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COMMERCE AND BUSINESS ADMINISTRATION and MATHEMATICS NUMBER

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PITTSBURG, KANSAS

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The winding roads, lagoons, and picnic grounds in Crawford County State Park, five miles north of Kansas State Teachers College, attract many visitors.

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The Educational Leader

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Contributions of Commerce to Mathematics

J. A. G. Shirk

Sometimes the workers in one field of learning are unaware of the influence of other fields upon their own, and they erroneously believe that all the important contributions to its advancement have been made by individuals whose principal interest has been along that particular line. Probably this conception is due to the great progress that has been made during the nineteenth century in almost all phases of human activity thus making it impossible for any one to make further contributions except those who have delved deeply into that special realm.

While today most fields have already been extensively developed, there are still a few lines of thought in which relatively little has been accomplished. The frontiers of these new realms are rather close to us, and very important contributions are not infrequently made by workers with an established reputation in some older field.

Mathematics, as one of the oldest sciences, has long since pushed its frontiers so far away that investigators in one division of mathematics are unable to follow intelligently the researches in other phases. Henri Poincaire is often mentioned as the last generalist in mathematics. At his death in 1912 no living mathematician was able to wear his mantle of universal mathematical knowledge and attainments. As we scrutinize the research activities of the prominent mathematicians of today, we find it relatively easy to list each one as being rather definitely confined to a limited number of mathematical domains. The aspiring devotee of mathematics is able to acquire only a broad survey of the several phases of the subject; after doing this he must confine his efforts to some particular type of research in order to be able to add to the vast store of mathematical knowledge.

It is the purpose of this article to set forth the influence that commerce has had upon the development of mathematical ideas, and to show how such ideas have been disseminated through the operations of commercial transactions.

The beginnings of mathematics are shrouded by the veil of the prehistoric unknown, and we can only surmise as to how the elementary mathematical notions were evolved. There are still a few very backward tribes whose manner of thought is probably not much different from the uncivilized ancestors of those early civilizations whose mathematical attainments we now know quite well. Primitive man early learned some notions of geometrical form and design in the making of pottery and in painting designs upon it. Counting probably came at a still earlier stage in the enumerations of objects or animals possessed by the tribe or by individuals.

The number of fighting men of the tribe as compared to the number of their enemies was most essential to the continued existence of the tribe. The exchange of various articles in the beginning of commerce made a knowledge of the size, shape, and number of such articles quite desirable. The simple operations of addition and subtraction must necessarily have been developed in connection with these commercial transactions. The operations were performed by the use of some type of counting device. In very simple cases where the numbers involved were small, this counting was probably done by the aid of the fingers and toes. The operations with larger numbers made some other devices necessary, and the sand board, wax tablet, and abacus were developed to provide concrete means of performing arithmetical operations.

The earliest civilizations employing mathematics were the Egyptian and the Babylonian. The Egyptian mathematics was not developed through the impetus of trade, but rather as an aid to the construction of pyramids, obelisks, and temples and in connection with the resurveying of land after the sediment from the overflow of the Nile River had covered up boundary marks or when the river had washed away portions of fields. There was also an extensive irrigation system in which the construction of canals and ditches made elementary leveling processes imperative.

Egypt carried on very little commerce with the rest of the world previous to its conquest by foreign kings about 1600 B. C. The country had sufficient resources to meet all its needs; hence trade with other nations was not necessary. Also the Arabian desert had to be crossed to make contacts with the other great civilizations of that period. At a later period, the mathematics of Egypt was given to other peoples by means of traders who came to Egypt for the purpose of exchanging their wares for the products of the Nile Valley.

On the other hand Babylonia was an aggressive commercial nation. Situated midway between the nations of southern and western Asia, it was in a position of advantage to carry on the trade of the world. Great mercantile firms were developed, and almost all of the principal business procedures now in use were developed by this resourceful people. Contracts, mortgages, notes, partnerships—all expressed with capital of dates, date wine, flour, oil, barley, and sometimes silver—were recorded on tablets of soft clay. These tablets were then hardened by baking which made them very durable. Records of the commercial transactions of some of the large firms over a period of several generations are found in the mounds which mark the ruins of once populous cities.

Interest rates were probably standardized by law or custom, as almost no mention is made of the rate of interest charged, although there is abundant evidence of the loaning of capital and the payment of interest for such loans.

The laws of Hammurabi, codified about 2100 B. C., show very clearly the commercial development of Babylonia. These laws contain many provisions concerning the relations of agents to employers, losses of goods due to hazards of travel, penalties for fraud or violations of agreements, and many other business situations.

The commercial mathematics of the Babylonians was much more extended than is commonly thought. Recent investigations have brought to light ingenious operations with fractions and even the solution of some problems that are fundamentaly algebraic in character. Possibly the Hindus obtained some of their first concepts from the Babylonians. The place value idea seems to have originated with the Babylonians and next appears in Hindu mathematics. Unless this idea was independently developed by the Hindus, the commercial contacts of the Hindus with nations whose culture was influenced by Babylonian concepts must explain the reappearance of this very important concept in number representation.

The greatest commercial nation of the ancient world has left no records that compare in completeness with those of Babylonia. From 1600-1000 B. C., the trade of the world was carried on by the Phoenicians. Caravan routes led eastward even as far as India, and ships went regularly to Spain and even to England for silver and tin. Undoubtedly most of their trading was merely barter but they must have used considerable arithmetic in such extensive commercial enterprises. They were the greatest ship builders of antiquity, not only making them for their own use but selling them to other nations. Solomon bought ships from the Phoenicians for use in his trade with Arabia. These ships were transported in separate pieces to the Red Sea, where they were assembled. The marking of each part must necessarily have involved ideas of position and number that are essentially mathematical.

The Greeks were early driven into commerce by the lack of certain products in their home land. In reaching out to other lands, they established cities in Asia Minor, in Italy, and on many islands of the Mediterranean. Miletus in Asia Minor was the first to become important. Thales was one of its most prosperous merchants. He made many trips to Egypt for commercial purposes and perhaps went to Babylonia. He became interested in the geometry of the Egyptians and the astronomy of the Babylonians.

The geometry of the Egyptians was partly intuitive and partly empirical. There was no thought of demonstrating formulas but only of evolving processes of finding the lengths and areas necessary to their peculiar agricultural conditions and for the building operations which they conducted so extensively. Thales was the first man to appreciate the desirability of demonstrating geometrical theorems, and while he can be credited with proving only five or six theorems, he deserves great honor for laying the foundations for demonstrative geometry. To commercial activities belong the transformation from the empirical geometry of the Egyptians to the demonstrative geometry of the Greeks, since it was through commerce that Greek merchants first came into contact with the Egyptian mathematics.

We have almost no records of Greek arithmetic used in connection with their extensive commerce. This is due to the fact that the Greeks put utilitarian mathematics in an entirely different category from theoretical work. In their estimation, the only mathematics worthy of preservation was that type which was obtained as the result of logical thought.

It is almost universally true that commerce and its attendant wealth produce the conditions under which the arts and sciences can flourish. Greek centers of art and learning followed the centers of trade from Greece to the coast of Asia Minor, to the island cities of the Mediterranean, to the Greek cities in Italy, and to Alexandria. Thus did trade and commerce stimulate the development of logical mathematics among the Greeks and cause its spread over almost all of the civilized world of that era.

