RAPID COMPREHENSION THROUGH EFFECTIVE READING

SPEED LEARNING

2

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BOOK 2

RAPID COMPREHENSION THROUGH EFFECTIVE READING

by

RUSSELL G. STAUFFER, Ph.D.
Director Reading Study Center
University of Delaware

and

JEAN HORTON BERG, B.S., M.A.

Published by:

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Mount Laurel Plaza, 113 Gaither Drive, Mount Laurel, N.J. 08054

Nothing in this material should be construed to indicate a discrimination because of race, color, religion, sex, age, or national origin. Personal pronouns are used to improve readability and are in no way intended to discriminate against persons of either sex.

Several articles have information that is dated. Your purpose in completing each exercise is to practice developing reading skills. Do not be distracted by the information included in the reading material. Dated information sometimes gives an added dimension to the reading-thinking process.

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PART I

SCAN-TYPE READING

2nd Level of Comprehension — Interpretation of Meanings

Now you are ready to learn another new skill in efficient reading . . . **Scan-Type** reading. Let's define **Scan-Type** reading.

> **Scan-Type** reading is a quick, orderly search for the author's statements, that will meaningfully answer your purpose questions **How?** and **Why?**

Efficient *scanning* requires accurate identification of the author's statements of why or how something happened. You **Skim** the article looking for key words that are part of your purpose question in order to recognize a sequence of events, or a series of enumerated points, or the general order of ideas. *Scanning* requires a search for reasons that will produce more detail and be more qualifying than just the facts that answer **Skim-Type** questions.

Even though you are going rapidly through an article on a point by point basis you still must *think.* All reading requires thinking and your reasoning is guided by your *purpose. Scanning* simply represents a type of reading-thinking ability pegged at a level of comprehension which is less demanding than **study-type**, yet more demanding than **skim-type** reading.

Scan-Type reading is *slower* reading than *skimming.* When you scan, you are reading for specific information scattered throughout a selection. Your *purpose* in reading is to select specific answers to your questions. You are looking for a definite order of information. This requires discrimination and interpretation. You must be able to quickly choose the facts that will answer your *purpose*-setting questions.

Scan-Type reading can be called the 2nd level of comprehension — interpretive meanings. **Skim-Type** reading was the 1st level of comprehension — literal meanings. Now in **Scan-Type** reading we must interpret statements (ideas) that can create relationships between facts, time sequences, generalizations, definitions, values, etc. These interpretations of the author's statements (ideas) can also compare relationships or imply relationships.

You may need to identify cause and effect relationships or related categories of ideas that have common characteristics. Depending on your *purpose* question, you may want to identify a reason then find other examples of that same reason. Also, drawing conclusions from relationships and information learned by reading graphs, charts or tables of statistics, may be the results of your **Scan-Type** reading.

Now do the **Scan** exercise on the next page. Use our question as your purpose for **Scan** reading the article. Then *speculate* on the answer to the purpose question. **Scan** read for the correct answer and then write your answer in the space provided at the end of the article.

Our question: How do long range factors affect commodity prices?

Our speculation: a. They force prices up.

Our speculation: b. They force prices down.

Your speculation: c. . . . .

COMMODITY PRICE MOVEMENTS

Factors that effect price are both long and short range. Consider the long-range first. The price of any single commodity is bound to be influenced by the general level of all commodity prices. There are periods of gradual rises and periods of slowly, sinking prices. From 1866 to 1893 commodity prices were in a slow decline. From 1893 until World War I there was an advancing level. Commodity prices prior to World War II were relatively low. After World War II there was a rise. In 1953 another descending trend began.

We must be aware of the price trend of all commodities in order to study one or two. A number of indices register prices – the Bureau of Labor Statistics, Dow-Jones and an index by the Commodity Research Bureau of commodities traded on futures exchanges. Using the proper index gives the correct picture of what is happening in various groups of commodities.

