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The Educational Leader

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CONTENTS

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Palestine Divided by Three

ETELKA HOLT

Owing to its position across one of the ancient trade routes from East to West, Palestine has always played an important part in the affairs of man. For centuries, the valuable products of the Orient were carried overland by way of the Euphrates and Damascus to the Levant. The great shore road, the oldest road in the world, was the caravan route between Damascus and the Nile.

Because Palestine forms this narrow bridge between two continents and the two oldest civilizations of the world, throughout the centuries many peoples have traveled across its borders for purposes sometimes of religious devotion, sometimes of peace, and sometimes of conquest. These travelers included the Babylonians, the Assyrians, the Egyptians, the Ethiopians, the Hittites, the Scythians, the Persians, the Parthians, the Greeks, the Romans, the Moslems, the Mongols, the Turks, and the Crusaders.

One remarkable thing, the result probably of the topography of the country, is that a little people in such a narrow strip of land have been able to retain their individual characteristics and not be eclipsed by the stronger powers invading them. Although there was room for a caravan route along the coast, there were almost no harbors to welcome ships until the extreme north was gained. Though this coast road made an easy path from Egypt to Assyria, the hilly country of Judea held few attractions to lure the traveler to stop off and make this his home. As a result of being able to maintain their cultural integrity, they bequeathed to the world a rich literature and a great religion.

Because Palestine forms the background for the religious life of approximately one-half of the people of the globe, much interest has been shown in the report of the Royal Commission proposing a three-way division of this little country about the size of the state of Vermont. On the one hand, the report has roused bitter opposition; on the other, there has been much favorable commendation of the proposal and a feeling that it would tend to for-

ward the new era which began in Palestine with the influx of the Jews at the close of the World War.

In Bible days Palestine experienced an era of prosperity. The Romans were great builders and there are still remains of roads constructed by them nearly nineteen centuries ago. We are told that the country experienced national glory under the reigns of David and Solomon. In 70 A. D., with the destruction of the temple and the fall of Jerusalem the era of prosperity ended and there followed nearly nineteen hundred years of conquest, of stagnation, and of gradual decline, resulting in a land without a people and a people with a land. History records that Jerusalem has been besieged forty-six times and completely razed to the ground seventeen times. It has been a city of righteousness and justice, a city of hypocrisy and wickedness. In and around it have taken place the greatest events in the history of mankind.

In 1917 with General Allenby's famous campaign came the wresting of Jerusalem from the Turks. Palestine became a "national home for the Jews" under the British mandate. Since that time a rapid and remarkable transformation has taken place. During the past twenty years swamp land has been reclaimed and sandy wastes have been turned into beautiful orange groves. It is felt by some that this is but the fulfillment of prophecies given in the Old Testament, such as: "And they shall build the old wastes, they shall raise up the former desolations, and they shall repair the waste cities, the desolations of many generations." (Isa. 61:4)

Before this return of the Jews to Palestine, there was a measure of peace between the Jews and Arabs living in this province of the Ottoman Empire. But when the country became a national home for the Jews, Arabs, seeing the steady stream of Israelites pouring into Palestine, appealed to the League of Nations, protesting that the land could not absorb the number of Jews returning. At length their pent up anger burst forth in violence and bloodshed in the riots of 1929. Many Jews were killed and hundreds of homes demolished. Following these riots, Great Britain and the League of Nations sent a special commission to Palestine to investigate the protest. The commission confirmed the complaint of the Arabs and recommended that immigration be further restricted. In spite of this mandate the Jews continue to migrate in large numbers.

Twenty years of government under the British mandatory has seemed to intensify such fear and distrust between the two races that the barrier now looks formidable. The attempts of the officers of the Palestine Government to apply the mandate have met with hostile criticism and constant disturbances. Indeed the lives of many of them have been threatened, for Jewish and Arab extremists are religious zealots who know no fear and who

are prepared to die in defense of their concept of duty.

It was hoped that when the country was put under mandate, Arabs and Jews would be welded into a single nation and that out of a conflict of two nationalisms would come a blend of Eastern and Western civilizations. That hope has disappeared, for the antagonisms of the two peoples seem now intensified beyond the possibility of reconciliation. The experiment that was to unite these peoples is being abandoned for a policy of separation, as it is felt that partition is the only way out. It is an unhappy conclusion but it appears inevitable.

It was under such circumstances that the British Government, in November, 1936, sent out the Royal Commission to study the situation and propose a solution. The Commission sat on an average of five days a week for more than two months. Whatever days were not given over to hearings were spent in tours of investigation through the country. The Commission has found it a difficult task to divide Palestine into three parts, for the followers of Christianity, of Judaism, and of Islam consider this country holy ground. The historic struggles of these three great religions to possess the land are not forgotten. In brief, the report provides:

1. That the northern section and the maritime plain constitute a "sovereign independent Jewish State."

2. That most of the rest of the country, together with Transjordan, form a new "sovereign independent Arab State."

3. That a new mandate be exercised by Great Britain over Jerusalem, Bethlehem, and Nazareth with a corridor leading from Jerusalem to the Mediterranean; also an enclave at Akaba in the extreme south.

4. That there be temporary continuation of British mandatory administration in Haifa, Acre, Safed, and Tiberias.

Arabs and Jews alike have been disappointed in the report. The Arab State comprises approximately four-fifths of the country. This region is largely in the interior but with access to the Mediterranean at Jaffa excluding a relatively small area to be retained by Britain as a permanent mandate. In this decision the Arabs lose some territory which they have owned for hundreds of years, but at the same time they obtain sovereign power over what remains to them. This power they long coveted. They would also be reunited with their co-religionists across the Jordan and would be relieved of all apprehension of being crushed by Jewish immigration. In view of the backwardness of Transjordan, a grant of 2,000,000 pounds is proposed for the Arab State. Arab objections are based on the claim that Palestine is their own country and they question why they should have fought for the Allies against the Turks if their own independence had not been promised them.

The new Jewish State comprises only about one-fifth of the total area, chiefly in its richer plains along the coast. The Jews feel that the area apportioned to them is entirely insufficient. They are going about the task of rebuilding with scientific thoroughness and have already made many improvements in parts of Palestine not allotted to them in this division. The Jews put their faith in God's promise made in Genesis and believe that even the present boundaries of Palestine do not include all of the land they eventually will occupy. "In the same day the Lord made a covenant with Abram, saying, unto thy seed have I given this land, from the river of Egypt unto the great river, the river Euphrates." (Gen. 15:18). The Jews concede, however, that the division will permit them independent rule in their cherished "Land of Israel" for the first time since the destruction of Jerusalem. Here they will be able to regulate their own affairs, including immigration. Their safety and freedom of worship will also be secure.

Provision has been made in the report for the gradual transfer of the Jews from Arab territory and the Arabs from Jewish territory in order to remove possible sources of friction.

For its part, Britain looks forward to being relieved of what has come to be an impossible position. The British permanent mandate includes those centers of almost universal reverence, Jerusalem, Bethlehem, and Nazareth. Access to them for the world will be insured by the British. The report provides for an enclave or corridor to be laid out, extending from a point north of Jerusalem to a point south of Bethlehem, leading to the sea at Jaffa. Jaffa, although in the Palestinian section, is to be an outlying part of the Arab State, narrow belts of land being acquired and cleared on the north and south sides of the town to provide access from the Mandatory Corridor to the sea.

Britain is given power to protect such cities as are sacred to either Jew or Arab. Tiberias and Safed, two sacred cities of the Jews, are put under temporary mandate. Britain is also given full power to safeguard the sanctity of the waters and shore of Lake Tiberias. This lake is variously referred to in the Bible, sometimes as the Lake of Gennesaret, in other places as the Sea of Galilee. Around this lake were the ancient cities of Tiberias, Chorazin, Bethsaida, and Capernaum. All except Tiberias have disappeared. It is claimed that Bible prophecy has been fulfilled, for not a word of judgment was pronouned against Tiberias. "Woe unto thee, Chorazin! Woe unto thee, Bethsaida! for if the mighty works had been done in Tyre and Sidon, which have been done in you, they had a great while ago repented, sitting in sackcloth and ashes. But it shall be more tolerable for Tyre and Sidon at the judgment, than for you. And thou, Capernaum, which art exalted to heaven, shalt be thrust down to hell." (Luke 10:13-15). While Tiberias is approximately 680

feet below level of the Mediterranean, Safed, in which are found ruins of a castle built by the Crusaders, occupies a conspicuous position on the summit and slopes of the highest mountain in Galilee, about 2700 feet above the sea. This mountain is purported to mark the place referred to in the Sermon on the Mount: "A city that is set on an hill cannot be hid." (Matt. 5:14).

The country of Palestine has one of the most forbidding and harborless of coasts, owing to the shallow off-shore waters and bordering rocks. Haifa, the best location, was only an open roadstead protected by the bluff of Mt. Carmel. The ports of Gaza, Ashkelon, Ashdod, Joppa, Ceasarea, Tyre, and Sidon are all formed by reefs. In the days of Solomon it was through the port of Joppa (Jaffa) that the cedars used in the temple of Jerusalem were landed.

In more recent years, Haifa and Jaffa have been the only ports of any importance but even so, cargoes have had to be lightered ashore in small surf boats. This is a slow and hazardous process, for the steamer must remain out some distance even in calm weather. As no large shipping could enter either of these two ports, the government several years ago decided to construct an artificial harbor. As far back as 1920, trial borings were made to determine which city would be most suitable for the purpose. In 1922 a report was submitted in favor of Haifa. The estimated cost of building the harbor was 1,250,000 pounds and a loan of that amount was authorized by the British Parliament. Work was begun in November, 1929, and for four years construction went forward, 1000 to 2000 workman being daily employed. The port was formally opened in October, 1933.

Haifa was chosen rather than Jaffa largely because of its physical advantages. The town lies at the foot of Mt. Carmel on the southern shore of the beautiful Bay of Acre, the only natural bay along the coast. Mt. Carmel, where the prophet Elijah called down the fire of the Lord to consume his burnt offering, is a ridge twelve miles long ending in a peninsula jutting out into the Mediterranean and rising to a height of some 1800 feet. For this reason Haifa enjoys natural advantages superior to any other place along the coast.