The Romans were at first predominantly an agricultural people, but their trade led them into an extensive commerce, and they acquired a reputation for honesty and fair dealing that made them soon the commercial leaders of the world. Roman ships went to Africa, Spain, France, India, and even to China. Practical arithmetic and constructive geometry were the only types of mathematics that appealed to the Romans. The risks encountered by storms and pirates led to the insuring of ships and cargoes against these hazards. This seems to be the beginning of maritime insurance. Again commercial operations had produced a new aspect of arithmetic. After the fall of the Roman empire, the practice of insuring ships and cargoes was discontinued until the rise of the Italian cities of Venice, Pisa, Genoa, and Florence.

After the fall of Rome, Europe passed into a dormant condition intellectually which is generally called the Dark Ages. Italian merchants from the cities mentioned went to Syria, Northern Africa, Flanders, London, and many other remote regions. The Arabians had settled down to develop the countries captured by them. They absorbed the culture of the captured peoples and became intensely interested in art and science, particularly mathematics. The Italian merchants came into contact with these Arabian peoples and learned of the ancient mathematics that had been treasured by the Arabian scholars.

Through trading operations the Arabians had come into contact with the Hindus of India and received from them the Hindu system of numerals together with the Hindu scheme of representing numbers. The Arabians also obtained algebra from the Hindus who had solved both the linear and the quadratic equation. Arabian mathematics was introduced into Italy through the outstanding work of Fibonacci, whose father was agent for Pisa in its trade with the Arabian city of Bougia in Northern Africa. Fibonacci introduced the new numerals into Europe along with the algebra which the Arabians had received from the Hindus and had developed quite extensively. Again the spread of mathematics is due directly to the operations of commerce. Since Fibonacci introduced the new numerals into Europe from Arabian civilization, they were known as the "Arabic Numerals," and not until recent times have they been given the name of Hindu-Arabic Numerals in recognition of the part that one people played in originating these numerals and the other people in transmitting them to Europe. This important transmission was made about 1200 A. D., and from that date most of the important advances in mathematics were made in Europe.

The great fairs of medieval Europe led to the development of many new problems in arithmetic. Problems of exchange, customs duties, profit and loss, drafts, and deferred payments became of great importance. Arithmetics were written to expound the methods of solving these problems. Among the most important of these arithmetics was Borghis' *Arithmetic*, published at Venice in 1484; Widman's *Arithmetic*, in Germany in 1489; Adam Riese's *Arithmetic*, published also in Germany in 1522; and the *English Arithmetic* of Robert Recorde, published about 1540.

In these distinctly commercial arithmetics is found the first use of many mathematical symbols. Widman introduced the plus and minus signs used today. These were introduced into England by Robert Recorde who was the originator of the equality sign.

During this period the risks of trade led to the revival of maritime insurance by a group of London merchants who met in Lloyd's coffeehouse in London. This was the origin of the great insurance business of Lloyd's of London. Fire insurance rapidly followed, and other forms of insurance were developed until almost anything can be insured against any type of loss.

Perhaps the two most outstanding contributions of commerce to mathematics were the interpretation of negative numbers as losses by Fibonacci and the invention of decimals by Stevin. Before this useful interpretation of negative numbers was made by the merchant of Pisa, negative numbers were not considered as having any practical value. When negative answers were encountered in solving any problems, these answers were rejected as being of no practical significance. Their very name indicates this attitude toward them, being derived from the Latin word "*negare*" which means to deny. Since that time, so many other useful interpretations of negative numbers have been made in science and engineering that they are now thought of as being just as important as positive numbers.

Before the invention of the Hindu-Arabic numerals, fractions were expressed in a variety of ways to simplify somewhat the operations with them. The need for simpler computations in commerce was the impelling motive in these ancient schemes of representing fractions and working with them. The Egyptians used what are known as unit fractions. In these fractions the numerators are always unity and the denominators are positive integers. They found it convenient to have one fraction not of this type which was $\frac{2}{3}$. By means of these unit fractions they could express any fraction. As an example,

$$6/7=\tfrac{2}{3}+1/7+1/21.$$

The use of the special fraction $\frac{2}{3}$ made it possible to represent many fractions in a simpler manner than by unit fractions alone, since without its use $6/7=\frac{1}{2}+\frac{1}{6}+1/7+1/21$. The Babylonians used fractions whose denominators were multiples of 60, in a manner somewhat suggestive of fractions whose denominators are powers of 10, which in reality are decimal fractions with the denominators omitted and with the numerators arranged in definite positions to indicate their respective denominators.

The Hindu-Arabic numerals were introduced into Italy by Fibonacci near 1200 A. D., and it was almost four centuries later before Simon Stevin completed that number system by the invention of decimal fractions. Until this was accomplished there was not so great an advantage in using the Hindu numerals, but after decimals were invented and a good symbolism was developed, it was only a short time until the use of other systems of numerals was entirely discarded in commerce. Stevin lived in the Netherlands and was inspector of the dykes, quartermaster general of the army, and minister of finance. These positions are evidence of his executive ability in financial and commercial affairs. It is evident that Stevin arrived at the discovery of decimals by combining the essential features of sexagesimal fractions with the place value idea of the Hindu-Arabic numerals. After trial by many prominent practical men, the decimal system was recommended by them as much superior to all short cuts or devices then in use for using common fractions. Stevin showed how all the computations met in business could be performed by integers alone without the aid of fractions. He suggested that most practical work could be made much less complicated if the units of measure would be divided into tenths, hundredths, etc. This was done in the formation of the Metric System of weights and measures and is now being practically used in the English System. The surveyor now subdivides the foot into tenths and hundredths, and the machinist subdivides the inch in a similar manner. The sizes of electrical conductors are decimally expressed in mils. Further evidence of the value of the decimal system is the manufacture of surveying instruments on which the degrees are divided into tenths and read by verniers to hundredths. By the decimalization of units used in special vocations, it will be possible to utilize the great conveniences of the decimal system before the Metric System is universaly used. Four centuries elapsed between the introduction of the Hindu-Arabic numerals into Italy by Fibonacci, and the invention of decimals by Stevin, and it now seems as if another four centuries may elapse before the final adoption of a complete decimal system in all weights and measures. When that is accomplished the vision of Simon Stevin will have been realized.

Another most important contribution of commerce to mathematics was in the invention of calculating devices. Some types of calculating devices were developed especially for architects and engineers but others were devised as aids in making the computations encountered in business. Those devices particularly adapted to commercial activities are generally known as calculating or computing devices and machines.

If relatively simple in construction, they are called devices, but when their construction and operation becomes more complicated, they are called machines. Among the calculating devices extensively used were the wax tablets and sand boards of the early Greeks and the various forms of the abacus used by the Greeks, Romans, Medieval Europeans, Chinese, and Japanese. Loose counters laid on lines laid off on a board were used to represent numbers on the medieval counting board, which is really a form of the abacus. The operations on the abacus quite generally gave place to operations on the counting board, and this in turn was used less as operations with the Hindu-Arabic numerals became more generally known. The greatest disadvantage in connection with the use of either the abacus or the counting board was that some numbers used in the computation disappear as the work proceeds, hence making the reviewing or checking of the work very difficult or even impossible.

The invention of the adding machine by Blaise Pascal in 1642 as an aid to his father in auditing the government accounts at Rouen, France, was probably the most important step in the development of calculating machines. The same principle is used in most of the multiplication machines later developed almost simultaneously in England and in Germany. Many special forms of computing machines have been developed for use in banks, mercantile establishments, and manufacturing enterprises.

