. Imaginary Map. The amount of deviation may vary with the place in which the subject happens to be.

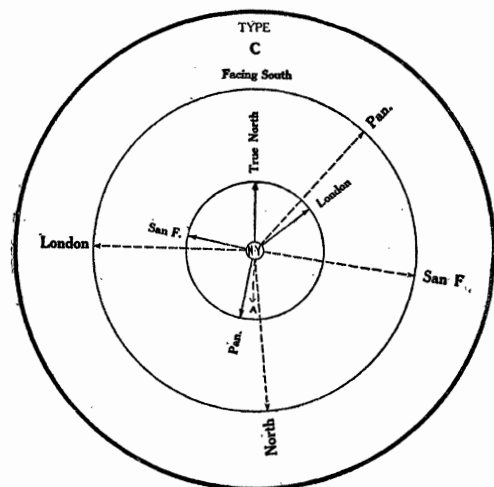


FIG. 6. Type C. Imaginary Map. The map depends on which way the subject is facing.

If it is desirable to correct this very common defect in orientation training, it would appear necessary that children should be seated at school in a special manner when studying

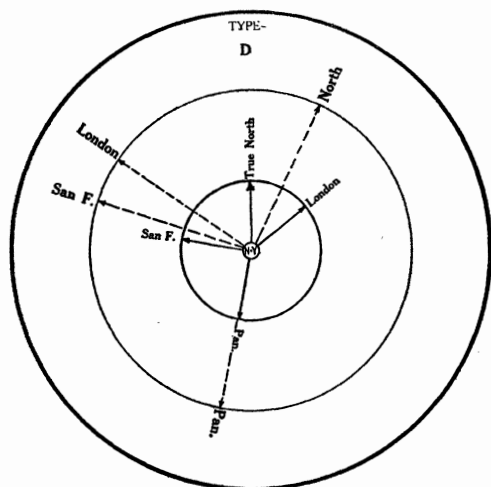


FIG. 7. Type D. Imaginary Map. All distant places appear to be west (or east) of north.

being of the order of thirty to fifty per cent., if not a much higher ratio; hence the matter is one of general interest.

The object of the presentation of these facts

is to show that children of civilized parents, through accidental faults in early education arising from the faculty of vivid imagination, and owing to the misuse of the "ego-centric" or cardinal point method of orientation, build up persistent impressions quite erroneous, which later on in life unconsciously affect their judgment when attempting to find their way in unfamiliar regions and lead to utter confusion with respect to the way home. Examples of this effect are common.

In the tests made by the author it is interesting to note that almost every subject who had an "imaginary map" for far distant places, gave the direction from New York towards Albany, N. Y., nearly correct. Albany is about 90 miles from New York. This indicates that the education gradually fixes in thought the correct direction toward places, finally overshadowing the influence of the "imaginary map." The position of the Hudson River with respect to New York probably is an important factor in correctly fixing this particular direction.

It must be distinctly understood that the directions in "imaginary maps" are not as the subject knows the directions to be, but merely where they always imagine them as being in the ordinary process of thinking, and *in all cases referred to in the present discussion the subject having an imaginary map, knew the correct directions approximately.* The "imaginary map" is thus superimposed on the real map, or it may be said that the subject has two maps; one approximately correct, the other entirely imaginary.

Statistical Data.—Some statistics are given in Tables I. to V. The subjects on whose orientation data the tables are based were all persons of university training. Table I. contains ten cases of imaginary maps as determined by the directions towards four far distant places. Four of these maps are given diagrammatically in Figs. 4, 5, 6 and 7, representing different types which have been classified as A, B, C and D, respectively. In Table II. is given the mean error and average variation of the observations recorded in Table I.

Table III. contains ten cases of subjects

having no imaginary maps and includes the angular deviation from the correct directions. It is seen that there may be very large errors in some cases in locating the direction towards the places selected for the test. All the subjects in Table III. had but one orientation map, however, while those in Table I. have two.