In 1934 international interest in Haifa was further increased by the opening of the great petroleum pipe line that carries oil from Mesopotamia (Iraq) to the Mediterranean. It is claimed to be the greatest pipe line ever carried through as a single enterprise; an army of 9000 men were employed for more than eighteen months in its construction. The line begins at Kirkuk, Iraq, and runs to Haditha on the Euphrates; here it branches into two sections. The French section runs to Tripoli, Syria; the other crosses the desert and the Jordan River, and runs south of the Sea of Galilee to Haifa In addition to being one of the two

terminals of the pipe line, Haifa is the headquarters of the Iraq Petroleum Company, an international enterprise, that has built up this modern method of transporting oil. American, British, French, and Persian oil interests are represented in the consolidated corporation. Oil tankers stop a little way out from shore and receive, from a large hose, the oil that has been pumped through the desert almost one thousand miles distant. Haifa with its modern harbor and the outlet of this pipe line provides opportunity for British ships to refuel there instead of going to some more distant port in the Empire.

Across the Bay of Acre from the new city of Haifa, the small town of Acre (Accho or Jean d' Acre) is another of the places over which the report gives Britain temporary mandate. This interesting white crusader town juts out into the sea as an extension of the Plain of Acre. It was an important place in remote antiquity and famous for the sieges it has sustained. Taken by the Crusaders in 1104, retaken by the Saracens in 1187, it was recovered by Richard Coeur de Lion in 1191 and given to the Knights of St. John of Jerusalem, whence it received the name of St. Jean d' Acre. In 1291 it again fell into the hand of the Saracens. Bonaparte attempted to take the city in 1799 but retreated after a siege of sixty-one days. As a port it can be entered only by vessels of small draft, for the water is very shallow.

Not much has been written or known of the village of Akaba, located in the extreme south of the country, but over which Britain is given temporary enclave. The Gulf of Suez and the Gulf of Akaba are two narrow bodies of water which from either side of the Sinai Peninsula unite to form the Red Sea. The village of Akaba on the east corresponds to Port Suez on the west. The feasibility of building a canal on the east side of the peninsula to correspond with the Suez Canal on the west has been considered. Akaba, which under various names has been in existence since ancient times, was one terminal of the pilgrim road from Damascus to the Red Sea and formed the route by which Israel appears to have entered Moab and marched to Bashan.

Conditions today in the Mediterranean are so altered that Britain has to consider the defense not of a hundred-mile canal from Port Said to Port Suez, but of a three thousand mile line from Gibraltar to Aden. Located on the eastern shore of the Mediterranean, Palestine is more than ever a vital link in the chain of communications between East and West, by sea, by land, and by air.

As the Anglo-Egyptian Treaty of 1936 provides for the gradual withdrawal of Britain from Egypt, control of strategic points in Palestine and the possible use of the route to the Red Sea by way of Akaba is becoming increasingly important.

With the seat of government at Jerusalem connected with the Med-

iterranean by a corridor, with an enclave at Haifa on the Mediterranean, and with another enclave at Akaba in the extreme south, Britain is retaining strategic points. These will secure not only partial protection of the Suez Canal from the north but also of a route from Haifa to Akaba as an alternative to the Suez.

Haifa, the most easterly point in the Mediterranean, is the one farthest away from Italian bases. In this respect it is superior to Malta. The position of Akaba on an arm of the Red Sea makes it a suitable base, subsidiary to Aden, for maintaining British prestige and dominance in the Red Sea. Danger to British interest from Italian ports in this body of water is greatly reduced by British possession of Akaba.

Both Arabs and Jews will have to rely to some extent on British support, especially in the matter of defense. If partition can come about with their mutual consent and with a measures of friendliness towards Britain, Britain will in no way lose the advantages which the mandate over Palestine has given her in the past. Decision has not yet been reached. On Feb. 28, 1938, announcement was made in London of a new Royal Commission to look into the technical questions involved in the proposed partition.

Most of the Arabs are fighting the plan. They wish to maintain the present ratio of 65-35 between Arabs and Jews. They also say that while the Jews would be permitted to live in Palestine and become citizens, they must abandon the idea of a Jewish National Home. The Jews, for their part, are reserving their decision but contend that the Arabs must accept this idea of Palestine as their National Home. The new Commission of Inquiry is to conduct a long and exhaustive survey to determine, if possible, what is causing the trouble.

Will the peoples of this narrow strip of land, the Arabs and the Jews, ever be satisfied each to develop the land allotted to them and remain at peace with their neighbors; or must it still be said of the Holy Land that it is a land without a people and its peoples are without a land? Will Palestine retain its characteristics and the country continue to be but a narrow bridge of land between the East and the West; or will the development of these two strategic cities, Haifa, the "gateway" to the East and Akaba the "back entrance" through Palestine to the Mediterranean, change its character? Time alone will tell.

The Changing Conception of the Atom

W. B. PARKS

The atom of today is the chemist's building unit. While the historic atom has claimed a large share of man's thought from an early day, the meaning given to it has not always been clear. Bergman has been quoted as saying,[1] "The history of Chemistry is properly divided into the mythological, the obscure, and the certain." During the mythological period the changes taking place in matter were supposed to be controlled by spirits, either good or bad. In the obscure epoch men now and then got a glimpse of the truth but soon lost it in the confusions of varied opinions. The majority of educated people of that time thought it beneath the dignity of man to engage in experiments. Man but dimly recognized method in nature, and knowledge obtained from observation was considered of but little value.

Mellor tells us that the Greeks not only furnished the scientific method based upon facts, but also that the Ionian philosphers, Thales and Anaximenes, protested the intervention of the Gods in natural phenomena, as against the rule of invariable laws acting uniformly and continuously. While the scientific method was suggested by Grecian philosophers, it was by no means always practiced and many of their theories, instead of being based upon accumulated facts laboriously collected were often based upon nothing more substantial than the "baseless fabric of a dream."

In trying to solve the problem as to the constitution of matter, these early thinkers did not use the term element as it is now used; they meant rather by element, the principle of things, the real substance of which matter is made. They have given to us their theories based upon belief in one, or more than one, primal element.

Anaxagoras (B. C. 500-428) believed[2] that every difference evident to the senses was fundamental and that there were as many elements as there were different simple substances. No means were known, at that time, for breaking down most substances; hence, they were considered simple substances. The number of elements was infinite. By subdivision all matter could be separated into ultimate particles, which were termed "like." These "homoeomeries were supposed to be eternal, unchangeable, infinitely divisible, and capable of continuous extension." Like homoeomeries

[1]Mellor, J. W., *A Comprehensive Treatise on Inorganic and Theoretical Chemistry*, Logmars and Co. 1927, Vol. 1, pp. 1-4.

[2]*Ibid.*, p. 33.

would act upon like to form matter.

The accepted atomic theory of today represents the work of many men throughout the centuries; credit for this work cannot be claimed by any one man, nor can it be assigned to any particular epoch. The theory[3] had its origin among the Hindu philosophers long before it was advocated by those of Greece. It was a mere assumption that all matter was made up of minute particles, atoms. A similar guess was made by the Grecian philosopher, Leucippus, whose disciple, Democritus, about 420 B. C., set up a system which became the theme of a poem written in 80 B. C. by Lucretius. The poem presents the most outstanding characteristics of the Hellenistic theory of the constitution of matter. These characteristics are summarized by Mellor as follows:[4] 1. Matter is discrete, not a continuum. 2. All substances are formed of solid atoms which are separated from one another by void spaces. Each atom is a distinct individual. 3. Atoms are impenetrable, invisible, and indestructible. They are as perfect and fresh today as when the world was new. 4. The atoms differ from one another in shape, size, and weight. 5. There is a finite number of different kinds of atoms, but an infinite number of homoeoferic atoms of each kind. 6. The properties of all substances depend upon the nature of the constituent atoms and the way the atoms are arranged. 7. The atoms are in constant motion. Motion is an inherent property of atoms. 8. Combination or aggregation is due to the coalescence of moving particles. Democritus supposed the particles to move in straight lines . . . Epicurus supposed the atoms to move in paths which deviate slightly from the rectilinear.

Chemistry as a science was unknown to the ancients. It grew up as a child of the alchemist and the medico-chemist or the iatro-chemist. The alchemist's interests in the structure of matter centered in his belief in the transmutation of metals. The four-element theory of Aristotle and his belief in the interconvertibility of the elements is supposed to have planted the seed thought of transmutation in the mind of the alchemist, encouraging him in his quest for the "elixir," the "philosopher's stone." Venable states[5] that as proof of the possibility of transmutation Geber gives the following example of copper being changed into gold: "In copper mines we see a certain water which flows out and carries with it thin scales of copper, which (by a continued and long continued course) it washes and cleanses. But after such water ceases to flow, we find these thin scales with dry sand, in three years' time, to be digested with heat of the sun; and among these scales the purest gold is found; therefore we judge those scales were cleansed by the benefit of the water,

[3] *Ibid.*, p. 105.

[4] *Ibid.*, pp. 107-8.

[5] Venable, F. P., *History of Chemistry.*, D. C. Heath and Co., 1909.

but were equally digested by the heat of the sun, in the dryness of the sand, and so brought to equality." The medico-chemist, or the iatro-chemsit, was chiefly interested in his search for new medicines and the explanation of the natural processes. One of the first of these, Van Helmont (1577-1644), looked upon water as the primal element and brought forth his famous willow experiment to support his theory. He planted a five pound willow in two hundred pounds of dried earth and kept it watered with rain and distilled water. At the end of five years the willow weighed one hudred and sixty-nine pounds and three ounces. The earth had decreased but two ounces. His conclusion was that one hundred and sixty-four pounds of plant tissue had been formed from water. Fishes, he said, live in water, yet they contain all the peculiar animal substances. These substances, he concluded, were formed from water.

In one form or another the old conception that all matter can be traced back to one or more ultimate units has persisted during the centuries. Through an accumulation of facts gathered by many workers during the passing years and through their improved methods of procedure, a ripe harvest was prepared before the close of the eighteenth century. This harvest was largely reaped by Lavoisier, Dalton, and others in the days of the "new chemistry."

Dalton's atomic theory was founded upon facts enunciated in his laws of definite combination, of multiple, and of reciprocal proportions. The atom is a real discrete particle of matter and cannot be subdivided by chemical processes. All atoms of the same element are similar and of equal weight. Atoms of different elements have different properties, as weight and affinity.

The constancy of composition of compounds as claimed by Dalton and set forth in his law of definite, or constant proportion, was questioned by Berthollet[6] who denied that "compounds were formed in certain definite proportions." Proust came to the defense of the law of definite composition. The interchange of letters in this contention between Berthollet and Proust continued for a period of several years, each of the authors citing experiments to establish his conclusions, the result being that Proust's views prevailed, and the difference between compounds and mixtures was made clear.