The influence of commerce on mathematics may be briefly summarized under the following important accomplishments:

1. Development of prehistoric number concept.
2. Development of elementary mathematical operations.
3. Dissemination of mathematical knowledge by early traders.
4. First interpretation of negative numbers that gave them practical significance.
5. Invention of decimals.
6. Invention of calculating devices.

When viewed as a whole, the influence of commerce on mathematics is seen to have been most stimulating. Without the urge for better and more rapid ways of making the calculations of commerce, the progress of mathematics, to say the least, would have been very much retarded.

Law as a Medium of Social Control

WALTER SAMUEL LYERLA

Primitive man recognized no rule of law other than the rule of might. Since he lived in comparative isolation, no rule of conduct was laid down by higher authority to govern his daily activities of life. His desires for food, clothing, and shelter were so meager and so easily attained that these were had by the expenditure of the smallest amount of energy. Little or no competition from his fellow men hindered his taking what he chose.

In time, as numbers of these primitive people increased, their paths crossed and they found each other often desiring the same thing. No longer in this second step of primitive advancement was man free to take whatever he desired, but a common desire for comradeship made him willing to concede some rights to the other fellow. At this point it became necessary to establish rules for the common good of all. Each person was forced to give up some individual right for the privilege of sharing in the social good of the community. The advantages gained by cooperation, however, were greater than the value of the rights given up. The members were freer from invasion from without, and living was better within.

A governing body was necessary to enforce the rules, and settle the controversies as they arose. It was not sufficient that everyone do what he thought was right, because not everyone knew what was right, and what was right for the individual was not always best for society.

Laws have developed to meet present-day needs. They have developed in order that society may function in fulfilling its needs and desires at the present time, not for the future. As social change makes new laws necessary, they are enacted. They are somewhat tardy, to be sure, but are at all times a reflection of the times and conditions of that society. Good or bad, they are what society has made them. Each rule is tested by usage, and if found adequate for present-day needs, it remains in force until social change makes it obsolete. Thus is developed a body of laws which undergoes only a slight change from generation to generation.

It has been said that the main body of laws should not change rapidly but rather that the law should have certainty and stability. The stability of the law is preserved largely through adherence to the doctrine of *stare decisis*, or court precedent, and so strong is this doctrine that legislative action often becomes necessary to change it.

Students of law diligently study the cases of early times because it is conceded that the doctrines laid down in many of our early cases are still good law; furthermore, early cases and early statutes are read in order to establish a better understanding of the foundation of present laws. It is still considered quite a necessary task in most law schools for the student to read Blackstone's *Six Commentaries on the Laws of England*. Laws do change as society progresses, but they do not come into existance in advance of their need. On the contrary they are preceded by a condition which the law is meant to remedy.

THE COMMON LAW

The common law is an outgrowth of the habits and customs of the people and while there is little to preserve this early law, as scarcely any of it is written, it is surprisingly vital. The term "common law" as distinguished from the Roman law is applied to the law arising from the customs of English-speaking people. Some of the customs, however, were brought over from the mainland while others originated and developed in England. Prior to the Norman Conquest of England in 1066, trial by jury was unknown; in civil cases one who was sued for debt could avoid payment by swearing in court that he did not owe the debt, or in other instances if he could get eleven of his neighbors to swear in court that he did not owe the debt, he was released from his obligation.[1]

Many changes have taken place in the common law since the beginning of its use, but that is because the history of the people has changed very much; furthermore, laws which exist largely in the minds of the people must necessarily change as the people change their customs and habits. We are often amused, even amazed, as we read ancient law and note the apparently foolish rules by which the people in that day were governed. But those laws are no stranger to us now than our present laws will be to the coming generations 500 years from now.

In the United States we live under the common law, the same in modified form which was brought over from England and transplanted into the colonies, from where it spread to each of the other states. Some states, however, were settled by persons from the Latin countries, and the laws of these states still, to a considerable extent, use the old Roman or Civil law. Many persons living in the states of Florida, Louisiana, Texas, Arizona, and New Mexico are of French and Spanish descent and are under legal systems derived mainly from the civil law.

Our laws from the standpoint of origin consist in general of two kinds, the common law and the statute or written law. Law-making bodies, such as our federal and state legislatures, meet periodically and draft laws for our government. These statutes together with the common law make up the body of laws under which we live. The statute law may nevertheless be greatly

[1] W. H. Spencer, *Law and Business*, p. 24.

changed if interpreted by the courts. A court of justice may interpret a statute law in such a way as to make the meaning contrary to the original intention of the body which passed it. The duty of the courts is to interpret or expound the law, and the interpretation made by the courts is the law regardless of what the original intention was when the law was enacted. In a sense, the courts as well as the legislative bodies become makers of the law. The term "common law," while applied to the law developed in England and transferred to this country, is also used to designate that great body of laws developed by the courts through their interpretation of the statutes. Judge-made law has stood the test of the courts and may be said to have a stability superior to that of the statute law. The common law in this latter sense is said to be unwritten law in that it is to be found only in the court reports of adjudicated cases in the respective jurisdictions where the cases have been tried. That part of the common law which is judge-made comprises a large portion of the body of laws under which we live.

THE LAW OF TORTS

A complex society as we have today brings about numerous problems which do not exist in a world less thickly populated. Carver has well stated that a great many of our social and economic ills are no doubt caused by the scarcity of economic goods, which scarcity causes bitter competition in the acquisition of human wants. Man is free to act as he desires and to possess that which he can acquire, but his rights end where another's begins. The law is that instrumentality which circumscribes the rights of each individual making him respect the rights of others. As man in his business relations must constantly adjust his activities to meet the needs of that society of which he is a part, and as controversies and misunderstandings arise they must be settled as quickly and equitably as possible for all concerned. In this respect no other instrument is more significant in these adjustments than the law of torts.

It is difficult if not impossible to define adequately a tort. It is probably easier to say what it is not than to say what it is. In a broad sense it is commonly described as a wrong. Blackstone says that torts are an infringement or privation of the private or civil rights belonging to individuals as distinguished from crimes which are an infringement of rights belonging to the state. Spencer has defined a tort as an infringement upon interests which the law deems worthy of protecting. It is a civil wrong as distinguished from a criminal wrong, and a liability incurred by a tort must be distinguished from a liability imposed by contract.

Those interests which the law of torts protects are the security of person, the security of the possession of property, the security of reputation, and the security of social and economic relations.

The law provides that man may go where he pleases, do what he desires, and act in any manner to his liking, providing he does not interfere with the rights of others. We go from place to place with a feeling of perfect safety, knowing that we are protected by the strong arm of the law. We have a right to be free from bodily harm and may not be put in fear by threats of one who has apparent ability to carry out such threat. Many illustrations may be cited to show the part the law of torts plays in our protection in this respect.

In an early New England case,[2] two men became engaged in an angry altercation, when one produced a gun and at a distance of three or four rods pointed the gun at the other, snapping it twice. Although it was later proved that the gun was not loaded, the court ruled that the act was nevertheless an assault for which damages could be had. Had the distance been so great that a shot from the gun could have produced no injury there would have been no assault, nor would there have been an assault if angry threats had been made over a telephone where they could not have immediately been carried out. It is not enough to say that no harm was done when a tragedy might have occurred.