In Table IV. the mean error and average variation of the observations in Table III. are given in a manner similar to Table II.

It seemed desirable to select at random ten subjects not having imaginary maps, and then to determine their orientation accuracy in each case by asking them to locate the directions towards the cardinal points of the compass. This was done, and it was found that astonishingly large errors were recorded in a few cases, as shown in Table V. The average error was 30° , and the mean of these errors with respect to north was 22.6° clockwise (eastward). All but two showed a decided clockwise error, which was accounted for by reason of the prevailing idea that the chief avenues in New York lie approximately north and south. Actually they lie 29° degrees (clockwise) from the meridian, that is, the azimuth of the longitudinal streets of Manhattan is N. 29° E.

In the tables the record in degrees given was based on but one observation. By a special test it was found that the deviation readings always varied a few degrees; some considerably more; therefore, the readings given in the tables should be understood to indicate the approximate deviation angle only.

In a few cases errors were made due to magnetic disturbances of the compass when checking up the charts, but these have no significance in the article, therefore, they are at present disregarded.

The method of obtaining the data relating to "imaginary maps" was as follows: A circular piece of paper was placed before a subject, who was requested to mark on the disk the directions from the center of the disk, New York, N. Y., to the North Pole, London, San Francisco and Panama, as these places appeared to him. The magnetic north was then

TABLE I
Deviation of Subjects Having Imaginary Maps

Name	Place Located	Deviation from Correct Location	Type
J. C. H. ¹ .	North Pole London Panama San Francisco	154° counter-clockwise 70° counter-clockwise 86° counter-clockwise 31° counter-clockwise	A
J. M. ¹	North Pole London Panama San Francisco	110° clockwise 126° clockwise 134° clockwise 111° clockwise	A
C. G. S. ² .	North Pole London Panama San Francisco	42° clockwise 82° clockwise 29° clockwise 21° clockwise	A
C. C. T. ¹ .	North Pole London Panama San Francisco	138° counter-clockwise 126° counter-clockwise 134° counter-clockwise 150° counter-clockwise	A
R. C. ¹	North Pole London Panama San Francisco	117° clockwise 156° clockwise 121° clockwise 107° clockwise	A
B. R. R. ¹ .	North Pole London Panama San Francisco	79° clockwise 117° clockwise 108° clockwise 78° clockwise	A
E. F. H. ¹ .	North Pole London Panama San Francisco	149° counter-clockwise 153° counter-clockwise 165° counter-clockwise 157° counter-clockwise	B
W. A. H. ¹ .	North Pole London Panama San Francisco	175° clockwise 139° counter-clockwise 149° counter-clockwise 177° clockwise	C
P. C. ¹	North Pole London Panama San Francisco	49° counter-clockwise 11° clockwise 93° counter-clockwise 124° counter-clockwise	C
J. D. ¹	North Pole London Panama San Francisco	26° clockwise 106° counter-clockwise 1° clockwise 8° clockwise	D
R. R. ¹	North Pole London Panama San Francisco	21° clockwise 151° clockwise 60° clockwise 26° clockwise	H (perhaps type D)

obtained by a compass and marked on the disk. The true north was ascertained later.

The correct direction from New York, N. Y., to the distant points above mentioned was obtained from one of the staff of the American Geographical Society who made the necessary calculations. They were as follows:

North Pole 0° 0'
 London 51° 10' (51° 10' east of north).
 Panama 190° 20' (10° 20' west of south).
 San Francisco ... 281° 25' (78° 35' west of north).
 Albany, N. Y. ... 4° 59' (4° 59' east of north).

The percentage of individuals having the so-called imaginary map can only be decided by extensive data on the subject, but in order to learn the approximate ratio in a certain class, twenty-seven persons, taken at random, were questioned. The results were as follows:

Total number of persons (males) consulted.... 27
 Those having "imaginary maps"..... 16
 Those having no "imaginary maps"..... 8
 Cases that were uncertain..... 3

Of the 16 having "imaginary maps" 14 were more or less confused when coming out of theaters, subways, etc.