That hydrogen was the primal element was advocated by Proust soon after Dalton's atomic theory was announced. Proust's hypothesis was published in 1815 and made the claim that all atomic weights were whole numbers and therefore multiples of the atomic weight of hydrogen. This interest in atomic weights led to greater accuracy in their determination. Among those who did outstanding work in determining these values was Stas whose

[6] *Ibid.*, p. 88.

values, particularly for silver and chlorine, established beyond all reasonable doubt that atomic weights of the elements could not be expressed by whole numbers with hydrogen as the unit.

The electric current and the spectroscope, in the hands of the physicist and the chemist, have proved themselves to be most valuable aids in opening up fields for atomic research. The spectroscope made possible large and valuable stores of facts, especially information as to radiation and absorption phenomena; the work of Crookes stimulated the intellect of a Roentgen who gave us the X-ray. The spinthariscope, the spectrograph, the cloud chamber, and other accessories of the physical-chemists' laboratory have lured the atom into speaking a language which is coming to be, in part at least, understood.

The human mind seems prone to revert to the idea that there is a primal element out of which all substances are formed. The idea was held by ancient philosophers, by medieval alchemists, and by medico-chemists. In some form it exists today in the minds of modern chemists. Harkin's hydrogen-helium theory reminds us of Proust's hydrogen theory. The hydrogen-helium theory explains, by the "packing effect," why resulting atomic weights are not necessarily whole numbers or multiples of the original unit.

The work in classifying the elements into Dobereiner's triads (1829), Newland's octaves (1864), and Mendeleeff's periods (1869) showed unmistakably that there was some underlying connection between the atoms. The new approach to the solution of the atomic problem through the discovery of radioactivity (1896) and the electron (1897) let up to Moseley's atomic numbers. These numbers when substituted for atomic weights make possible our modified Periodic System.

Through the labors largely of Lewis and Langmuir and of Bohr, we have, respectively, the octet and the Bohr theory as to the structure of the atom. Disregarding the differences between these theories, our picture of the atom is that of a structure composed of protons and electrons, which are arranged in such fashion as to give a compact nucleus surrounded by electrons at different energy levels. The mass of the atom is traceable to its nucleus, its chemical properties to the number and arrangement of the external electrons, numerically equal to the atomic number, which, in reality, determines the number and arrangement of the electrons.

It was only after the discovery of natural radioactivity and after a more definite structure of the atom had been conceived that the possibility of changing one atom into another passed from the realm of pure fancy to that of a reasonable possibility. In the early years of the present century it became evident that nature creates new elements by the disintegration of

others. Richards found one isotope of lead whose origin could be traced to uranium. He found a second isotope whose origin could be traced to thorium.

Is it possible by artificial processes for the scientist to bring into existence new elements from preexisting ones, as is done in nature by natural processes? Such was the belief of Lord Rutherford[7] in 1919. Prior to this time research workers were content to confine their investigations to the outside of the atom, leaving the nucleus untouched. Rutherford was one of the pioneers who set himself to the task of discovering some of the secrets locked within the nucleus. Taking our cue from nature, we are now bringing about radioactivity by artificial means. The Nobel prizes, one in physics and one in chemistry, for 1935, were both awarded[8] for work done in fields related to artificial radioactivity. James Chadwick was given the physics prize for the discovery of the neutron, and Fredrick Joliot and his wife, Irene Joliot-Curies, were winners of the chemistry prize for their work on induced radioactivity.

In order to transmute one atom into another,[9] it appears necessary to alter the atomic number on the nucleus. This is conceivably possible either by adding a positive charge as a proton, or an alpha-particle, or by removing such a charge. The nucleus, however, is strongly guarded and is held together by attractive forces which are not easily overcome. In order to disrupt or to penetrate the nucleus, intense forces must be brought to bear upon it. Such forces are found available in the protons and the alpha-particles ejected from disintegrating radioactive substances. Rutherford tells us[10] that when the oxygen atom was bombarded by alpha-particles there was no evidence of a change but that when nitrogen was treated in the same way, the spinthariscope gave rise to scintillations which indicated that charged hydrogen atoms or particles had been produced.

Until about four years ago the building units of atoms were generally supposed to consist of two electrical units, the light electron and the heavy proton. Now we list,[11] in addition to these, the heavy neutron, the light positron, and—shall we say—the light neutrino. Ladenburg asked the question,[12] "Are these particles—proton, neutron, electron, and positron—elementary particles?" While he tells us that no definite answer to this question can be made today, he also says that the building stones of the atom consist essentially of positively charged

[7]Rutherford, Lord, "The Transmutation of the Atom," *The Scientific Monthly,* January 1934, p. 18.

[8]Barton, Henry A., "Atomic Nuclei," *Industrial and Engineering Chemistry,* News ed., Vol. 13, No. 24, p. 467.

[9]Reference 7

[10]*Ibid.*

[11]Heyl, Dr. Paul R., "What is Electricity?" *The Scientific Monthly,* July, 1935, p. 44.

[12]Ladenburg, Prof. Rudolf W., "Stable and Unstable Nuclei," *The Scientific Monthly,* April, 1935, p. 307.

heavy neuclei surrounded by light negative electrons. Rutherford assumes[13] that the neucleus of a heavy atom is, in general, composed of a larger number of particles, some charged like alpha - particles and protons and others, like the neutron, electrically neutral. We shall await the final answer to Ladenburg's question.

In the early investigation in nuclear chemistry, dating from 1919, the proton and the alpha-particle were the only projectiles available, their sources being radioactive substances. The efficiency of protons as projectiles has been immeasurably increased by the use of high voltages of the order of one million volts. By using one half a million volts Cockcroft and Walton[14] succeeded in securing a stream of protons that penetrated the lithium nucleus ejecting alpha particles. In the discovery of heavy hydrogen, deutrons, and neutrons the scientist finds projectiles that are even more effective than protons in bringing about nuclear change.

The results obtained by bombarding the nitrogen atom with alpha-particles, the lithium atom with protons, the sodium atom with deutrons, and the sodium atom with neutrons are shown respectively as follows:

1. The nitrogen[15] atom of mass fourteen and nuclear charge seven captures an alpha-particle of mass four and charge two, and yields an oxygen atom of mass seventeen and charge eight, and a proton of mass one and charge two.

2. The lithium atom[16] of mass seven and charge three captures a proton of mass one, and charge one then yields two alpha-particles of mass four each and charge two each.

3. The sodium atom[17] of mass twenty-three and charge eleven captures a deutron of mass two and charge one, then yields a proton of mass one and charge one and also an isotope of sodium of mass twenty-four and charge eleven which isotope, in turn, yields an atom of magnesium of mass twenty-four and charge twelve together with a negative electron.

4. The sodium atom[18] of mass twenty-three and charge eleven captures a neutron of mass one and charge zero and yields an atom of sodium (isotope) of charge eleven and mass twenty-four and, this, then yields an atom of magnesium of mass twenty-four and charge twelve, also a negative electron.

One interesting phase of the study of nuclear reactions is that resulting in the formation of isotopes[19] not previously found occurring in nature, i. e., the sodium atom with a mass of twenty-four. This product is radioactive, having a half life of fifteen and one-half hours; as it decays it radiates electrons. It has been suggested that the "yield" of artificial radioactivity

[13] Reference 7.
[14] *Ibid.*, p. 20.
[15] *Ibid.*, p. 19.

[16] *Ibid.*, p. 20.
[17] Reference 8.
[18] *Ibid.*
[19] *Ibid.*

might be increased to the point of making it a competitor of radium as found in nature.

The true scientist is not so much concerned with the utilitarian aspects of his investigations of the atom as he is with the revelation of the secrets locked within its chambers. In Lord Rutherford's article, "The Transmutation of the Atom," he says, "It is not that the experimenter is searching for a new source of power or the production of rare and costly elements by new methods. The real reason lies deeper, and is bound up with the urge and fascination of a search into one of the deepest secrets of nature."

It is said that Sir Isaac Newton, one of the greatest truth-seekers, in his declining years pictured himself as a boy strolling along the seashore, now and then finding a pebble prettier than the ordinary, while out yonder lay the great ocean of truth yet undiscovered. At times we become discouraged and feel that there are no unexplored fields—no more north poles for the Pearys, no more south poles for the Admiral Byrds and the Lincoln Ellsworths. Let us turn to the heart of the world, to the atom, to nuclear chemistry, where there are myriads of mines—if we can but find the entrance—all aglow with dancing protons, electrons, positrons and neutrons. Possibly up in a tiny crevice the named, though undiscovered, neutrino may be found.

After the structure of the atom has been mastered, its ultimate nature remains to be determined. The end is not yet.

The Newer Conceptions of Geography

EULALIA E. ROSEBERRY

A copy of a certificate issued on March 8, 1826, recently published in the *Journal of Geography*, reflects the static idea which was held regarding the subject of geography a little more than a century ago. The part pertaining to geography is as follows: "Elizabeth Crane hath been engaged, during her attendance at this school, in storing her memory, that strong and capacious storehouse of mankind, with useful ideas, lessons and information generally . . . She hath repeated the principal divisions, oceans, islands, and answered 109 questions on the map of the world. She has recited the principal divisions, lakes, rivers, bays, gulfs, etc. and answered 41 questions on the map of North America. She hath defined the boundaries of 12 of the United States and repeated 95 of the chief towns and 33 of the principal rivers belonging to these 12 states and answered 86 questions corresponding to the geography of that fine country. On the map of South America she hath committed to memory the different countries belonging to this great peninsula and repeated 58 chief towns and 33 of the principal rivers and answered 39 questions corresponding with its geography . . ."

It was not until the latter part of the nineteenth century that the idea of geography as a dynamic subject, rich in content and valuable in potentiality, began to take form. Discussions ran rife for many years as to whether geography is a physical science or a social science or any kind of a science; at length it was generally conceded that geography is not only a science but is both a physical and a social science. It is a physical science inasmuch as it deals with physical conditions and environs; it is a social science inasmuch as it deals with the activity of human beings. According to the definition of the leaders in the field of geography today, "Geography has to do with the relation of the major human activities to their natural environment." Geography is the only social science which considers all the people of all the world, and it is the only physical science which provides the setting for man's work.

Surface, climate, soil, accessibility, each and all must be considered in the line of adaptation. In the old type static-place geography, much was said about geographic "controls and effects," neglecting entirely the fact that man is an active agent adapting himself to this natural environment. In a great measure man is a free agent and as a rule an intelligent agent; as he has

used his intelligence, he has found that instead of attempting to conquer nature he must take advantage of nature's opportunities to procure food, shelter, clothing, and culture. According to the newer geography, geographic control is negative only. An unfavorable type of environment may prevent a certain type of industry, but no environment, however favorable, can control the pursuit of activity by man. Rich mineral deposits in China have not made miners of the Chinese. Paucity of mineral deposits doubtless prevented the Scandinavians from becoming miners.