However, one may not obtain damage for physical injuries as a result of mental disturbances caused by mere fright, particularly where such mental distress is caused by actions done unintentionally. To do so would open up many unjust claims which could not be met. The law of torts is meant to provide that individuals may go about their daily task and be unmolested by those who might cause them harm, but those who have such a sensitive nature that they are in danger of being frightened to the extent of suffering real physical injury must refrain from frequenting public places. Industry cannot guarantee that no disturbances will happen which might produce serious harm through fright.

Of equal importance is the right accorded to every one to have a good reputation. The law recognizes the value of a reputation to one in his business and to one as an individual and will offer protection from slanderous or libelous statements made for the purpose of bringing shame and ridicule on him. "A good name is rather to be chosen than great riches, and loving favor than silver and gold." Every one desires to have the respect and esteem of his associates and to that end he conducts himself with such propriety as will win the best name that is possible for him to attain.

The law therefore imposes upon one who utters defamatory remarks of another the penalty of making full compensation for damages done. Words which are defamatory *per se* carry with them a penalty without the necessity of alleging and showing special damages; the very nature of the remarks is such as to leave no doubt that the character of the individual

[2]*Beach v. Hancock,* 27 New Hampshire 223 (1853).

about whom the words were spoken has been defamed. If such words are not actionable *per se*, actual damages must be proven. An editor of a newspaper published disparaging statements concerning a certain dinner which a caterer prepared and served to a group of persons. The statement published declared the dinner was "wretched, the cigars were vile and the wine was not much better." The caterer brought suit, alleging his reputation as a caterer had been defamed but lost the suit because he refused to show special damages (probably because he could not). The court said the words were not actionable *per se*, since what was published was merely a statement about the dinner and did not defame the character of the caterer.

Defamatory statements if made orally are slanderous while if put into writing become libelous. It is interesting to note that libel is a more serious offense than slander, although the words spoken or written may be the same, for words which are written have a more permanent character and are capable of greater circulation.

Defamatory words must, however, always be published before an action can be taken; that is, they must come to the knowledge of third persons by some means, as an oral statement, a writing, or by any other outward expression. Such remarks made of a person to his face are not actionable unless they are overheard by a third person. As an illustration, two women met in a bakery where one made a false statement to the other concerning the latter's character. Although the words were spoken in a public place, they were not heard by any other person, and consequently they were not published and not actionable.

Truth is always a defense in defamatory cases, since one cannot be penalized for telling what is true, unless it can be shown that there was over-publication and a malicious intent to cause harm.

The law of torts also protects one against invasion of his property, both personal and real. For the wrongful retention of personal property, one may bring an action in replevin to recover the specific goods. The old form used to recover the actual property was that of detinue, but this form fell into disuse, as the defendant was permitted to "wage his law;" that is, he was permitted to choose eleven of his neighbors to swear in court that the article belonged to the defendant; if these eleven would so swear, the property was kept by him. If one held another's property and refused to give it up, the plaintiff might sue in trover for conversion and get the value of the property instead of the specific property plus damages for the wrongful dentention of property.

One who owns real estate has the right to have peaceful possession of it and may not be molested by others. The stringing of a wire across another's land has been held as dispossessing the owner of his land for which an action in ejectment was had.[3] It was formerly held that the owner of land owned the ground to the center of the earth and the space above the surface to an indefinite height. With the advent of the airplane it has been held that one owns the space above his land only to the height which he can use.

The Security of Social and Economic Relations is a fourth interest which the law deems worthy of protection. Persons have a right to make agreements with each other so long as they are legal and not against public policy and the law will protect and permit them to carry out their agreements unmolested. It was early established that a master has a right to the services of his servant and that third persons are prevented from interference in any manner. In a modern English case,[4] a celebrated singer had agreed with the manager of an opera to sing for him during a period and to sing for no one else. The manager of a second opera, however, induced her to break her agreement with the first manager and sing in the theatre of the second. In an action for damages brought by the first manager against the second, it was held that one who induces a party to a contract to break it, causing damages thereby to the other party and with intent to injure that party and for the purpose of benefiting himself, is liable for the damages he causes.

[3] *Butler v. Telephone Co.* 186 New York 486 (1906).

[4] *Lumley v. Gye,* 2 Ellis and Blackburn 216 (1853)

There is no material difference whether the contract be between a master and a servant or between an employer and the one employed. There are, however, possibly two exceptions to this rule. In cases where one of the contracting parties is an infant, and there is an attempt to protect the infant, interference may be allowed; and in cases where a party is illegally induced to enter the contract, a third person may induce a breach.

THE LAW OF CONTRACTS

There is no other factor in civilized nations which exercises a greater force in the control of social and economic relations than the subject of contracts. A large per cent of our business activities arise out of contractual relationships. So true is this that there is scarcely a day in which we do not in some way make an agreement which is nothing more than a contract in simplified form.

"The Law of Contracts is at the foundation, if not the foundation itself, of our present society. One can scarcely conceive of the present organization of society or of its functioning without recognizing the existence of a law of contracts or its substantial equivalent. Those who engage in this cooperative scheme must have official recognition of some device for making future and binding arrangements, for securing the present and future conduct of others similarly engaged, for shifting their risks to professional risk-bearers, and for securing the exchange of property and values. Modern industrial society could not exist without in some way assuring these things to those engaged in its activities. It does make these guaranties to its members and it does so through the Law of Contracts."[5] Our social structure is made up of promises which through long sanction we expect will be fulfilled. A contract is an agreement (mutual promises) between two or more persons to do or not to do something which the courts will enforce.

Important as the law of contracts is, we nevertheless find that the enforcibility of "simple" promises is a comparatively recent development of the common law. The doctrine, according to Spencer, did not receive full recognition until about the middle of the sixteenth century. It is true, however, that during the Manorial period in England one could recover damages for the nonperformance of contract under seal, called covenants, or could enforce the payment of a debt provided the promise had been made by a sealed instrument, but simple or unsealed contracts had no standing in the courts. As towns sprang up and industrial life succeeded agricultural life, there came to a real need for a remedy to enforce simple contracts. As pressure was brought to bear, the enforceability of simple contracts came under the jurisdiction of the ecclesiastical or church courts, which originally had jurisdiction over spiritual matters or cases of "right and wrong."

[5]W. H. Spencer, Case Book I, p. 216.

Since the Chancellor was not only the head of the church but also at the head of the chancellor's or equity court, simple contracts came under equitable jurisdiction. It has been said that the King's courts or law courts became jealous of the Chancellor's court because many fees were going to the Chancellor instead of the King; so by the middle of the sixteenth century simple contracts were enforceable in the law courts by an action in *assumpsit* giving money damages rather than equitable damages as was done in equity courts.

Contracts founded on promises necessarily incur obligations, and since an obligation gives another a right to have this obligation fulfilled, contracts must have at least two persons involved. One person may not make a contract with himself even though he may be acting in the eyes of the law in two separate capacities. An administrator of an estate may not sell to himself as an individual, property belonging to the estate.