Another long range factor is the value of money. Any change naturally affects commodity price levels. As money declines in value, commodity prices tend to rise; more money has to be used to make a purchase because the intrinsic value of the commodity itself has not changed. People have "hedged" by exchanging their money for something with more stability.

A change in a foreign exchange rate may cause the volume of exports or imports to vary.

Population increase is a factor – the greater demand for goods bolsters prices.

Government price activity has tremendous long-range effects. We have had farm price support programs of some sort since the 1930's.

Then there is diminishing cost of production. Changes take place – new methods of transporting, new agricultural techniques – tending to reduce the price of the final produce.

This briefly covers some long-range factors affecting commodity prices.

But most daily activity at the Chicago Board of Trade concerns itself with short range factors. For instance, the short term trader will be very concerned about weather, insect damage, and so on, that might affect the supply of a crop being traded right now. Price rises when the crop is small, but this would only last until a normal crop is produced or to the point that another commodity can be economically substituted for the one in short supply.

Reprinted from "MARKETING GRAIN", Chicago Board of Trade.

Answer: . . . .

. . . .

. . . .

Proceed with this article, scanning and answering questions just as you did in the last article. Don't read the article until you have studied the questions and speculated on the answers.

Our question: 1. Why did the house fall?

Your speculation: . . . .

Our question: 2. Why was J. P. Morgan called the King of Credit?

Your speculation: . . . .

The Fall of the House of Morgan

A BLACK, torpedo-shaped cigar belches smoke from beneath an awesome red nose, and two belligerent eyes glare fiercely across the stretch of years. It is John Pierpont (Jupiter Pluvius) Morgan. J.P. Morgan did more to shape the course of American industry since the turn of the century than any other man. Yet, paradoxically, his firm itself has just about dropped from sight, surviving only as the "Morgan" in Morgan Guaranty Trust Co. and in Morgan, Stanley & Co.

A company is fundamentally an idea. But the idea needs money for its potential to become actual. More often than not, the hand turning the faucet of American equity capital during the formative period of today's great corporations belonged to J.P. Morgan. Among the great Morgan-financed companies: AT&T, General Electric, International Harvester, Kennecott, the New York Central Railroad, the New Haven, the Northern Pacific, Pullman, the Southern Railway, U.S. Steel, Western Union and Westinghouse Electric.

Morgan The Terrible, *whose fierce gaze was compared to the headlight of the Cannonball Express bearing down upon you, was the undisputed captain of capital.*

King of Credit

The nation became concerned that one man controlled its pocketbook. In 1912-13, Representative Arsene Pujo attacked the so-called "money trust" of Wall Street. Pujo showed that there were six key dispensers of credit in the country: J.P. Morgan & Co.; the First National Bank of New York; the National City Bank of New York; Kidder, Peabody & Co.; Lee Higginson & Co. and Kuhn, Loeb & Co. Morgan was by far the most powerful of the six, even though it was only the twelfth-largest investment banking house.

The Pujo investigation further showed that Morgan and his partners had deposits totaling $162 million; that Morgan had a powerful voice in banks with resources of $723 million; that he himself owned 51% of the $500-million Equitable Life Assurance Society; and that—in sum—he could put his hands on about $1.4 billion worth of liquid assets at a moment's notice.

In terms of influence, Morgan's power looked even more awesome. He and his partners held 72 directorships and controlled both the Banker's Trust and the Guaranty Trust. When linked with his traditional allies, the First National Bank and the National City Bank, the number of directorships influenced by J.P. Morgan jumped to 341. On top of this huge pyramid of power sat great "Jupiter Pluvius" himself, with an estimated 25% controlling interest in J.P. Morgan & Co.

The first curb on Morgan's powers came in 1902. As he sat at dinner one night he was informed that the Attorney General was preparing to file an antitrust suit against Morgan's Northern Securities Co. Deeply concerned, Morgan quickly journeyed down to Washington to protest that President Roosevelt could have given him advance warning. "Send your man to my man and they can fix it up," said Morgan, suggesting that the Attorney General of the U.S. meet with the attorney of J.P. Morgan & Co. After Morgan had departed, Roosevelt turned to the Attorney General and observed wrily: "Mr. Morgan could not help regarding me as a big rival operator." Two years later, Northern Securities was broken up.