The modern geographer sees in the races of mankind large groups of people who not only have adapted their mode of life to the kind of land in which they live but who are constantly attempting to make adjustments and bring about better conditions of living. This is responsible for the continual changes that the people of the world are experiencing. Trade treaties, trade agreements, protective tariffs, the free port of New York, conservative measures, and even politics are all brought about through the desires of people not only to live but to live better. Floods, dust storms, soil erosion, and the unemployment situation of today are all results of failure to adapt major human activities to the natural environment.

Not only is the political and economic attitude of people related to the kind of land on which they live, but religious ideas and viewpoints, moral standards, literature, and art are all, according to the geography of today, influenced by the natural surroundings. The people of hot, dry regions picture eternal punishment as hot and dry, while the people of cold, bleak regions object to becoming criminals in order to enjoy a lovely, warm place, their idea of punishment being a place of darkness, storm, and intense cold. Every religion in its early stage of development bears the stamp of a narrow, circumscribed habitat. Christianity did not conquer the world in the form in which it came from isolated Palestine until it had been remodeled in the wide contact of the Mediterranean Basin.

The relations of great literary masterpieces to their setting is so obvious that it seems trite and common-place to mention them. Scott's *Lady of the Lake*, Tennyson's *Idylls of the King*, Homer's *Iliad*, all owe much of their inspiration and interpretation to the nature of the land in which they were written. A knowledge of their setting is absolutely essential to the interpretation of their beauty and significance.

The predatory customs of nomadic peoples, such as the Tartars, Berbers, the ancient Huns, and the Indians of the Pampas are attributed to the barren deserts of their habitat together with their ease of moving about. The geographer regards history in a large part as "geographical factors embodied in events" or as one author has stated it, "History is geography in motion." The strong abolition movement of Massachusetts was related

to its granite soil, its boulder strewn fields, and its long cold winters, while the fight of the South for the maintenance of slavery was related to the deep fertile soils, level plains, and mild winters of tidewater Virginia. Ellen Churchill Semple said, "What is today a fact of geography becomes tomorrow a factor of history . . . Every map has its date." Militaristic or peaceful tendencies are developed through the abundance or lack of natural commodities as is illustrated by Japan's attitude toward China, the Italian Abyssinian fiasco, and the activities of Britain, France, and Germany today.

Superficial and inaccurate principles based on limited data or stated as unqualified factors together with extravagant and ill-founded generalization have often brought into disrepute and ridicule the consideration of the geographic factor in history. The historians have probably erred more in this respect than have the geographers. Montesquieu, a French author, in his *Spirit of the Laws* ascribes the religion, manners, customs, and laws in India and other Oriental countries to their warm climate, thus ignoring entirely the barriers which prevented group contacts and the progress that contacts bring. Buckle in his *History of Civilization in England* doubtless gives undue emphasis to the psychic effects of manificent scenery. He attributes the highly wrought imagination and gross superstition of the people of India and all other people living among great mountains and in vast plains to the scenic magnificence which excites the fancy and paralyzes the reason. He attributes the early predominance of reason in ancient Greece and like countries to natural features which are more nearly the measure of man himself. Helmolt in his *History of the World* went so far as to make the preposterous claim that the "Yankee with his tall, gaunt figure, the color of his skin, and the formation of his hair, has begun to differentiate himself from his European kinsman and approach the type of the aboriginal Indians" merely because he happens to dwell in the habitat of the Indian.

The following quotation from an editorial entitled the "Importance of Geography," published in the Kansas City *Kansan*, is significant of the accepted newer view of geography.

"According to reports of the recent conference of the national council of geography teachers in Detroit, geography isn't the irksome study in school that it used to be. Instead of learning by rote such isolated matters as the boundaries of Kleptomania, to borrow a name from the Wash Tubbs' comic strip, the capitals of the states to be recited in sing-song fashion, and the like, geography pupils nowadays relate what they learn to history, civics, economics, industry and related themes.

"And this is a good thing. If there is anything one needs to know in this age of radio, fast ships, and

globe-girdling airplane flights, it is geography. How does the land lie where the fighting is now going on in China and Spain? What are the limited, crowded territories of the "have not" nations that are making or threatening to make conquests for new colonial possessions? What are the natural resources that are abundant in some countries and scarce in others?

"And at home there are such vital questions as these: What are the main watercourses of the land? What are the problems of flood control and erosion control? What geographical attributes make some cities flourish and others stand still? How is the population distributed as to numbers, types of livelihood, share in the national income, purchasing power, etc.? How do transportation facilities relate to the growth of communities and of the nation?

"These are random thoughts merely suggestive of the importance of the subject as it relates to everyday problems."

The geographer is cautious about drawing conclusions from a single factor a single phase of influence. The theory of evolution has taught him as a scientist to think in large terms of time and the complexities of nature. Evolution comes about by a succession of infinitesimal changes throughout eons of time. Habitat affects man in different ways at different stages of his development. So the geography scientist views groups, tribes, and races of man as products not of a single habitat but a product of all the habitats which have left their impress on him throughout time. A group develops certain characteristics in a certain region and moves on taking with it the customs, habits, and methods acquired, some of which may be dropped and others retained. This may occur again and again with the same people and their descendants until it would be impossible to attempt to explain them completely in their present life.

Looking at the world from a geographic standpoint does not displace the viewpoint of the historian, the sociologist, or that of any of the other scientists, but rather adds to them. "Dust thou art" to the geographer means that man must look to the earth and the earth's resources for the sustenance of life and well being. For food, clothing, shelter, and culture, man must look to mother earth, and the nature of his adjustment to his source of livelihood determines the type of life he may enjoy.

Visual Aids

L. C. HECKERT

An important problem in the teaching of chemistry or science either in the high school or in college is that of suitable illustrations to aid in explaining the rather abstract laws, theories, and even facts. It is uniquely important that the concepts of atoms, molecules, symbols, formulas, and the like be established uniformly in all minds. Otherwise it will be impossible for even chemists to agree among themselves. Unless we all experience the same sense impression when a given word or idea is expressed, we cannot agree on the meaning of the term. The best method of obtaining reasonable certainty that we all receive the same sense impression for a term is to make that impression visually, if this is at all possible.

Usually good illustrative material is not readily available or is in a form not well suited for effective use in class work. The result is that the instructor either draws the desired illustration on the blackboard to the best, or worst, of his ability, calls attention to it in the textbook, if it is there, or passes it around the class. Fair results have been and are being obtained, at least the best that probably could be obtained with the method. Yet, at best, these procedures are highly unsatisfactory. Unless the instructor is a "chalk-artist," the drawing will be decidedly crude. To many of the students it will be but a jumble of chalk lines. Worse than that, the focus of attention is on the act of drawing rather than on the drawing itself.

A reference to a picture in the text will tend to cause a disturbance or a break in the continuity of thought, for the texts may not be open, or if open, not at the right place. Another difficulty is that the average text illustrates comparatively few of the points needing illustration, although there has been considerable improvement of late as a result of the improved and cheaper methods of making cuts. The text illustration often, however, does not illustrate the point to the satisfaction of the teacher nor as well as some other book.

Although a division of attention accompanies the passing of an illustation through a class, the chief objection to this procedure is that the major portion of the class will not see the illustration at the time of the explanation and their attention will be distracted later when the illustration arrives. The result is that they miss the matter under discus-

The materials of this article are taken, in part, from the thesis of Charles O. Jordon of Kansas City, Kansas.

sion at the time and probably miss much in the illustration also.

These remarks should not be construed as a criticism of the attempts of the instructors to utilize visual material. Instead, they merely indicate a very pressing need of improved illustrative material and improved methods of presentation. The ideal is the right picture presented at the right time, large enough and sufficiently clear and distinct for the entire class to see. It must be emphasized, however, that no class should, in any sense, degenerate into a "picture show." Pictures, illustrations and models are very desirable and useful aids, but in no sense are they a teaching method. Any tendency to use them as a crutch will defeat their purpose.

The effectiveness of the presentation of a few well-prepared lantern slides is readily apparent. It is obvious that a well thought out slide, prepared ahead of time, drawn to scale, or photographed is a much more effective aid than a crude, hastily drawn blackboard sketch. Curves, mathematically and graphically correct, are easily presented by means of slides or films and are much more effective than the usual crudely drawn curves illustrating only trends.

Although there has been considerable improvement in projection equipment of late, there still are some unsolved problems which need attention. Usually the room must be darkened. The psychological effect of this is bad even if the physiological effect of inadequate ventilation can be taken care of. The projection machine usually must be at some distance from the screen if the illustration is to be large enough for the entire class to see. The instructor should operate the projector as he needs it and must also be at the screen to call attention to the important points. Obviously he cannot be at both places simultaneously, and walking back and forth is exceedingly distracting. Oral directions to an operator are distracting and objectionable. The development of a projector for daylight projection that can be operated by the instructor at the front of the room and projected on a screen, also at the front of the room, would add materially to the successful use of visual instruction. A remote controlled projector is not at all out of the realm of the possible.

The method of acquiring a useful library of visual aids for any given course, however, is the object of this paper. A little experience with the material commercially available will soon convince one of the necessity of preparing, or having prepared, one's own material. Another person's choice is never as satisfactory, and the course must be adapted to fit the material instead of the material adapted to fit the course. It was this fact which led to the development of a suitable method of preparing visual aids for the various courses in science at this institution.

At the outset one is confronted with several choices in the type of

visual aid to use, and there is no doubt that all of them are exceedingly useful and effective in certain situations. The choice seemed, however, to lie largely between lantern slides and strip films. Of late, a method of mounting films between small glass slides, together with the development of a suitable projector, has removed some of the objections to strip films. While both silent and sound movies have interesting possibilities as instructional aids, their use is still somewhat in the experimental stage. Pupils are prone to regard movies as entertainment and not as instruction, a condition which psychologically is bad. Hopkins, at the University of Illinois, after a series of well-controlled experiments in the use of moving pictures said, "As the weeks went by it became evident that the students were coming to regard these (motion) pictures as a pleasant relief from the routine chemical lectures . . . that they were not making any definite effort to learn chemistry from the pictures." It is, however, likely that as we have more experience with moving pictures and acquire the proper technique of their utilization they may become a necessity in the presentation of certain types of information. At the present time, however, the capital investment and cost seem to be out of all proportion to their value and only the wealthy school systems can afford the investment. It appears that the sum now necessary to maintain an adequate sound picture program in a school as an aid in science teaching can usually be invested to better advantage in other ways . There is no doubt of the contribution of a well selected sound movie to the establishment of the proper visual impression in any situation in which motion or change is involved, but the student must have been previously advised as to what to look for or the process loses much of its value. In other words, the teaching must have been done previously, and the picture is largely for confirmatory purposes for avoidance of any possible wrong conceptions.