Every contract which is an agreement between persons must originate by a proposal either expressed or implied. This proposal expresses a willingness to enter into an agreement and creates in the mind of the one to whom the proposal is made a reasonable expectation that the proposal is bona fide. This expression is called an offer and, if agreed to by the other, an acceptance is made. If other elements, necessary in all contracts, are present, each party is obligated and may not be released without the consent of the other. If the terms of the contract provide for future performances, each person may go about his business and carry on activities in relation to this agreement with the assurance that the terms of the contract will be carried out in the future, or he will be permitted to collect damages from the one who fails to do his part. In other words each has bargained for the other's future conduct, each receiving a benefit by the agreement.

Laws are made to enable members of society to live harmoniously together. If the laws are just and equitable, we as a part of society can justly take credit for this virtue. If they are poor and inadequate, we have only ourselves to blame, but we are never justified in disobeying the laws because they are bad. We must obey the law. Pollock has well said, "Law is enforced by the State because it is law; and it is not law because the State enforces it."

The Scope of Mathematics

R. G. SMITH

Most people have little or no concept of the scope of mathematics. Time and again one asks, "What do you do for an original research thesis in mathematics? Do you make up a lot of problems in algebra, then work out the answers, or do you revamp and reorganize the theorems of geometry?" Even the student of mathematics in the undergraduate college is likely to form the idea that mathematics reaches the limit of its development in integral calculus and differential equations. Perhaps this is only natural since many of the courses in senior college present in more detail certain fields that were only introduced in the junior college.

For example, the average student in college algebra learns to expand second and third order determinants and to apply them in the solution of simultaneous linear equations. An accelerated section in algebra will spend a week or two studying the elementary properties and theorems of determinants. At best it is only an introduction to an enormous field, in which one could spend a lifetime of study. Sir Thomas Muir has done just this, publishing in abstract form the more important works on determinants. His abstracts and bibliography form four large volumes, while the original publications would no doubt fill a good sized library. Likewise the chapters in college algebra on theory of numbers, linear equations, theory of equations, probability, mathematics of investments, infinite series, and complex numbers merely open the door to extensive fields.

The field of determinants is much like an old mine, in that it seems to be about worked out, but now and then some precious nugget of truth is uncovered. On the other hand, some of the oldest fields are still very productive. Mathematicians of ancient times began the study of numbers, and today new results are being found. The amateur mathematician with little preparation can study numbers and their properties. He may discover for himself that the sum of any number of consecutive odd integers beginning with unity is a perfect square (for example 1, 3, 5, 7, 9 sum to 25), only to find that this theorem has been known for hundreds of years.

Numbers form an interesting study though they have lost much of the fascination that they held for the ancient, who looked to numbers and numerology for good luck charms that would bring happiness and fortune. A number like 28, whose divisors, 1, 2, 4, 7, 14, add up to the number itself, was called a perfect number. The first five perfect numbers are 6, 28, 496, 8,128, and 33,550,336. Nichomachus of Alexandria spent a great deal of time hunting for perfect numbers and because of their scarcity concluded that "the good and the beautiful are rare and easily counted; but the ugly and bad are prolific."[1] Two numbers like 220 and 284 were said to be amicable because the divisors of 220 (1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110) add up to 284, while the divisors of 284 (1, 2, 4, 71, 142) add up to 220. Pythagoras defined a friend as "one who is the other I. Such are 220 and 284."[2]

It may surprise some to learn that there are algebras besides the ordinary or classical algebra taught in the secondary schools and junior colleges. Any algebra deals with the formal combination of symbols by means of certain operations and according to certain laws. In the ordinary complex algebra there are two basal units 1 and i where i is defined to be a number whose square is -1. The symbols of this algebra are linear combinations of 1 and i of the form $a + bi$ where a and b are real numbers. The operations are addition and multiplication and their inverse operations of subtraction and division. The fundamental laws of combination assume that addition and multiplication are commutative and associative and that multiplication is distributive with respect to addition. Why should there be just two basal units, two basic operations, and five fundamental laws of combination? Why not have more or fewer units, operations, and laws of combination? There is no reason for admitting classical algebra at the exclusion of all others.

W. R. Hamilton and others developed one such algebra known as the quaternion algebra, with four basal units 1, i, j, k, and three basic operations called addition, vector multiplication, and scalar multiplication. In this algebra multiplication is usually not commutative. It is interesting to note that the theory of quaternions was developed by mathematicians who, true to tradition, formed it with little if any regard for any practical application. From the quaternion algebra J. Willard Gibbs, an applied mathematician, was able to build a vector algebra which today is almost indispensable in the modern approach to a study of mechanics and geometry. However, at that time many mathematicians felt that Gibbs had cheapened the works of Hamilton. A comparison might be made with the feeling that a lover of classical music has for the swing artist who takes some catching melody from an opera or symphony and procedes to "jazz it up" to the modern tempo. On the other hand Gibbs was criticized by ardent supporters of the ordinary complex algebra for setting up an algebra that violates some of the fundamental rules. When Gibbs learned from his pupil, Irving Fish-

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[1] Lancelot Hogben, *Mathematics for the Million* (New York: W. W. Norton and Co., 1937), p. 191.

[2] Ibid.

er, of the criticism of certain German mathematicians, he stated "that all depends on what your object is in making those sacrosanct rules for operating upon symbols. If the object is to interpret physical phenomena and if we find we can do better by having a rule that $a \times b$ is equal not to $b \times a$ but to minus $b \times a$, as in the multiplication of two vectors, then the criticisms of the Germans are beside the point."[3]

Too often geometry is thought of as a static sort of thing made up of configurations of points, lines, and planes. Geometry deals not only with configurations, but with the invariants of these configurations under certain transformations. The principal transformations of Euclidean geometry are translation and rotation resulting in rigid motion. Under these transformations such geometric properties as length of a line segment, size of an angle, and magnitude of an area are among the invariants. Projection changes the distance between two points and the size of an angle between two lines; hence these are not invariants under a projective transformation.

The type of geometry to be studied is further determined by the geometric space and elements chosen and by the fundamental postulates assumed. The shape of the earth suggests a study of the geometry of the surface of a sphere. Such a geometry is two dimensional and the elements chosen are the point and the line, but the line is not straight since the shortest distance between two points on a sphere is an arc of a great circle. The angles of a triangle formed by three lines sum up to more than two right angles, and parallel lines cannot exist since any two lines meet not only once but twice.

A photograph of some building on the campus affords an interesting example of a projective geometry that is of vital interest to the artist or architect attempting a perspective drawing. The brick course lines are no longer parallel but seem to converge toward the horizon. The length of a brick becomes less and less as one follows the course lines toward the horizon. The angles at the corners are known to be right yet some appear to be obtuse and others acute. A circular arch over the door has become elliptic. The above mentioned properties evidently are not the invariants of projective geometry. The windows, doors, and bricks that are on a line in the building are on the corresponding line in the photograph. Lines meeting at a point still meet at the corresponding point, and a line tangent to the arch is still tangent.

The problem of drawing a map of the earth introduces a different type of geometry known as differential geometry. The surface of the earth is better represented by mapping on a sphere or globe, but the plane map is more convenient since it is easily folded away or

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[3]Irving Fisher, *The Appliation of Mathematics to the Social Sciences*, Bulletin of the American Mathematical Society, vol. 36 (1930). pp. 225-243.

bound into a book .There are several ways in which one can establish a one-to-one correspondence between points of the globe and map so that each point of the map corresponds to one and only one point on the globe; but in each transformation not all of the properties of length, angle, and area are invariant. A comparison of globe and map shows that in detail there is similarity, while of the whole there is decreasing similarity. In many maps longitudinal lengths and areas undergo an increasing magnification as the region recedes from the equator toward either pole so that Greenland appears to be about five times as large as Mexico, whereas they are of about the same size. Differential geometry deals not with the whole configuration but with small or restricted portions.