Morgan had but to speak and millions of dollars flowed his way. In the middle of the 1907 panic, Morgan telephoned Charles A. Coffin, head of General Electric. "How much money have you got?" Morgan asked. Coffin proudly assured Morgan that General Electric could weather the storm with little difficulty. "How much?" Morgan repeated. "Fifteen million in cash," came the reply. "Send half of it over at once," Morgan growled and hung up. It was the beginning of the great capital pool that supported the market in 1907.

But today the great House of Morgan is only a pale shadow of what it once was in terms of power and influence. Split in two by the Glass-Steagall Act of 1933, which forbade all banks with Federal Reserve affiliation to be closely affiliated with brokerage houses, it is now a commercial bank, the Morgan Guaranty Trust Co., and a conservative investment house, Morgan, Stanley & Co.

In many ways, the imperious J.P. Morgan sowed the seeds of his own destruction, just as many a corporate chief executive has done. His successful financings were largely the result of combination, usually through horizontal integration. They were not particularly creative. Rarely did they back a technological advance in its infancy. Morgan's impulse was to regiment what already existed rather than to create new businesses. Once Morgan backed Thomas A. Edison's electric light experiments, but soon broke with Edison. Morgan was convinced that the idea had only limited appeal to corporations and a wealthy few; he refused to back Edison with any more funds and even made him pay for the use of his own patent.

Morgan also stubbed his august toes on various projects because his one thought, horizontal integration, was not the universal panacea he thought it was. Ill-fated International Mercantile Marine venture was a case in point.

It might also be said of Morgan that he failed to develop management that would be able to take over when he died. His son John Pierpont Jr. (Jack), who took over as titular head of the firm when Morgan died in 1913, was ill-prepared for the task. A product of St. Paul's and Harvard, Jack lived the life of an upperclass Englishman until the age of 40. Trained in the English branch of the firm, he was shy and self-effacing and neither able nor inclined to be the leader his father had been. Able Thomas W. Lamont and Henry P. Davison made the key decisions.

But the Pujo Committee was just the beginning of the problems the House of Morgan had to face. With the first Democratic administration in 20 years installed in 1913, the world became vastly more complicated. First there was the 16th Amendment giving Congress the power to tax income; then the Physical Valuation Act, which led to railroad rate control; then the Federal Reserve Act; then the Federal Trade Commission Act, which gave the FTC the right to demand reports from corporations; and finally there was the Clayton Antitrust Act.

Instead of trying to come up with a new approach to backing corporations, the Morgan firm turned more and more to the field of international finance, in effect trying to refinance countries the way his father had refinanced railroads. It wasn't nearly as profitable.

The Test

When the crisis of 1929 came, Jack Morgan just couldn't do what his father had done in 1907. Not only was it a far deeper, more complex crisis, but also the lines of power and authority linking the House of Morgan with the business community and its coffers had weakened considerably.

A bitter public turned on the House of Morgan in 1933 as a scapegoat for the Depression, and Congress split the old firm in two with the Glass-Steagall Act of 1933.

It was the end of an era. Never again would any investment banker wield the power J.P. Morgan had wielded. But it is interesting to ponder how different the course of American industry might have been had Jack Morgan found that new way of using the Morgan power. Would the Crash of 1929 have been so severe? Would there have been a Depression? One can almost see old Jupiter Pluvius shaking his hoary head. ■

Reprinted with permission from **Forbes**, 50th Anniversary Issue.
Picture courtesy of Culver Pictures.

Answers: 1. ....

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2. ....

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Remember, don't let technical vocabulary or small print distract you from your purpose in reading if they are not necessary in serving your purpose.