It would seem, however, that the obvious advantage of discussion offered by lantern slides or still pictures, practically impossible with sound or silent movies, together with the utilization of curves, graphs, drawings, tables, and models that may be illustrated by these methods, has much to offer an alert instructor. Of these choices, strip films were chosen as a matter of economy in both time and money. With the equipment developed, it is possible to make a strip of film of from fifty to one hundred pictures (including tables, charts, drawings, photographs, of anything that can be photographed) in a few hours' time at a material expense of about one-half cent per picture. Illustrations may be chosen from any book, magazine, newspaper, photograph, drawing, or, in fact, from practically any source. They are photographed in regular 35 mm. movie film and projected on the screen. With this very wide range of possi-

bilities, the development of suitable illustrative material is limited only by the initiative and ambition of the instructor.

For copying illustrative material from books, magazines, or papers or for general photographic work, a Memo camera, made by the Agfa Ansco Corporation, costing $12.50 list, was found most suitable. A number of other cameras, such as the Argus, the Balda, and the Leica may be used but were found somewhat less desirable because of more inconvenient handling, lack of sufficient supplementary equipment, or because of excessive cost. The Leica camera, with its wide choice of supplementary equipment, is a most useful instrument, but its very high cost places it beyond the reach of most instructors. The Memo has the advantage of being almost "fool-proof," very convenient to use, and very inexpensive. It has the disadvantage of lack of flexibility in the size of picture that can be copied. It takes pictures directly on 35 mm. motion picture film; after development, as many positive prints can be made as are desirable or necessary and a new print whenever needed.

The Memo camera is a fixed focus camera; for copy work, it must be used at a certain distance from the article to be photographed and with a supplementry lens. Under these conditions, a certain definite area is covered and the article to be copied must be no larger than this particular size. If smaller, it is usual to frame it with black paper. Three supplementary lenses were obtained for the Memo camera. Lens A covers an area of 3″ x 4″ with the front of the camera at a distance of 6″ from the article to be photographed; lens B, covers an area of 5″ x 5″ at a distance of 8$\frac{3}{8}$″, and Lens C covers an area of 6″ x 9″ at a distance of 25¾″. For larger pictures and greater distances (up to 4 feet) a portrait attachment is satisfactory, and beyond that no supplementary lens is necessary.

Many devices have been proposed to hold the camera and the material to be copied in the proper relative positions. The camera must be held at the proper distance from the article, and this distance must be accurately gauged, exactness becoming increasingly essential as the camera approaches the object. Thus, with the supplementary Lens A in place, it was necessary that the camera be placed exactly 6$\frac{1}{8}$ inches from the object, in which position it would photograph an object not larger than 3″ x 4″. With the other lenses, similar conditions had to be met, differing only in the distance and size of the object. In addition, the object to be photographed required adequate and even illumination.

To meet these conditions three open frames were constructed of sheet metal in such a way that when the frame was set on the article to be photographed, the camera was held at exactly the proper distance from the object in the proper position. For example, the frame to be used for reproducing small pictures

was made as follows: two pieces of sheet metal 4″ x 5″ were cut. An opening 3″ x 4″ was cut in one of them, and a hole 1½″ in diameter was cut in the center of the other. Four pillars were made from pieces of sheet metal 1″ x 6⅛″ by bending them to a right angle lengthwise. These four pillars were then soldered to the corners of the two plates, perpendicular to the surface. Two guide blocks were attached to the top surface of the plate in which the hole was bored in such a manner that the camera, when placed against these guide blocks, was held in such a way that the film frame of the camera was parallel to the opening in the opposite side of the frame.

When the 3″ x 4″ opening of the frame was placed directly upon the article to be copied, and the camera placed on the upper plate, the camera was held at exactly the proper distance from the object to be photographed and exactly centered over it. Illumination was provided from two sides with 100 watt lights in a desk type reflector. Using the smallest stop, an exposure of 3 to 5 seconds was usually satisfactory. In a similar manner, the larger frames, 5″x6″ x 8⅜″, 8″x11″x24¾″ were made for copying larger objects. In use it was merely necessary to select the frame whose picture opening most nearly fitted the size picture to be taken, put the proper supplementary lens on the camera, set the frame on the book or magazine and the camera on the frame, illuminate the object, and make the exposure. The entire time required is less than one minute; it has been possible to photograph and develop as many as two hundred pictures in an evening. Once the illumination and exposure has been determined, the process becomes entirely routine and practically "fool proof." The development and printing of the film follow the conventional methods. An eminently satisfactory printer can be easily made at little expense; the film, in bulk, is very cheap and if one mixes his own developers, the entire cost is less than one-half cent per picture.

With strip films and projection material of one's own choice easily available, there seems no reason why every course in which such material can contribute something of value should not be adequately provided for.

If, as has been said, "one picture tells more than thousands of words," why not use the picture?

Chemical Aid for Agriculture

O. W. CHAPMAN

Chemists are serving agriculture by research in methods of increasing yields, introducing new crops suitable to conditions in particular localities, and extending the uses of farm products by developing applications of new as well as of present crops.

The assistance thus given to agriculture makes possible the provision of food for a world population which could not possibly have been adequately nourished by crops grown by old methods on soil depleted of elements essential for the production of plants. Nearly one hundred and fifty years ago Malthus, the great economist of that time, predicted that in less than a hundred years the human race would cease to multiply because by that time it would be impossible to grow enough foodstuffs to feed it. That this prediction has not been realized is due in no small measure to the contribution of chemical manufacture to the growth of foodstuffs by utilizing the discovery of fertilizers by the chemist, Liebig.

In a series of experiments it has been shown that the growth of plants consumes several elements from the soil; hence, unless these elements are replaced, the yield from the land will decrease to the vanishing point. This is particularly true of the elements potassium, nitrogen, and phosphorus. This discovery has provided a means of insuring the yield of existing farm lands and has also made possible the utilization of land which ordinarily would be unprofitable to cultivate.

Since the necessity of supplying certain elements to farm land has been ascertained, chemists have sought satisfactory sources from which to make these essential substances.

One of the elements which is removed from the soil, in quantities which makes its replacement imperative, is nitrogen. Although nearly 80 per cent of the air is nitrogen, it is of no value since neither plants, except the legumes, nor animals can utilize it. Before it can be assimilated by plants, the nitrogen of the air must be converted into compounds that the plants can absorb and convert into proteins.

Nitrogen in combined form has been available in the saltpeter deposits of Chile and as a by-product of coal distillation. Neither of these sources has been adequate or entirely satisfactory; Chile places a heavy export tax on her nitrate, since she has the only large supply in the

world. In times of war, when the nations involved demand a greatly increased supply of nitrogen compounds, it is feared that the Chilean supply may be cut off except to the nation with the superior fleet. Nitrogen obtained through coal distillation has never proved satisfactory because the amount produced from coal has varied greatly, depending as it does on the demand for coke or fuel gas.

Since neither of the two best sources of nitrogen is entirely satisfactory, especially in times of stress, it is fortunate that methods have been devised to convert the nitrogen of the air into forms readily available to plant life.

Three different processes have been developed to a point where they are satisfactory for the fixation of atmospheric nitrogen. The Birkeland-Eyde process used in Norway converts it into nitric acid. In a process used in America nitrogen is combined with calcium carbide to form calcium cyanamide, which may be used directly as a fertilizer or in turn transformed into other compounds. Both of these methods require large amounts of power and so are not as economical as the Haber process, which combines, in the presence of a catalyst, the atmospheric nitrogen with hydrogen to produce ammonia. The ammonia may in turn be converted into nitric acid by the action of oxygen in the presence of a platinum catalyst by the Ostwald process, or it may be changed into ammonium salts.

The perfection of nitrogen fixation methods has broken the monopoly of Chile on the world supply of this essential element. This is shown by the decrease of the amount of nitrogen exported by Chile. It has fallen from 476,700 tons, calculated as nitrogen, in 1913 to 141,700 tons in 1934, although the total world production for the same years increased from 843,500 to 1,971,900 tons.

The principal source of potassium is the salt, potassium chloride, which is obtained from deposits in Germany and certain parts of the United States. The role of the chemist here is to refine the natural occurring salt or to convert it into the form desired for application to the soil. For use in fertilizer, the potassium may be used as the chloride, sulfate, nitrate, or phosphate.

The third essential element, phosphorus, is obtained chiefly in the form of rock phosphate, in which form it is found in the United States and Africa. Since in this form the phosphorus is unavailable to plants because of its low solubility in water, it must undergo chemical treatment. By treating the rock with a suitable amount of sulfuric acid, the phosphate is converted into a more readily soluble form, called "superphosphate." However, the phosphate is diluted with the calcium sulfate formed in the reaction. The sulfate is not, however, detrimental to the soil, but its presence does add to the cost of transportation. A method has been developed to avoid this added cost by

converting some of the rock phosphate into phosphoric acid, which in turn may act upon raw phosphate rock to produce the so called "triple" superphosphate.

Compounds containing nitrogen, phosphorus, and potassium, and if necessary other elements such as iron, magnesium, manganese, and sulfur, may be mixed in desired proportions and applied to soil, thus greatly increasing the yield of foodstuffs. Production of fertilizers by chemical industries thus serves the world through agriculture.

Another way in which chemistry aids crop production is in combating pests that are destructive to the crops. Chemical fertilizers play an important role in increasing the crops of grains and cotton, but this would be of no avail if the crops were destroyed by insects. Chemical science has made itself indispensable to the farmer in the killing of insects which render the fruit wormy or destroy the foliage and in the control of fungi which spot the fruit and destroy the trees or vines. Such crops as the potato, tobacco, corn, wheat, cotton, and many fruits and vegetables are all subject to pests which are fought by means of chemical poisons.

Different types of insecticides have been developed. These include: compounds of arsenic, lead, copper, mercury, and calcium; mixtures containing oils, sulfur, nicotine, pyrethrum and rotenone; such fumigants as carbon disulfide, hydrogen cyanide, and ethyl acetate-carbon tetrachloride mixture. Continual warfare upon destructive pests with weapons such as these is necessary to insure satisfactory crop production.