Of the 8 having no "imaginary maps," 7 were not confused when coming from theater and had in general a good "sense of direction." (These ratios are similar to those in Tables I. and III.).

According to these figures, the number of persons in 27 having "imaginary maps" was about 59 per cent. These statistics are far too few on which to base any general conclusions other than the prevalence and importance of this curious so-called "imaginary map."

Certain physiological effects connected with this matter are of interest; Yves Delage has touched upon the subject in his "Essay on the Constitution of Ideas." He states that when he is "turned around" or confused in regard to direction, he feels a sensation of illness at the moment of rectification of his notions.

¹ Subject is confused as to directions on coming out of theaters and subways.

² Subject is not usually confused as to directions on coming out of theaters and subways.

Henri de Varigny in the "Revue des Sciences" of the *Journal des Débats* (Paris, April 17, 1913), discussing the above essay, states that under the same circumstances he has an impression like a slight vertigo, the feeling being localized clearly at the base of the skull.

The work in this investigation has been aided by a grant by the New York Academy of Sciences from the Esther Herman Fund.

TABLE II

Average Error and Variation in the Case of those Subjects Having Imaginary Maps

Name	Mean Error of Four Places Located	Average Variation from Mean	Type
J. C. H., Jr.	85° counter-clockwise	35°	A
J. M.	120° clockwise	10°	A
C. G. S.	44° clockwise	20°	A
C. C. T.	137° counter-clockwise	7°	A
R. C., Jr.	125° clockwise	15°	A
B. R. R.	96° clockwise	17°	A
E. F. H.	156° counter-clockwise	5°	B
W. A. H.	160° ³	16°	C
P. C.	69° ³	39°	C
J. D.	35° ³	35°	D
R. R.	64° clockwise	43°	H

Column 2 gives the average angle between the true directions of distant places and the directions in which the subject thinks these places lie.

Column 3 indicates the inconstancy of this angular displacement or deviation.

TABLE III

Deviation of Subjects who have No Imaginary Maps

Name	Place Located	Deviation from Correct Location
H. C.	North Pole	? (chart confused).
	London	5° clockwise.
	Panama	11° clockwise.
	San Francisco	23° counter-clockwise.
E. L. K. ⁴ ..	North Pole	0°
	London	21° clockwise.
	Panama	10° counter-clockwise.
	San Francisco	20° counter-clockwise.
J. H. M. ⁴ ..	North Pole	6° clockwise.
	London	31° clockwise.
	Panama	18° counter-clockwise.
	San Francisco	16° counter-clockwise.

³ Some errors clockwise, others counter-clockwise. See Table I.

E. F. K. ⁴ ..	North Pole	14° clockwise.
	London	43° clockwise.
	Panama	4° counter-clockwise.
	San Francisco	14° clockwise.
W. H. G. ⁵ ..	North Pole	14° clockwise.
	London	41° clockwise.
	Panama	6° counter-clockwise.
	San Francisco	14° clockwise.
H. W. W. ⁴ ..	North Pole	28° clockwise.
	London	32° clockwise.
	Panama	26° clockwise.
	San Francisco	18° clockwise.
H. M. R. ⁴ ..	North Pole	8° counter-clockwise.
	London	4° clockwise.
	Panama	36° counter-clockwise.
	San Francisco	31° counter-clockwise.
F. B. ⁵	North Pole	8° clockwise.
	London	17° clockwise.
	Panama	4° clockwise.
	San Francisco	14° counter-clockwise.
W. A. D. ⁴ ..	North Pole	34° clockwise.
	London	48° clockwise.
	Panama	2° counter-clockwise.
	San Francisco	16° clockwise.
J. C. G. ⁴ ..	North Pole	4° counter-clockwise.
	London	8° clockwise.
	Panama	13° counter-clockwise.
	San Francisco	20° counter-clockwise.