Our Question: **What good trading principles can a speculator use?**

Your Speculation: ....

SPECULATION AND SPECULATORS

The overwhelming majority of commodity speculators are position traders. They may be business and professional men, farmers or commodity handlers, to name some. All of them must have available capital, over and above their ordinary requirements, for venture purposes.

These people take long (buy) or short (sell) positions in the futures markets because they have formed an opinion that prices are about to advance or to decline. They derive their opinions of the market in a number of ways, but those who are consistently successful base their activities on a close study of fundamental market conditions plus a knowledge of trading techniques, two factors of equal importance.

Some of the most successful speculators are wrong in their market opinions more often than they are right. When they are wrong, they take losses quickly without having added new trades to their position. When they are right, however, they will pyramid their profitable trading experience so final over-all results are satisfactory.

Since there are nearly as many philosophies of trading in commodities as there are individual traders, it is virtually impossible to lay down any hard fast rules. However, out of experience certain trading principles have emerged that merit serious consideration. Here are some of the best:

1. **Have a definite plan. Don't act on impluse and don't allow the original plan to be upset by temporary developments; but be sure you're in step with the market before asserting your position.**
2. **Don't over-trade. Always hold some funds in reserve.**
3. **Limit losses and allow profits to run. Most successful traders find that the failure to limit losses and the urge to take small profits quickly would be their downfall.**
4. **Learn all you can about the commodity being traded. Be guided by fundamental economic forces and common sense, not by fragmentary information or "hot tips".**

It helps to understand how to trade, to pyramid a position, how and where to enter stop loss orders, how to gather useful information from a chart, how to interpret published statistics in order to learn about the internal structure of the market. This information, whether fundamental or technical, is used to choose market situations that appear low in risk in relation to profit potentials.

Even though we have broken speculation into three categories, all are basically united in what they perform for our economy. The position trader takes a long-term risk; the scalper makes for second-to-second fluidity in pit trade; the spreader helps to keep price differences in line – but all really contribute to the liquidity of contract markets.

Commodity speculation is not an easy way to get rich quick. One professional describes speculation as a very hard way to make an easy living. Commodity speculation, like any other business, demands certain characteristics of the successful operator – intelligence, courage, knowledge, prudence, alertness. These are characteristics of leadership in every segment of American business.

Reprinted from "MARKETING GRAIN", Chicago Board of Trade.

Answer: ....

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Our Question: 1. How was the metric system developed?

Your Speculation: ....

Our Question: 2. Why is the word meter used?

Your Speculation: ....

Brief History of MEASUREMENT SYSTEMS

"Weights and measures may be ranked among the necessaries of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian, to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war. The knowledge of them, as in established use, is among the first elements of education, and is often learned by those who learn nothing else, not even to read and write. This knowledge is riveted in the memory by the habitual application of it to the employments of men throughout life."

JOHN QUINCY ADAMS
Report to the Congress, 1821

Weights and measures were among the earliest tools invented by man. Primitive societies needed rudimentary measures for many tasks: constructing dwellings of an appropriate size and shape, fashioning clothing, or bartering food or raw materials.

Man understandably turned first to parts of his body and his natural surroundings for measuring instruments. Early Babylonian and Egyptian records and the Bible indicate that length was first measured with the forearm, hand, or finger and that time was measured by the periods of the sun, moon, and other heavenly bodies. When it was necessary to compare the capacities of containers such as gourds or clay or metal vessels, they were filled with plant seeds which were then counted to measure the volumes. When means for weighing were invented, seeds and stones served as standards. For instance, the "carat," still used as a unit for gems, was derived from the carob seed.

As societies evolved, weights and measures became more complex. The invention of numbering systems and the science of mathematics made it possible to create whole systems of weights and measures suited to trade and commerce, land division, taxation, or scientific research. For these more sophisticated uses it was necessary not only to weigh and measure more complex things—it was also necessary to do it accurately time after time and in different places. However, with limited international exchange of goods and communication of ideas, it is not surprising that different systems for the same purpose developed and became established in different parts of the world—even in different parts of a single continent.