Chemists also serve agriculture by finding a great variety of new uses for substances grown on soil, thereby extending the market for the products of the soil. A familiar example of this service is shown in the uses made of wood. When heated, wood is converted into charcoal and other substances useful in chemical industries. Cellulose from cotton and wood is converted by chemical processes into paper, artificial silk, cellophane, and surgical dressings. These commodities provide an outlet for enormous quantities of farm products but without great injury to old established industries. For example, the real silk industry has lost but very little on account of the introduction of artificial silk.

Starch is an important component of a great many farm products, such as wheat, corn, and potatoes. Chemists have been especially active in devising means of converting this material into valuable products, thus increasing materially the value of the starch-containing crops by removing huge tonnages of these farm products from the market for foodstuffs and diverting them into raw material for chemical industries.

Perhaps the most interesting development at this time is the conversion of starches or other carbohydrates into grain alcohol for use as a motor fuel. It is obvious that

the world's petroleum supply is not inexhaustible. The question is when the supply will be exhausted. For this reason, the production and use of alcohol blended with gasoline are now receiving the attention of everyone interested in power and transportation. An experimental plant has been built in Atchison, Kansas, capable of producing 10,000 gallons of anhydrous alcohol daily by the fermentation of sugars obtained from starch. If the production and use of alcohol in motor fuel proves successful, an outlet for enormous quantities of farm products will be provided.

Another important fermentation industry also employs starch as the raw material. When gelatinized starch is inoculated with certain bacterial cultures, it is converted into butanol, ethanol, acetone, carbon dioxide, and hydrogen. All of these products are useful. Ethanol is used in practically all chemical industries as a solvent or in the preparation of other compounds. The carbon dioxide is used in part with the hydrogen to manufacture synthetic methanol, which in turn is used as a solvent in a great many industries and in the manufacture of compounds such as formaldehyde, which is useful in the preparation of plastics. The excess carbon dioxide is converted into dry ice, used for the preservation of foods. The hydrogen may be separated and converted into ammonia. Most of the butanol is converted into butyl acetate, stearate, lactate, oleate, phthalate, tartrate, or ether to be used as lacquer solvents. Some is made into butyraldehyde to be used as an accelerator for the vulcanization of rubber, some into tributyl phosphate which is used to prevent the yellowing of safety glass. Other derivatives are used in metal cleaners, antifoaming agents, stencil film, plastics, synthetic flavors, the flotation of metals, and many others. The acetone is used as a solvent for acetylene, airplane dopes, explosives, liniments, varnish removers, dewaxing lubricating oils, the manufacture of iodoform, chloroform, diacetone alcohol, and mesityl oxide.

By means of hydrolysis, enormous quantities of starch are used annually for the production of dextrins, syrups, and commercial dextrose. The dextrose is used in many food products and for conversion into such chemicals as citric, lactic, oxalic, succinic, fumaric, malic, and other acids; ethyl acetate, acetaldehyde, ethanol, sorbitol, mannitol; and resins for the plastic industries.

Although this list of the uses of starch may seem long, yet its potential uses in industry have scarcely been touched. One company alone consumes each day in the year the grain grown annually on 1,000 acres of fertile farm land. None of this grain is used for food, but all is converted into products which serve nearly every industry, from ore refining to medicine.

The chemist also uses as raw materials the oils, fats, and waxes in the manufacture of soap, glycerin,

and paints. From milk he obtains milk sugar and casein, which he in turn may convert into casein glue or casein plastics. From oat hulls and other wastes he obtains furfural, used extensively in plastics and as a selective solvent.

Another type of aid to agriculture is the development of commercial uses for new crops. A good example of such a service is seen in the history of the production of soya beans in the United States. Although soya beans have been raised in China for thousands of years and introduced here in 1804, large scale production here was not undertaken until 1920, when satisfactory methods for processing the beans for meal and oil were perfected. Now over six million acres are devoted to the production of this crop, which is used in part for pasturage, hay, and ensilage. The beans, which are characterized by their high protein and fat content and by the almost complete absence of starch, are processed to obtain oil and meal as well as small amounts of other constituents.

The soya bean meal is used to some extent for the manufacture of plastics, but because of the rather limited quantities of meal available, the cost of raw material is too high for extended use. Larger amounts of meal are used in the preparation of adhesives, which have been found valuable in the fabrication of ply wood. Another important discovery is that soya bean proteins can be converted into a paper sizing, which can be used on certain types of raw material that can not be successfully sized otherwise. This protein is also used satisfactorily as a paper glaze and for the preparation of weather resisting paints and kalsomine. Many food products are made from soya bean meal, including breakfast cereals, confections, vegetable milk, cheese, and diabetic flour.

The oil obtained from soya beans is unique in that it is both a drying and an edible oil; unlike most vegetable oils, it contains vitamins. It is used extensively as a salad oil and in the preparation of oleomargarine. Hydrogenated soya bean oil is used as a shortening compound.

Soya bean oil is not used extensively in paints, not because it is inferior, but because its wide use as a food keeps its price high. Paint chemists have shown that, as a paint vehicle, soya bean oil is superior to all others in giving a good finish for auto baking and air drying synthetics, as it gives a depth of color, freedom from peel, and a permanent elasticity not possible with other oils. A refrigerator finished with baked soy bean synthetics has a true porcelain appearance and exhibits grease resistance and permanency of color not possible with linseed, perilla, or tung oils. Paints made with soya bean oil are free from wrinkling and have a superior color retention which make them desirable for inside wall finishes as well as for baking resins. The chief objection to the oil is that it is rather slow drying; it is, therefore, not suitable for exterior paint unless

mixed with tung, perilla, or other oils. Other experimental developments, similar to the one just described, include that of the tung tree for the production of tung oil, of the perilla for its oil, and of pyrethrum, which is the basis of many insecticides.

Chemical research is not a panacea for all agricultural ills, but it does contribute substantially to their alleviation. Much progress has been made in the utilization of agricultural by-products, in increased production, and in the introduction of new crops. Further research should add materially to the progress already made.

Electrical Courses in Secondary Schools

E. W. JONES

The subject of electricity in the secondary school is a comparatively new and a much-neglected item in the present-day curriculum. So universal has the use of this modern form of energy become, touching the everyday lives of so many people in so many lines of human endeavor, that any boy, or girl for that matter, who, during his school life, is deprived of a chance to study the essential facts of its behavior and use will always be handicapped more or less, regardless of his career or calling. The inherent needs of life should be the objectives of education, both cultural and vocational.

If the intelligent use of electricity is to function in the everyday lives of young people, information concerning it should be made a part of their formal education. But the problem of teaching in the school what the students will later need and use is complicated by the rapidity with which the world is changing. Electricity is an example of that change; it is the symbol as well as the servant of progress. Almost within a generation it has grown from a seldom-considered source of power to one of the most common but perhaps one of the least understood utilities. A new industry with many branches has been built up. New methods and new standards have been established in all walks of life. A new vocabulary of terms and expressions, almost as complicated as a foreign tongue, has been introduced. Old ways of doing things have become obsolete. And the end is not yet. Changes are occuring now, greater and faster than ever before in history, changes that are penetrating into all the invisible depths of the social order. As a single example, where once the work of the world was slowly performed by the muscle power of toiling men much of it is now done by electric power, faster, cheaper, and better than ever before.

How may this new information become a part of the mental capital of the child and of the race? There is very little in the social heritage to supply it, and that little is steeped in mystery and confusion. Although recognized as a potential force for centuries, practical knowledge of electricity had its beginnings only a hundred years ago. For decades it remained the problem of the scientist and the plaything of the inventor, later becoming the tool of the engineer. Knowledge of its action and application was largely the exclusive possession of those groups. Now its use, but not its understanding, has spread out to take in nearly everyone. Our grand-

parents contributed almost nothing on the subject and our parents but a trifle more. The present generation is aware for the most part only of the cost and the danger of electricity and knows little of how to use it intelligently. Obviously such widespread usage warrants consideration of such subject matter as a part of the curriculum for the general student in the secondary schools.

For the general purpose of everyday life the course in electricity should be simple and direct, not technical or extensive. Its aim should be to help young people do those things electrically that they will always be trying to do anyway and to meet their needs, regardless of their vocations by giving them a practical working knowledge. The course should cover the fundamental science facts, the operation, care, and simple repair of common consuming devices, the ordinary rules of safety, and, to some extent, the economic and social tie-up of this subject with life situations. Such instruction should aim at educating consumers rather than the training of workers.

Girls as well as boys may properly take such a course, since they have much use for it. It has been estimated that women use seventy-five per cent more electrical devices than men, devices of which they should understand something of the operation, care, and simple repair. Sometime during his training period every child should come face to face with the essential information needed to promote the intelligent use and full enjoyment of the many time and labor-saving devices in use today. Much of the "mystery" of electricity may be removed, its ways familiarized, and its sources, uses, and dangers made a matter of common knowledge.

The course serves another very valuable purpose. Some few of the students will later specialize in some field utilizing electricity. For them, the course opens the field and sometimes permits individuals to "find themselves" somewhat earlier in life than they otherwise might. A few years' advantage at this stage of life is of considerable importance. Thus this first course, in addition to imparting useful and practical knowledge, would serve admirably in the cause of vocational guidance.

Vocational training is, however, for a different purpose and has different objectives. Consequently it should receive a different treatment. It is training for production in which more specialization is required. Vocational efficiency should be the universal possession of all, and every student should be given opportunity to secure vocational training suitable to his taste and talent. To a large extent, this should be provided by the school in the new curriculum since a very important part of every young person's practical education lies in preparation for making a living.

For the students that develop a vocational interest in electricity during this preliminary course, there should follow a somewhat

more technical course which would introduce the science content of electricity. This course should serve to satisfy the natural curiosity of the active boy as to the why and how of things and replace the too frequent attitude of fear and mystery with understanding and confidence of practical reality. It should introduce him to the literature of electricity through specific references to good books and magazines and thus lay the foundation for more intensive study.

The courses just mentioned may be offered during junior high school, perferably during the eighth or ninth grades, and should cover a total of two or three semesters. The first course should be required, the second should be elective. To install these courses where no electricity is included in the curriculum at present, it would not seem necessary or best to lengthen the training period but to replace a part of some other subject of lesser importance. It is now recognized by leading school men that important subjects have been neglected in the past because of the stress placed upon the so-called academic subjects, but there are indications that electrical courses are beginning to receive their share of interest and consideration.

Where the study of electricity is carried into the senior high school, a course of an advanced vocational nature may follow closely the work previously taken. This course should be planned for the boy who has quite definitely chosen electricity as a life's vocation.