One of the greatest steps in the development of mathematics was taken in the seventeenth century by Descartes of France when he combined algebra and geometry to form an analytic geometry. This paved the way for the discovery of calculus by Newton of England and Leibniz of Germany in the latter part of the same century. Calculus became at once a most powerful tool for the development of science. The proofs of the theorems on areas and volumes which were laboriously performed by the methods of Archimedes' geometry became simple exercises for the student of calculus. The modern method of analysis is to set up a one-to-one correspondence between some algebra and its associated geometry so that geometric intuition may lead the way through an otherwise abstract maze of algebric manipulation. At the same time geometry shares the benefits of this union, as the methods of algebra often simplify the study of geometry and produce greater accuracy in geometric measurement. For example: the ratio of the circumference of a circle to its diameter can only be determined for a few decimal places by the most accurate geometrc measurement, while the method of algebra permits the calculation to any desired degree of accuracy. In the nineteenth century several mathematicians staged an endurance contest in the calculation of *pi* which was won by Willam Shanks when he carried the approximation to 707 places of decimals.

To illustrate a type of problem, the solution of which is made possible by the methods of analysis, consider the famous Problem of Dido. According to legend, Queen Dido, being in disfavor with her brother, collected her wealth and went to the south shore of the Mediterranean. There she bargained with King Iarbas for as much land as could be encompassed by the hide of a bull. A large hide was selected and cut into fine thongs which were tied end to end and made to encompass the site of Carthage. She even made the ends of the leather thread terminate on the seashore instead of bringing them together and insisted that the coast form a natural boundary line to her property. Her problem was: Given a curved seacoast and knowing the value of the land which may vary from lot to lot, how can a curve of given length with ends terminating on the coast be drawn so that the value of the tract enclosed by it and the coast shall be a maximum? According to legend, she drew the thread into an arc of a semi-circle, which by the way is a correct solution for a straight coast adjoined by land of uniform value.

Mathematics is used extensively in the study of science. It is surprising to note the amount of meaning and power that is contained in the symbolism of a single equation. The entire theory of a science like electromagnetism may be contained in a few simple equations. Moreoever these equations summarizing the theories of a science often lead the way to new discoveries. Euler predicted that the earth's poles would move about in a cyclic manner, yet it was more than a hundred years before astronomers were able to determine this movement because the maximum departure from the mean position is only about 55 feet. One of the most interesting examples of a mathematical prediction is afforded by the radio. The radio wave which today brings music and the spoken word into almost every home was predicted by Maxwell long before Hertz was able to construct a machine for the generation of these waves. Maxwell based his prediction on purely mathematical considerations.

Dynamic Influences of Language in Stenography

ROWENA WELLMAN

We can measure and count strokes and curves and circles in shorthand; we can regulate the length of sentences dictated; we can manipulate the diction to conform to a standardized ratio of syllables; we can scale the frequency of a vocabulary; and we can gauge the importance of English construction. Yet not one of these measures nor all combined will provide the teacher of stenography with a formula for selecting, constructing, or evaluating instructional materials. There remains an area of unmeasured factors in which the most potent elements of stenographic difficulty pertain to language, oral and written. Indeed, stenography, like telegraphy as reported by Bryan and Harter fifty years ago, "involves the use of a great array of higher language habits" and is "psychologically a distinct language almost or quite as elaborate as the mother tongue."

It is the purpose of this paper to point out but one baffling phase, the dynamics of language. Its purpose is also a protest against the indictment of stenography *per se* for so-called stenographic blunders. Similar and identical boners are encountered in other subjects. Blame not the system, but the amanuensis! Examine the pen-and-ink lecture notes recorded by college students. Here are some bona fide renditions: "the common wealth fund" (Commonwealth Fund); "the reading ice pan" (eye span); "Mark, the perfect man."

Every step of the stenographer's task, from hearing and "taking" the dictation to proofreading his transcribed version, is affected by unpredictable influences. The examples presented under the following categories of stenographic errors will no doubt suggest parallel instances in non-stenographic realms.

OBSCURED SOUNDS

Faulty hearing is not always due to poor auditory acuity on the part of the stenographer, nor to poor enunciation on the part of the dictator. Certain sounds in the English language are clearly heard when isolated but become obscured in particular sequences. "Fourth Street." for example, may sound like "Fort Street." Parrot's blood, if we may believe a newspaper feature story from Joliet, Illinois, was injected into an infant's veins instead of blood from a parent, as a result of a misinterpreted telephone message. Tests for judging poultry were requested of a publisher of

[1]Earl W. Barnhart, formerly of the United States Office of Education, has analyzed the task of a stenographer and reported more than fifty mental processes involved in taking dictation and transcribing.

poetry tests. "Miss R. Wellman" became "Mrs. Ira Willman" in a transfer from signature to typewritten address by way of oral announcement. "A program of help for the poor" became a "health" program. (In a different sequence, such as, for example, "help the poor," such substitution would be improbable.)

SANDHI OR SLURRING

The influence of sandhi, or slurring is a most potent factor in mishearing the spoken word. "K. C. Jones" and "L. C. Smith" may evolve as "Casey Jones" and "Elsie Smith," whether dictated to a stenographer, repeated over the telephone, or pronounced to a sales clerk. "Adam Street," "William Street," and "Banks Street"—we see them correctly but hear them slurred. Because of the effect of sandhi, few persons recognize as English words the ditty that *sounds* something like this:

Merze dotes, dozy dotes;
Little sheepy divy,
Anda kiddly divy too

The correct translation is:

Mares eat oates;
Does eat oats;
Little sheep eat ivy;
And a kid will eat ivy too

SUPPLEMENTATION

Supplementation is a mental process that both aids and hinders the stenographer. It is dynamic in that it is conditioned by the sequences of words. The stengrapher—or any hearer—must restore "would have" from "would of," "and" from "'nd," "kept" from "kep'," "district" from "distric'," and so on. It sometimes happens that the stenographer must also observe the opposite of supplementation, and elide superfluous sounds, as in "acrosst" and "attackt." Speakers are prone to omit the *s* in "Johns Hopkins University" and equally prone to interpolate *s* in such names as "William and Mary" and "Hollingworth"; to add a redundant article in other expressions: "the Il Duce," "the El Rancho," "the hoi polloi."

SPOONERISTIC HEARING AND WRITING

As the Reverend Mr. Spooner distorted his phrases to utter "sin twisters" when he intended to say "twin sisters," so do we interchange figures in hearing telephone numbers and transpose words and phrases in writing from immediate oral stimulus. Only recently I became aware of this phenomenon as a source of stenographic errors. In an extensive examination of students' papers, there were found numerous recurrences of transposed shorthand symbols and of transposed words in transcripts from correct shorthand notes.

THE DYNAMICS OF VOCABULARY

Abilities pertaining to vocabulary are dependent to a great extent upon the individual's native intelligence, general information, and specific experiential background. He may be able to guess from context the meaning of an unfamiliar word, or he may not. "Detergent" and "siblings" are two terms that puzzled a group of college graduates whose study habits unfortuately did not demand their recourse to the dictionary. In a summer-session class of commercial teachers, discussing a shorthand-translating examination, several members spelled phonetically but failed to recognized the word "homicide." The term was unfamiliar to them, even in vocabulary-recognition as distinguished from their more limited working vocabulary.