The English System

The measurement system commonly used in the United States today is nearly the same as that brought by the colonists from England. These measures had their origins in a variety of cultures—Babylonian, Egyptian, Roman, Anglo-Saxon, and Norman French. The ancient "digit," "palm," "span," and "cubit" units evolved into the "inch," "foot," and "yard" through a complicated transformation not yet fully understood.

Roman contributions include the use of the number 12 as a base (our foot is divided into 12 inches) and words from which we derive many of our present weights and measures names. For example, the 12 divisions of the Roman "pes," or foot, were called *unciae*. Our words "inch" and "ounce" are both derived from that Latin word.

The "yard" as a measure of length can be traced back to the early Saxon kings. They wore a sash or girdle around the waist—that could be removed and used as a convenient measuring device. Thus the word "yard" comes from the Saxon word "gird" meaning the circumference of a person's waist.

Standardization of the various units and their combinations into a loosely related system of weights and measures sometimes occurred in fascinating ways. Tradition holds that King Henry I decreed that the yard should be the distance from the tip of his nose to the end of his thumb. The length of a furlong (or furrow-long) was established by early Tudor rulers as 220 yards. This led Queen Elizabeth I to declare, in the 16th century, that henceforth the traditional Roman mile of 5 000 feet would be replaced by one of 5 280 feet, making the mile exactly 8 furlongs and providing a convenient relationship between two previously ill-related measures.

Thus, through royal edicts, England by the 18th century had achieved a greater degree of standardization than the continental countries. The English units were well suited to commerce and trade because they had been developed and refined to meet commercial needs. Through colonization and dominance of world commerce during the 17th, 18th, and 19th centuries, the English system of weights and measures was spread to and established in many parts of the world, including the American colonies.

However, standards still differed to an extent undesirable for commerce among the 13 colonies. The need for greater uniformity led to clauses in the Articles of Confederation (ratified by the original colonies in 1781) and the Constitution of the United States (ratified in 1790) giving power to the Congress to fix uniform standards for weights and measures. Today, standards supplied to all the States by the National Bureau of Standards assure uniformity throughout the country.

The Metric System

The need for a single worldwide coordinated measurement system was recognized over 300 years ago. Gabriel Mouton, Vicar of St. Paul in Lyons, proposed in 1670 a comprehensive decimal measurement system based on the length of one minute of arc of a great circle of the earth. In 1671 Jean Picard, a French astronomer, proposed the length of a pendulum beating seconds as the unit of length. (Such a pendulum would have been fairly easily reproducible, thus facilitating the widespread distribution of uniform standards.) Other proposals were made, but over a century elapsed before any action was taken.

In 1790, in the midst of the French Revolution, the National Assembly of France requested the French Academy of Sciences to "deduce an invariable standard for all the measures and all the weights." The Commission appointed by the Academy created a system that was, at once, simple and scientific. The unit of length was to be a portion of the earth's circumference. Measures for capacity (volume) and mass (weight) were to be derived from the unit of length, thus relating the basic units of the system to each other and to nature. Furthermore, the larger and smaller versions of each unit were to be created by multiplying or dividing the basic units by 10 and its powers. This feature provided a great convenience to users of the system, by eliminating the need for such calculations as dividing by 16 (to convert ounces to pounds) or by 12 (to convert inches to feet). Similar calculations in the metric system could be performed simply by shifting the decimal point. Thus the metric system is a "base-10" or "decimal" system.

The Commission assigned the name *metre* – which we spell meter – to the unit of length. This name was derived from the Greek word *metron*, meaning "a measure." The physical standard representing the meter was to be constructed so that it would equal one ten-millionth of the distance from the north pole to the equator along the meridian of the earth running near Dunkirk in France and Barcelona in Spain.