It is my opinion that all these courses should be made strong in shop work, teacher demonstration, and field trips, so that personal participation by the students themselves under conditions of controlled experience may give vitality to the principle studies. The use of materials and tools, the handling and observation of real circuits and apparatus, and the construction of devices that successfully operate give a breadth and depth that can be obtained in no other way.

During the last year or two of the training period the boy should be encouraged and helped to obtain part-time employment in the trade itself in order to have contact with the special line of work in which he expects to engage after completion of high school. Thus his school work will be strongly and naturally motivated. He will not drop out from lack of interest because he can see the advantage of training. There will be built up within him a steadying and satisfying sense of importance in his chosen work which will dim the illusion of the white-collar job, too often held up as the only worthy attainment. Furthermore, there will be less of the charge made by industry and business that graduates of high schools have little of value to show for their years of training because of the lack of correlation between the work within the school and the world outside the school.

Organic Qualitative Analysis in Elementary Organic Chemistry

O. W. CHAPMAN

In a recent article Coghill and Sturtevant[1] described the plan of teaching the laboratory course in elementary organic chemistry which has been practiced at Yale University during the past four years. In the hope that the plan might increase interest in the course taught at the Kansas State Teachers College of Pittsburg this year, I put into operation a modification of the plan as used at Yale University.

The elementary course in organic chemistry in the Kansas State Teachers College consists of two semesters of five credit hours each. Each student spends not less than four hours a week in laboratory work. The laboratory manual used is that of Adams and Johnson[2], in which the first nine experiments are designed to develop skill in the principal operations employed in organic chemistry. Most of the remaining experiments are for the preparation of a variety of compounds. Heretofore I have selected about forty of the preparations to be made by each student in the course of the year.

[1]Coghill, Robert D. and Sturtevant, Julian M., *J. Chem. Ed.* 14, 68-70, 1937.

[2]Adams, Roger and Johnson, John R., *A Laboratory Manual of Organic Chemistry*, 2nd ed., Macmillan, New York City, 1933.

Coghill and Sturtevant have pointed out that there are objections to this method of teaching. The chief objections are that in only a few of the preparations does the student learn new methods; that there is danger of developing "cook book" technique; and that in making the preparations the student fails to get first hand contact with reactions studied in the classroom. Because of these objections and because they believed that qualitative analysis in organic chemistry has as great pedagogical value as in inorganic chemistry, preparations have been omitted from the second semester's laboratory work at Yale University, and a course in elementary qualitative analysis has been instituted.

To facilitate the teaching of such a course, the second part of the laboratory manual of Coghill and Sturtevant[3] is devoted to analysis. The method outlined consists of the following steps: purification of the compound, determination of physical constants, elementary qualitative analysis, and preliminary identification by a series of special tests. In connection with the

[3]Coghill, Robert D. and Sturtevant, Julian M., *An Introduction to the Preparation and Identification of Organic Compounds*, McGraw-Hill Book Co., Inc., New York City, 1936.

tests there is a guide in which compounds are divided into orders depending upon what elements are present and into groups depending upon water solubility and whether the substance is liquid or solid. The last step, the preparation of the derivative, teaches the student how to terial, an experience from which he receives valuable training in the selection and methods of preparing the derivatives.

In the experiment at the Kansas State Teachers College, a shorter time was devoted to the qualitative part of the work than at Yale University. Only the last six weeks of the second semester were thus used, the first twelve weeks being devoted to preparations. In this short time, however, each student was given four different compounds. The substances selected as unknowns were fairly simple and quite pure single compounds. Although the time was short, each of the fourteen students in the class succeeded in identifying all of his unknowns. Not a single erroneous report was made, and in each case a portion of the derivative was submitted with the report.

The students of the experimental class consisted of chemistry majors, chemical engineering majors, and pre-medical students. Since the experiment some of the chemistry majors have gone on into a one semester course for seniors and graduate students, devoted entirely to qualitative and quantitative organic analysis. While it may be too soon to predict, it appears that the six weeks' training has been of great value to those who take the advanced course and, no doubt, will be of even greater value to the students who take no other course in chemistry, owing to the contact they made with analytical operations which they would ordinarily not have had.

Do You Know?

ELSIE BROOME

The highest to the lowest highway in the United States connects Mount Whitney, 14,494 feet (highest point in the United States), with the lowest point, Death Valley (280 feet below sea level)?

The Amazon Basin has a seaport two thousand miles from the sea? Regular ocean vessels ascend the river to Manaos, nine hundred miles from the sea, and at flood season ocean vessels can go to Iauitos, Peru, more than two thousand miles from the coast.

The spice of life to Zanzibar? Extensive groves of clove trees cover almost half the island. Zanzibar and the small island of Pemba supply more than ninety percent of the world's cloves. Ten thousand tons of this spice are used to season foreign fruits and delicate meats.

Bamboo which furnishes food, shelter, clothing, and tools to the Oriental is being introduced into the United States? The government is experimenting with 275 species of bamboo in the Ogeechee River Valley. The Americans are finding even more uses for this plant than the Orientals.

Passengers going through the Panama Canal from the Atlantic to the Pacific come out 25 miles east of their starting point? They may also come out eight feet higher on the water. The tide on the Atlantic side is only a few inches while that on the Pacific side rises and falls on the average about eight feet.

The difference between chocolate, cacao, and cocoa? The tropical tree which is the source of chocolate is called the cacao tree. The tree bears large leathery-like pods which contain cacao beans. The beans are removed from the pod, roasted, and ground, and the substance resulting is called chocolate. If the oil is pressed from the ground bean, the substance left is called cocoa.

The Gold Coast, in west central Africa, has gold found in the region, but most of its gold is the income from cacao and palm oil?

The Ivory Coast, in west central Africa, does not export ivory? Its supply of ivory has been exhausted and now mahogany, cacao, and palm oil are its principal exports.

New Guinea, an island of the East Indies, does not raise guineas? By a stretch of the imagination the island might be seen to resemble the shape of the fowl which bears this name. Among the animal life there are found many gaily colored birds, especially the brilliant bird of paradise.

Greenland is not a land of green

vegetables? More than three fourths of its surface is covered with a great ice sheet 2,000 and more feet thick. The interior may be the coldest place in the world. Only four expeditions have ever crossed this island and they found only ice, bare rock, and a very cold wind that blows out from the center. Its shores contain some of the largest and deepest fiords in the world. The great ice sheet of Greenland sends most of the icebergs southward to become a menace to transportation in the North Atlantic. Only a small portion of its southeastern shore contains green mosses and lichens. Very hardy crops can be grown for a short time in summer.

Deserts would be totally unpopulated if it were not for the camel and the date? The camel furnishes transportation, food, drink, and wool for clothing and blankets. The date, half buried in sand, can send its long roots down to alkaline water and thrive. Its fruits are used for food, the body of the tree supplying posts and furniture for huts. The bark is a fiber which is used for rope, sacks, and matting. The leaves are used for fuel, thatch for huts, and packing cases for the exported fruit.

Iceland is not just a land of ice and snow? The island is less than half as large as Kansas and supports more than half as many people. It is sometimes called the land "of ice and fire." The whole island has been built up by the outpouring of volcanoes. At least one hundred craters still bear signs of life. Hekla, the most famous volcano and great geyser, hurls its immense columns of almost boiling water to a height of more than 150 feet. The island contains the hottest spring in the world, whose waters, below the surface, are 50 degrees above the boiling point. Hot springs, bubbling mud lakes, spouting geysers, flocks of birds, and a very intelligent people make this island one of famous tourist resorts of the world.

The little island of Helgoland, Germany's island fortress, is crumbling away beneath its 25,000 inhabitants? The island is a triangular block of red sandstone which England gave to Germany in exchange for extensive territory in Africa in 1890. In England the transaction was regarded as the exchange of a "button for a whole suit of clothes." Helgoland was then fortified and became the Gibraltar of the North Sea. It protects the Kiel Canal, built by Germany to connect the Baltic Sea with the North Sea. This mighty fortress protected the German coast during the World War.

CAMPUS ACTIVITIES

Kappa Delta Pi, national honorary education fraternity, held initiation services for fourteen junior, senior, and graduate students at 5:30 o'clock in the cafeteria annex, Jan. 12. Initiates included: Mary Elizabeth Allmen, Vilas; Mary Helen Austin, Pittsburg; Doris Clark, LaHarpe; Veda Courtright, Independence; Donald Graham, Lansing; Martha Hessong, Fort Scott; James Humble, Cedar Vale; Fred Jarvis, Columbus; John Lagneau, Girard; Iris McIntosh, Mound Valley; Hazel Miles, Fulton, S. D.; Naomi Thompson, Grenola; Mrs. Tracy White, Pittsburg; Harry Zook, Fall River.

J. A. Trent, Assistant Professor and Director of Teacher Training in the Department of Biology, has returned from a year's sabbatical leave spent at Ohio State University studying in the field of botany under the direction of Dr. Edgar N. Transeau, well known authority in plant physiology. Mr. Trent has completed his course work, language requirements, and preliminary examinations toward his Ph. D. degree, and is now working on a problem in the field of plant physiology.

Charlie Morgan, assistant football coach and chief "troubleshooter" for the Gorilla athletic department for the last seven years, was appointed head football mentor by President W. A. Brandenburg to fill the vacancy left by the resignation of "Blue" Howell.

The Festival orchestra under the direction of Walter McCray is busy with concerts both in Pittsburg and in other cities of the district. At Chanute on Feb. 10 the orchestra presented an afternoon concert for the benefit of the school children and featured the demonstration of the different orchestral instruments. That evening the orchestra appeared as one of the features of the Chanute concert series. Other out-of-town concerts are scheduled for April 3 at Ft. Scott and April 7 at Baxter Springs.

Dr. C. B. Pyle, Dr. J. A. Glaze, and Dr. Paul Murphy, of the psychology department, administered psychological and educational tests to thirty-eight enrollees of the CCC camp at Farlington, Kansas, the latter part of September. This was one phase of nationwide testing to evaluate the effectiveness of educational activities carried on in

CCC camps. A similar testing program was carried on at the Farlington camp by these three K. S. T. C. psychologists last April.

Louise Gibson was one of twenty-five teachers and administrators sent by the State of Kansas to George Peabody College, Nashville, to work during the summer quarter on the Kansas program for the improvement of instruction. Her special problem dealt with the teaching of consumer education in the clothing field from the first grade through junior college.

Eight students became charter members of the Tau chapter of Kappa Pi, honorary art fraternity, in installation services which took place in the art rooms of the Industrial Arts building Saturday, Feb. 5, at 5 o'clock. Miss Garnet R. Leader, national organizer of Kappa Pi and public school art instructor in Birmingham, Alabama, came to install the charter here.