Sometimes the individual ingenuously devises a translation for what he does not hear or does not comprehend, as in the instance of the transcript "simarates" for "summer rates." "Looks like 'bean coop' to me," remarked the father of a Connecticut lad who had written home from France. "'S-e-e-p'—there's no such word," said one stenographer to whom the verb "seep" was unfamiliar. "' Protzha,' what's that?" asked another stenographer of a co-worker, who did not know the word "protege." A student reading copper-plate shorthand symbols spelled aloud "t-r-a-s-e-r" and failed to recognize the intended word, but a teacher of English, who knew no shorthand, supplied the word "tracer."

Even ordinary word-forms—those ranked as the 500 or 1,000 most commonly used words—are stenograhpic hazards when employed as technical terms or in unusual sequences. I recall my first experience with "high tea." What are puts, calls, and spreads in business? What is a lame duck in politics? A dark horse? North Carolina is in the South and West Point is in the East. In Pennsylvania Northeast is southwest of a certain city. "I read the pink" is meaningless to those who do not know that "pink" is dialogue script.

The New Yorker of April,1936, printed an interesting account of blunders incident to a Dr. Huddleton's want ad for a secretary with "I.Q. over 130." The *New York Times* clerk, believing the expression to be code, was reluctant to accept the advertisement but was finally persuaded. "It turned out that the *Times* had perhaps been right about its being obscure," commented *The New Yorker*. "One of the young ladies who answered said that she couldn't quite take 130 words a minute but felt she was fast enough to satisfy the Doctor."

One writer[2] would have us believe that the word-form *red* "has only one meaning and of course every count [in estimating the freuency rank] represents that meaning." Perhaps so, but what a variety of meanings it can express when combined with other simple words: "red-card a store," "redbud," "red cent," "red-letter day," "red-hot," "red-handed," "red horse," "red necks," "Redmen," "Ohio Reds," "Rhode Island Reds."

Innumerable are the instances of so-called spelling errors that may rightly be assigned to the dynamics of language. Particularly do the homographs and homonymic

[2]Noel E. Cuff, "Vocabulary Tests." *Journal of Educational Psychology*, March, 1930.

phrases constitute pitfalls in written English: "its-it's;" "principal-principle;" Pittsburg, Kansas, and Pittsburgh, Pennsylvania; Sheboygan, Wisconsin, and Cheboygan, Michigan.

Punctuation, too, demands continuous selective judgment. We formerly had a few rules that could be relied upon with complete faith. But can we say: "Put a question mark after every sentence that is in the form of a question?" Strict observance of the rule is challengeable in *Please send your check immediately* and *Will you please send your check immediately?* We once held to another rule, too: "Always place the period and the comma inside the closing quotation mark." American typography gave us that rule, but lately the trend is toward differentiated practice, notably in the recommendations of recent handbooks and in the manual of the Government Printing Office.

Even syllabification (syllabication) is not static. The stenographer must go beyond Webster lest he offend the gentle reader by some such division as "mate-rial" or "rear-rangement," correct according to the dictionary but not typographically acceptable.

Perhaps Dr. Huddleston was right. One of the qualifications of a stenographer should be "I. Q. over 130."

Field Work in Mathematics

R. W. Hart

That something is wrong with the teaching of mathematics at the secondary level is quite apparent even to the casual observer. During the past decade many colleges and universities have omitted mathematics as an entrance requirement and a large number of high schools no longer insist that every student take the traditional two years of algebra and geometry. School administrators say that they have had too many complaints from their patrons because of the difficulty that students have in the junior and the senior high schools with mathematics. At the same time the demand for workers trained in the sciences where mathematics is indispensable is increasing, and now mathematics is being applied in such subjects as economics, biology, and psychology where only a few years ago it was commonly believed that these subjects could function without the aid of higher mathematics.

This situation has caused the teachers of mathematics considerable concern; during the past fifteen years we have seen various plans and reorganizations of secondary mathematics tried. It was believed at one time that if a subject were made practical it would appeal to the high school student; hence the ninth and tenth grades were introduced to topics brought down to them from college mathematics. Graphical representations of data were taken from statistics, and the solution of the right triangle was borrowed from trigonometry. Physics and mechanics were also called upon to offer choice morsels to tempt the interest of the adolescent youth. Seemingly these efforts have been in vain, for the subject of mathematics has not regained the enviable position that it once held in the curricula of the public schools.

From these experiments of the past there is a growing belief that the cause of the trouble lies in the fact that the mathematics taught high school students lies outside their experiences. No matter how useful a study may be, if it takes up topics with which the learner has never come in contact, it is as abstract to him as if it had no practical application whatever. Distances and angles become real to anyone only when he has actually measured and worked with them. Here is where field work in mathematics is expected to fill a need.

The average high school teacher does not know how to measure distances and angles. He can draw a diagram on the blackboard and explain the theory involved in such an example as finding the distance across a pond, but actually to take a surveyor's steel tape, a set of arrows and some range poles and go out to the pond and determine that distance is something else. If this is true of the teacher, what must be true of the pupil? It is expected that a teacher of physics should be able to perform suitable experiments to illustrate his theories, and the same abilities are expected of the chemistry teacher and the biology teacher. In fact, any teacher of these subjects would be severely criticised if all he did was to talk and draw diagrams and never give the class an opportunity to experiment.

Some progress has already been made with laboratory work in mathematics, and the indications are that this phase of presentation will be stressed more in the future. Most of the work has been confined to mechanical drawing, constructions with ruler and compass, paper cutting, construction of models, and such related projects. The outdoor work has not been developed mainly because of the expense attached to it and the lack of teachers trained in this work. Surveyor's transits and levels cost too much for the average high school to own, but just lately several instrument companies have begun to put on the market inexpensive transits that are suitable for use by high school students. These instruments are not intended to do the fine work that an engineer requires, but they obtain results that are gratifying to a beginner, and through their use such things as angles, distances, and lines become a part of the experience of the user.

Field work in mathematics is only beginning to be taught in colleges to prospective teachers of secondary mathematics. It was taught at this College for the first time last summer. All of the members of that class were teachers of mathematics and their enthusiastic response showed that it fills a need in the curriculum. The aim of the course is to train teachers so that they can conduct field work in connection with their teaching of mathematics. They are taught to use several instruments in performing projects that illustrate theorems from geometry and trigonometry. There is nothing strenuous about the work; hence girls become as adept at it as boys.

The design and construction of some of the instruments used is also a part of the course taught here. While in some cases neater and more accurate instruments may be purchased, there is something appealing to a youth about a homemade piece of apparatus that is not found in one that is bought ready made. It is not feasible to attempt to make all of the instruments needed in the work, but the making of the simple types should be encouraged. There is the danger that the student may grow tired of the construction of a complicated piece of apparatus before it is completed; nor are the time and effort expended rewarded by the lessons learned.

A description of some of the more common instruments used in field work will be given here in order that those interested may get a clearer idea of the nature of this kind of work.