The metric unit of mass, called the "gram," was defined as the mass of one cubic centimeter (a cube that is 1/100 of a meter on each side) of water at its temperature of maximum density. The cubic decimeter (a cube 1/10 of a meter on each side) was chosen as the unit of fluid capacity. This measure was given the name "liter."

Although the metric system was not accepted with enthusiasm at first, adoption by other nations occurred steadily after France made its use compulsory in 1840. The standardized character and decimal features of the metric system made it well suited to scientific and engineering work. Consequently, it is not surprising that the rapid spread of the system coincided with an age of rapid technological development. In the United States, by Act of Congress in 1866, it was made "lawful throughout the United States of America to employ the weights and measures of the metric system in all contracts, dealings or court proceedings."

By the late 1860's, even better metric standards were needed to keep pace with scientific advances. In 1875, an international treaty, the "Treaty of the Meter," set up well-defined metric standards for length and mass, and established permanent machinery to recommend and adopt further refinements in the metric system. This treaty, known as the Metric Convention, was signed by 17 countries, including the United States.

As a result of the Treaty, metric standards were constructed and distributed to each nation that ratified the Convention. Since 1893, the internationally agreed-to metric standards have served as the fundamental weights and measures standards of the United States.

By 1900 a total of 35 nations—including the major nations of continental Europe and most of South America—had officially accepted the metric system. Today, with the exception of the United States and a few small countries, the entire world is using predominantly the metric system or is committed to such use. In 1971 the Secretary of Commerce, in transmitting to Congress the results of a 3-year study authorized by the Metric Study Act of 1968, recommended that the U.S. change to predominant use of the metric system through a coordinated national program. The Congress is now considering this recommendation.

The International Bureau of Weights and Measures located at Sevres, France, serves as a permanent secretariat for the Meter Convention, coordinating the exchange of information about the use and refinement of the metric system. As measurement science develops more precise and easily reproducible ways of defining the measurement units, the General Conference on Weights and Measures—the diplomatic organization made up of adherents to the Convention—meets periodically to ratify improvements in the system and the standards.

In 1960, the General Conference adopted an extensive revision and simplification of the system. The name *Le Systeme International d'Unites* (International System of Units), with the international abbreviation SI, was adopted for this modernized metric system. Further improvements in and additions to SI were made by the General Conference in 1964, 1968, 1971, and 1975.

Reprinted from U.S. Department of Commerce, National Bureau of Standards.

Answers: 1. ....

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2. ....

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Let's stop and see if you can write purpose questions of your own. Here is an article that contains information about the migration of birds. Write two of your own skim-type purpose questions and two scan-type purpose questions after you have skimmed through the article.

Your Skim-Type Question: 1. ....

....

Your Skim-Type Question: 2. ....

....

Your Scan-Type Question: 1. ....

....

Your Scan-Type Question: 2. ....

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MIGRATION OF BIRDS

As with most aspects of migration, there are many theories about why. Many scientists believe that birds migrate north to south because of inclement weather. Supposedly, these birds began this journey originally because they were driven southward by the advancing ice age.

Many birds feed almost entirely upon insects, so another theory holds that birds migrate to areas with plentiful insects. When winter sets in, insects, of course, disappear and the birds would starve unless they moved southward to warmer climes. You may wonder, however, why insect eaters fly north again with the coming of spring, when there are many insects at winter homes.

A more realistic theory holds that birds have an "imprint" or lasting impression of the birth place, resulting in a lifelong urge to return to this locale each spring.

Scientists have recently found that length of day is the triggering force that prepares many birds for their migratory journeys. The change in length of day brings the birds into breeding condition and causes them to seek their northern nesting grounds.

In North America, it is possible to see migrating birds almost every month of the year. Some birds start south early in July, while others remain north until pushed out by either severe weather or shortage of food. Soon after hardy travelers reach winter homes, other equally hardy migrants start north on the heels of winter. In their eagerness to reach northern nesting grounds, early spring migrants sometimes crowd the retreating winter a little too closely and are caught in sudden storms and of course some perish.