President W. A. Brandenburg has announced that he has issued a formal invitation to supervisors and teachers to hold a Regional Conference on current problems of industrial arts at the College on Friday and Saturday, Oct. 7 and 8, 1938. Invications will be sent to the State Departments of Public Instruction, to departments of industrial education in all public and private universities, colleges, and teachers colleges, and to all city supervisors and teachers of industrial arts in the four adjoining States of Kansas, Missouri, Oklahoma, and Arkansas.

A general program committee has been organized, consisting of the following: O. B. Badger, Tulsa, Oklahoma; L. E. Falgren, Kansas City, Kansas; C. B. Gatchell, Joplin, Missouri; R. B. McHenry, Fort Smith, Arkansas; V. L. Pickens, Kansas City, Missouri; J. C. Woodin, Wichita, Kansas; O. A. Hankammer, K. S. T. C., Pittsburg, Kansas; R. L. Schwanzle, K.S.T.C., Pittsburg, Kansas; W. T. Bawden, *Chairman*, K. S. T. C., Pittsburg, Kansas. The three members of K. S. T. C. faculty have been designated an Executive Committee on arrangements and will be responsible for local details and publicity.

Miss Bertha A. Spencer, Associate Professor of Art, is represented in the fourteenth annual exhibition of work by Kansas artists which was held in February at the galleries of the Topeka Art Guild.

President W. A. Brandenburg met several graduates of the College who are doing highly successful work in their fields when he attended the N. E. A. convention at Atlantic City. He said that alumni of the College are doing outstanding and diversified lines of work in all parts of the country.

The Kansas State Association of Health and Physical Education met in Pittsburg, March 25 and 26, with Miss Hazel Cave acting as Convention Manager.

FIELD NOTES

Ralph O. Hammer, history major 1931, was recently elected president of the Butler County Teachers Association. There are three hundred teachers in this organization.

Alvin Proctor, M. S. in history 1936, is teaching history and dramatics in the senior high school at Hot Springs, New Mexico. He is also teaching an extension class in history from the University of New Mexico at Albuquerque.

Lindley Stanley, who received the M. S. degree in history in 1937, is a teacher in the social science department at Ft. Myers, Florida. Last year Mr. Stanley was academic head of Patterson School, Lenoir, North Carolina.

Miss Florence Penn, Director of Public School Art at Coffeyville, will receive her Master of Arts degree from Columbia University at the close of the summer session. Last summer one of her mural paintings was given special recognition by the department and the University. Miss Penn received her B. S. degree with a major in Fine Arts from K. S. T. C. in 1930.

Mort E. Smith, a former K. S. T.C. student, now director of art at Sterling College, was represented at the Botanical Garden Museum in New York by his block print entitled "Old Mine in Creede." Mr. Smith was elected to the faculty of the Greater University of Tours and last summer directed the eastern Appreciation and History of Art caravan, which covered the United States and parts of Canada.

Mrs. W. L. Snider, formerly Miss Lillian Bohl, B. S. 1933, recently exhibited a picture entitled, "Indiana Home," in the Co-operative Artists Gallery in Kansas City. Miss Bohl is a member of the Art Association of St. Joseph.

Marvin Hawker, who is a graduate of the Kansas State Teachers College Pittsburg, is a student this year in the Graduate Division of the school of Education, Kansas University. He has recently been awarded a scholarship in the Graduate School for the second semester of the present academic year. Other recognitions he has received while

in Lawrence includes inititation in the Kappa Chapter of Phi Delta Kappa and election to the Editorial Staff of the Kappa Chapter News, a bimonthly publication of Phi Delta Kappa of the local chapter.

Prof. Arthur M. Banta, scientist of the department of biology, Brown University, and his associates, Dr. Lester Ingle and H. Howard Dunham, graduates of K.S.T.C., have announced a possible cue for longer human life in experiments which have nearly doubled the life span of one kind of lower animals by regulating its food supply.

Although Professor Banta made it clear that a close parallel between longevity in daphnia and longevity in humans should not be drawn, he said that "it seems possible that the results of studies with lower animals may point the way to longer life for man."

Dr. Ingle is an instructor in the Department of Zoology, University of Illinois, and Mr. Dunham is a fellow in the Department of Biology, Brown University.

Edward Rankin, B. S. in history in 1928, who has been connected with public schools of Houghton Lake, Michigan, for the last eight years is at present holding the position of superintendent.

Time for Jan. 3, 1938, carried a story on the magazine *Building America,* a publication for junior and senior high school students, dealing primarily with the subject of our nation's resources and how better they can be conserved. The editor of this magazine, which is spoken of in the highest terms, is Dr. James E. Mendenhall, son of Professor Edgar Mendenhall of the Education Department of the College.

WAYFARING

This column is devoted to notes and letters from faculty members away on leave or from other friends of the college who are doing interesting things.

Springfield, Illinois
February 8, 1938

To the Editor:

My last letter to you was written at Cambridge, Massachusetts. After completing our work at Harvard and at the Boston Public Library, we spent some time visiting the many places of historic interest in and around Boston. Then we went to Salem, interesting for the witchcraft episode, for its stately houses with their beautiful doors, houses built by sea captains of an earlier age, and for other reasons.

To me, however, the most interesting place we have visited is Gloucester, the port of fishermen. Most of its men live on the sea and its women wait for them to come home. As many have never come home, a beautiful monument to their memory stands by the shore, an expression of a tragic chapter in Gloucester's history. A visit to and around Cape Ann, with the "Reef of Norman's Woe" and other points of interest.

I have, for a long time, had a desire to see the boyhood home of Whittier. So we spent a night in Haverhill and early next morning drove out in the country to the farm where he probably gained the inspiration for "The Barefoot Boy" and "Snowbound."

We found our trip across New Hampshire and Vermont very interesting, the scenery in the late autumn being beautiful. Crossing over into northern New York we came soon to Schuylerville and the site of the battle of Saratoga. By most historians this battle is considered the turning point in the American Revolution and indeed one of the most decisive in all history. It was fought on a larger scale than most students realize and markers and monuments extend for miles to the southward of Schuylerville.

To me the most impressive features of this battle site are two in number. One of them has to do with Benedict Arnold. On the hill to the west of Schuylerville stands the Saratoga Battle Monument. On each of its four sides is a niche. In three of the niches is a statue in honor of an American commander,

but the fourth niche is left vacant. It might have belonged to Arnold. Far to the southward, on the site of Burgoyne's great western redoubt, is the "boot monument" for Arnold. It was here that he stormed the Hessian stronghold of Colonel Breyman and was severely wounded.

The other feature is the well of water in the field of Saratoga where both British and American wounded dragged themselves to quench their thirst.

After using the New York State Library at Albany we went to Niagara Falls where, we think, we were one of the last couples to stand on "Honeymoon Bridge."

In Ohio we stopped at several county seats to use certain records. We also used the libraries at Western Reserve University and Oberlin College. I then made a trip to Chicago to work for a time at the Chicago Historical Society Library, at Newberry Library, and at the University of Chicago.

For some time we have been here at Springfield, Illinois, working in the Illinois State Historical Library. In a few weeks we plan to go to several libraries in Iowa and Missouri.

The way of the historian is long and devious!

Very sincerely
Ernest Mahan.

COMMENTS ON BOOKS

Things Past Redress

By Augustine Birrell, London, 1937, Faber and Faber Ltd.

In these days when the British Liberal is becoming a rare if not highly valued political specimen, the memoirs of a Liberal statesman may cause something akin to nostalgia. The autobiography of the late Augustine Birrell paints a fascinating picture of the Victorian and Edwardian eras. A lawyer, Member of Parliament, Cabinet Minister, and man of letters, the author had many fields of experience upon which to draw; and near the close of his long life of more than fourscore years, the biographer of Andrew Marvell, William Hazlitt, and Charlotte Bronte wrote his own biography. He did not live to see it published.

Of his parents he writes with unusual sympathy and understanding; and the early death of his mother was a source of profound grief. His father was a Noncomformist minister of Liverpool; and Augustine was one of a family of nine children. Had it not been for a timely legacy received after he had been apprenticed to a Liverpool solicitor, Birrell might never have attended Cambridge; but this was a happy turn of fortune in his long and useful career.

In telling of his success at the bar, his becoming King's Counsel, and his political campaigns, the author employs an urbane and anecdotal style that lacks the brilliance of Chesterton's prose but charms the reader by its engaging modesty. In describing some of the lawsuits in which he took part, Birrell may seem a trifle tedious to the layman; but for the lawyer this portion of the book is of exceptional interest. Even in his purely literary ventures one finds the flavor of legality: witness the titles of two of his collections of essays—*Obiter Dicta* and *Res Judicatae.*

As President of the Board of Education with a seat in the Cabinet under Campbell-Bannerman, Birrell had a difficult task. It fell to his lot to pilot through Parliament the Education Bill of 1906. After passing the House of Commons it was sent back from the House of Lords with so many amendments that it finally perished. Significant is Birrell's comment:

> "No Election cry, no parliamentary majority, can make, at least it could not in

1906, the education of the people a real, genuinely felt National Question. Education is in most of its important aspects a teacher's question, and smacks more of the Lecture Hall or a Social Service Congress than of a mass-meeting. A prize-giving can never compete with a football match!"

Through his marriage with Eleanor Locker Tennyson, Birrell became acquainted with the Poet Laureate; and he met Robert Browning and Matthew Arnold on various occasions. His personal recollections of these great Victorians as well as his comments on Carlyle and Newman will be to some readers the most interesting portions of this book.

—R. Balfour Daniels.

Letters to Susan

By Margaret Culkin Banning

Morals and manners for modern young people are ever present topics for discussion. One of the recent books deals informally with such problems in *Letters to Susan* by Margaret Culkin Banning, Harper and Brothers. The letters were an outgrowth of an article that appeared in Harper's Magazine on "What a Young Grl Should Know," which led to widespread discussion and correspondence.

Through a series of letters written supposedly to her daughter in college, Mrs. Banning discusses such topics as chaperons, the unpopular girl, use of money, petting, drinking, loyalty, and others of a similar nature which arise in the life of a young girl trying to find herself in the modern world. The advice is wise and friendly, showing full and sympathetic understanding of modern young people and at the same time a just appreciation of the larger values involved in the problems which are overlooked in the thinking of youth.

Young people themselves will find much of value and interest in the volume, while teachers, club leaders, and parents will welcome the clear presentation of the problems involved.

—Josephine A. Marshall