TABLE IV

Average Error and Variation in the Case of Those Subjects Having No Imaginary Maps

Name	Mean Error of Four Places Located	Average Variation from Mean
H. C.	13° ⁶	7°
E. I. K.	13° ⁶	8°
J. H. M.	18° ⁶	7°
E. F. K.	19° ⁶	12°
W. H. G.	19° ⁶	11°
H. W. W.	26° clockwise	4°
H. M. R.	20° ⁶	14°
F. B.	11° ⁶	5°
W. A. D.	25° ⁶	16°
J. C. G.	11° ⁶	5°

⁴ Subject is not usually confused as to directions on coming out of theaters and subways.

⁵ Subject is confused as to directions on coming out of theaters and subways.

⁶ Some errors clockwise, others counter-clockwise. See Table III.

TABLE V
*Errors in Locating the Cardinal Points of the
 Compass in the Case of Subjects Having
 No Imaginary Maps*

Name	Direction	Deviation from Correct Direction	Mean Deviation or Error
W. S. N.....	North	5° clockwise	24°
	East	37° clockwise	
	South	34° clockwise	
	West	18° clockwise	
R. M.....	North	31° counter-clockwise	31°
	East	34° counter-clockwise	
	South	29° counter-clockwise	
	West	31° counter-clockwise	
F. N. C.....	North	8° counter-clockwise	7°
	East	8° counter-clockwise	
	South	7° counter-clockwise	
	West	3° counter-clockwise	
W. A. D.....	North	34° clockwise	1°
	East	34° clockwise	
	South	31° clockwise	
	West	25° clockwise	
A. C. M.....	North	25° clockwise	22°
	East	19° clockwise	
	South	22° clockwise	
	West	23° clockwise	
T. E. H.....	North	12° clockwise	15°
	East	5° clockwise	
	South	19° clockwise	
	West	22° clockwise	
H. F. J.....	North	19° clockwise	22°
	East	24° clockwise	
	South	20° clockwise	
	West	25° clockwise	
G. F. W.....	North	79° clockwise	85°
	East	84° clockwise	
	South	88° clockwise	
	West	88° clockwise	
J. M. G.....	North	52° clockwise	56°
	East	57° clockwise	
	South	59° clockwise	
	West	57° clockwise	
W. W. R.....	North	11° clockwise	9°
	East	14° clockwise	
	South	2° clockwise	
	West	10° clockwise	

C. C. TROWBRIDGE

COLUMBIA UNIVERSITY

THE CONVOCATION WEEK MEETING OF
 SCIENTIFIC SOCIETIES

THE American Association for the Advancement of Science and the national scientific

societies named below will meet at Atlanta, Ga., during convocation week, beginning on December 29, 1913.

American Association for the Advancement of Science.—President, Professor Edmund B. Wilson, Columbia University; retiring president, Professor Edward C. Pickering, Harvard College Observatory; permanent secretary, Dr. L. O. Howard, Smithsonian Institution, Washington, D. C.; general secretary, Professor Harry W. Springsteen, Western Reserve University, Cleveland, Ohio; secretary of the council, Professor William A. Worsham, Jr., State College of Agriculture, Athens, Ga.

Section A—Mathematics and Astronomy.—Vice-president, Dr. Frank Schlesinger, Allegheny Observatory; secretary, Professor Forest R. Moulton, University of Chicago, Chicago, Ill.

Section B—Physics.—Vice-president, Professor Alfred D. Cole, Ohio State University; secretary, Dr. W. J. Humphreys, Mount Weather, Va.

Section C—Chemistry.—Vice-president, Dr. Carl L. Alsberg, Bureau of Chemistry; secretary, Dr. John Johnston, Geophysical Laboratory, Washington, D. C.

Section D—Mechanical Science and Engineering.—Vice-president, Dr. O. P. Hood, U. S. Bureau of Mines; secretary, Professor Arthur H. Blanchard, Columbia University, New York City.

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