Most small birds and a good many larger ones migrate by night. This may sound strange since most seem helpless in the dark, but there are good reasons for this nighttime travel. Some are poor fliers. Even good fliers can fall easy prey to hawks, which feed and migrate in daylight. Also, night migrants have daylight hours for feeding.

Many kinds of wading and swimming birds migrate either by day or night. Such birds usually feed at all hours and rarely depend on hiding to escape enemies.

Day migrants include, in addition to some of the ducks and geese, loons, cranes, gulls, pelicans, hawks, swallows, nighthawks, and swifts. All these are strong-winged birds. Swifts, swallows, and nighthawks feed on flying insects and can easily pick up a full course dinner as they travel. Gulls, hawks, and pelicans feed so heavily when food is available that to miss a meal now and then causes little hardship.

Migrations of blackpoll warblers and cliff swallows are samples of differences between routes of day and night migrants. These two birds winter as neighbors in South America. When northward spring migration starts, warblers, traveling at night, head north *across* the Caribbean Sea and the Gulf of Mexico and into the United States. Cliff swallows, traveling during daylight hours, move westward through Panama, up the western slope of the Caribbean Sea to Mexico, and then *around* the Gulf of Mexico into the United States.

Migratory birds do not travel as fast as some people have believed. A German scientist in 1895, for example, attributed speeds in excess of 200 miles an hour to some birds during migration, but later investigations indicated this estimate was much too high. It is true that the peregrine falcon flies 165 to 180 miles per hour while pursuing food, but very few birds can even approach this.

Birds have two speeds—one for normal flying including migration, and a faster one for escaping enemies or pursuing food. Most songbirds have cruising speeds between 25 and 50 miles per hour during migration.

Scientists making studies of the amount of fat lost by migrating birds are convinced that migration often consists of a series of single, long flights, followed by feeding for several days to replenish fat needed for the next stage of the journey.

At one time it was thought that migrating birds traveled at heights above 15,000 feet because flying was easier high up. Lack of oxygen and of buoyancy in the rarified air, however, would handicap such high altitude flying.

Birds such as vultures, pelicans, cranes, and some of the hawks feel this lack of buoyancy least since their wing surface is very great in comparison with body weight. But smaller and shorter-winged birds do not have this buoyancy at high altitudes. Even when flying close to the earth, small birds have to keep their wings beating rapidly to stay airborne.

Observation from towers and by radar and airplanes indicate that most birds travel below 5,000 feet above the earth during migration.

Perhaps the most mysterious aspect of bird migration is navigation. The old idea that birds have a mysterious "sense of direction" or some sort of built-in compass has been discarded by most modern scientists, but in place of this theory there are a host of others with their advocates and evidence to support them.

Some scientists, for example, believe that many birds navigate by the sun and stars. This would account for amazing treks across vast stretches of ocean.

But other scientists believe birds use familiar landmarks to guide them. Veteran fliers who made the trek before "educate" young followers on the journey to nesting or wintering homes.

Still other scientists say birds can navigate by way of subtle differences in the magnetic field of the earth. This theory would endow young birds with subtle receptors that can detect differences in field strength.

One of the most amazing things about migration is that some birds brought up away from their parents and without adult guidance or experience in actual migration can orient to the proper direction across vast stretches of water.

It is thus obvious that most theories on navigation apply only for some birds and under certain conditions. Migrating birds traversing oceans could guide their journey by way of heavenly bodies, but many birds following land routes could guide their treks by familiar land objects. Much more research is needed before we can say what theory applies for each migrating bird.

Birds like bobwhite quail and cardinals never get more than 10 miles from the nest where they were hatched, but arctic terns are true globetrotters. These birds nest in Greenland and the northern part of North America, with a few found as far south as Massachusetts. As soon as the young are grown, those from eastern North America cross the Atlantic Ocean to Europe and a few months later can be found in the Antarctic regions, 11,000 miles from their nesting grounds. They fly at least 25,000 miles each year in migrating.

Most North American birds, however, spend winters in southern United States and Central and South America. Coastal marshes along the Gulf of Mexico and along the South Atlantic coast of the United States serve as the winter home for hundreds of thousands of ducks and geese.

Migratory birds generally follow north-south routes in the United States. They may veer east or west, but their movement in the end is southward.

Most waterfowl follow the same approximate route each spring and fall. Probably in no other region of the world does such a large proportion of the birds migrate north and south as they do in North America. The outlines of the coasts, the courses of large rivers, the trend of mountain chains—all combine to make northward and southward migration easy and natural. These routes are known as flyways. and there are four in the United States—Atlantic, Mississippi, Central, and Pacific.

But some birds that nest in high mountain areas simply move down to the warmer lowlands to spend the winter. This is known as vertical migration. In such cases, a few hundred feet in elevation corresponds to a flight of hundreds of miles. Only such hardy birds as the harlequin ducks, chickadees, rosy finches, juncos, and a few others make such migrations because winters are still severe in most lowland areas near larger mountain ranges.

Our feathery friends do not recognize man's political boundaries, traveling across both international and State borders. Protection of these birds within the United States is in the hands of the Department of the Interior's Bureau of Sport Fisheries and Wildlife. Treaties with Canada and Mexico extend protection throughout the North American Continent. Nearly all migratory birds are protected by Federal law, and a corps of Federal game management agents and cooperating State conservation officers enforce these laws.

Protective laws regulating hunting of ducks and geese are established according to flyways. But rather than follow indefinite boundaries, so-called legal or regulation flyways follow State lines, with the exception of the boundary between the Central and Pacific Flyways which follows the Continental Divide.

Many perils are faced by migrating birds during their long journeys. Aerial obstructions such as television or radio towers and monuments are responsible for the deaths of thousands each year. Planes landing and taking off at airports and airport ceilometers are also dangerous for birds flying at night because some are attracted to the light during foggy weather.

The famous Washington Monument in our Nation's Capital, which is illuminated by powerful searchlights, kills many birds, especially when gusty winds and low cloud cover prevail. The Statue of Liberty, when the torch was kept lighted, caused enormous destruction of birds.

Storms also kill many birds, particularly the smaller ones. Inland hailstorms kill great numbers. Those traversing large stretches of water are sometimes forced down and drown.

But birds like the sandpipers, plovers, and terns are well-adapted for long overseas flights. For example, the golden plover, traveling the Atlantic oceanic route from Nova Scotia to South America covers the entire distance of 2,400 miles without stopping and although considerable fat is lost, the bird seems little worse for wear as a result of its journey.

Banding—the marking or attaching of identification tags to individual birds and other kinds of wildlife—has been responsible for scientists determining many routes of migration. This technique, which began in Europe by amateur naturalists who were curious about the movements of individual birds, was later picked up along with data by biologists.

There are several dozen banding centers throughout the world, but we in North America are fortunate to have a facility where much of these activities can be coordinated. This is the Interior Department's Bird Banding Laboratory located near Laurel, Maryland. In cooperation with the Canadian Wildlife Service, this Bureau of Sport Fisheries and Wildlife center coordinates the banding activities of about 4,000 professional and amateur ornithologists throughout North America and several foreign countries.

To this station hunters and others send bands they find on birds and facts of recovery to help scientists get a better picture of the population dynamics and migration routes of birds. Thousands of recoveries come in each year—so many that the center's scientists use electronic computers to keep track of information.

Bird migration had its start such a long time ago that it is only possible to speculate how it all began. Some aspects of migration, particularly routes of travel and time of year of journeys for many species have been worked out largely through banding efforts and observations from planes, radar, and miniature radio transmitters. Interested observers and laboratory experiments have also contributed to the growing fund of knowledge. But much of bird migration is still a mystery for future generations of scientists and amateur naturalists to explore.

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