To measure distances, some kind of tape is necessary. The best thing for this purpose is the surveyor's steel tape or as it is usually called, a chain. These come in different lengths, but the one hundred foot size is most suitable. Cloth tapes are not as good for general out door work because they stretch and do not stand the wear which a steel tape will. Students must be taught to exercise care in the use of the steel tape because it is easily broken. With this tape distances can be measured accurately to tenths of a foot, and with a little practice the hundredths can be estimated closely. With the tape it is necessary to have a set of marking pins or arrows to measure distances greater than one hundred feet. Range poles are also a part of the equipment.

The tape is very useful and indispensable to a class in field work. With it alone it is possible to make complete surveys of various types. It can be used to measure angles in connection with the study of the right triangle. It can be used in finding the distance to inaccessible points by use of similar triangles. With it one can lay off any sized angle or erect perpendiculars to lines. The accurate use of the steel tape is the first thing that a beginner should learn.

The angle mirror is a simple and useful piece of apparatus that should be part of the equipment for field work. It is used to lay off right angles. It consists of two small mirrors mounted on a plane surface so that they make an angle of forty-five degrees with each other. In use it is placed on a Jacob's Staff which is merely a pointed staff with a hole in the top where the angle mirror rests. The use of this apparatus is easily learned, and its results are fairly accurate. With a little practice students can lay off a right triangle with the angle mirror so that the sides check by the Pythagorean Theorem to the nearest tenth of a foot when the sides are more than a hundred feet in length.

The teacher of high school mathematics will find many applications of the angle mirror such as finding the distance between two obstructed points, map construction, finding areas of irregular fields by the trapezoidal rule, measuring distances across ponds, etc. Heights of buildings may be found by using the angle mirror, but the accuracy is not good because the height of the eye is so small in comparison with that of the building. The angle mirror is used any time that it is desired to construct a perpendicular in the field. This instrument may be constructed by any one with some ability in handling tools, and it is inexpensive.

An apparatus easily made and simple to use is the hypsometer. This has a dignified name with a scientific sound, but the instrument itself is merely a piece of cross section paper, such as may be obtained at most school supply stores, mounted on a board which in turn is bolted to a vertical staff. A plumb bob completes the assembly.

Heights of objects can be read directly with the hypsometer after the distance from the observer to the object has been measured with the tape. The principle used is that of similar triangles. While the use of the hypsometer is limited, its simplicity, ease of construction and operation recommend it for use in secondary work.

Closely allied to the hypsometer, and sometimes combined with it, is the clinometer. This is a hypsometer with the degrees marked on it so that it can be used to measure angles of elevation and depression, and it can be used wherever these angles are used in geometry and trigonometry. This is especially good to clarify those problems where it is desired to find the height of an inaccessible object. With the clinometer angles can be measured to the nearest one fourth of a degree, which is accurate enough for classes in geometry where they have only a three place table of trigonometric functions. Measurements to the nearest foot are near enough for this work. A clinometer is easily constructed, though it is advisable to buy the graduated arc used in measuring angles.

The surveyor's transit is the best instrument for measurng both horizontal and vertical angles. A simple type of transit can now be purchased for about twenty dollars and some fairly good work can be done with such an instrument. With it one can measure angles to the nearest one-fourth of a degree, and some types are equipped with a vernier so that angles may be read to the nearest ten minutes. These transits are easy to handle and their simplicity of construction is a favorable quality for high school use. With reasonable care they should give many years of service. They can also be used as levels.

Many interesting and practical problems may be worked out with the transit and level such as finding heights and distances indirectly, running straight lines and circles in the field, prolonging lines through obstacles, setting stakes for drains and sidewalks, finding differences in elevation, profile leveling, measuring earthwork, and others. Of course, these are problems from surveying, but they can be understood by the average high school student. It is not expected that the accuracy of surveyors will be reached in this field work, but the teacher should demand a degree of exactness in keeping with the instruments used and the time spent in acquiring skill in using the transit.

The plane table is a piece of apparatus easy to construct and use. It consists of a drawing board mounted on a tripod and an alidade for use in sighting objects and drawing straight lines on a piece of paper attached to the board. The tripod of the transit may be used to hold the drawing board, or one may be constructed. The finer types of plane tables are so made that the top may be leveled, but this is not a necessary arrangement for ordinary work. This apparatus is used for drawing maps in the field and for locating objects on these maps. It can also be used to illustrate various problems in elementary geometry. The plane table is becoming more popular every year with surveyors, and its use in high schools is not at all out of place. Boy Scouts will find it useful in some of their work for merit badges.

The sextant is an instrument often mentioned in connection with field work, though on land a transit is preferable. A sextant is indispensable in navigation where a transit cannot be used and in some schools located near seaports or where there is a considerable interest in aviation it may be desirable to have some acquaintance with the sextant. This instrument may be built by some one who has a fair degree of skill in wood working. The sextant is related in principle to the angle mirror, its advantage lying in the fact that it can be held in the hand while angles are being measured with it.

In addition to the apparatus that has been mentioned there should be provided some equipment for indoor work, for there are usually several weeks during a school year when the weather will not permit outside work. For this purpose and also to further the application of mathematics to real problems, here are several worth while projects. The slide rule illustrates the use of logarithms and is used quite extensively in many different occupations. Demonstration slide rules and student slide rules may be purchased at very reasonable prices and should be in every high school. The construction of a slide rule by laying off to a scale a table of logarithms on a piece of card board helps the student to understand the principles of the rule and its operation.

The ideal mathematics classroom is equipped with drawing desks, drawing boards, and a few essential drawing instruments to be used in plotting curves, drawing graphs and maps, and for making geometrical constructions. Such projects as these are handled better in the classroom as laboratory exercises than in making them a part of the required home work. The skill in manipulating drawing instruments should be acquired under the supervision of the instructor where suggestions and demonstrations will save many needless trials and errors. Some of the instruments used in teaching mathematics are scales, tapes, calipers, and micrometers for measuring the dimensions of solids in order to calculate their volumes or areas.

In teaching field work, a mistake is often made when the teacher does the manipulation of the instruments and the class merely goes along and records what is given them. Demonstrations by the instructor should be given only for the purpose of showing the class how to use the equipment; then the class should be divided into groups of not more than three or four who should be required to make their own measurements, an arrangement that is used in physics or chemistry. After the measurements have been made, each student should write up the project, make neat scale drawings, and show the formulas used and the calculations made. Every pupil should be required to do neat, accurate work. If this is not done or if the working groups are too large, there is a tendency for a high school class to look upon field work as a type of picnic and the results will be poor. In dividing the class into small groups, it is not necessary to have as many different sets of equipment as there are groups, for they do not all have to be working on the same project at the same time.

It is not expected that field work is going to revolutionize the teaching of secondary mathematics, but it is a step in the right direction. It means that we will not try to teach as many topics as we are now doing, but the ones that are taught will be better understood and more real to the student. Those teachers who have already introduced laboratory work to their classes are enthusiastic about it. The objections to it are the expense and the lack of time to meet the requirements of the course of study. Neither of these objections is as serious as it seems at first thought. The construction of home made instruments whenever practical helps to keep down the expense, and the present desire for a revision of the curriculum opens the way for some experimentation on the part of the instructor which makes supervisors more lenient towards any deviations from the course of study.

The Place of Accounting in Our Educational System

J. U. MASSEY

A glance into the history of business education in the United States indicates that educators and laymen have considered that the primary purpose of the department of business has been to provide for all who desired a training which would enable them to secure jobs. This idea of the vocational values and objectives in business education, no doubt, has remained prevalent in the minds of many. However, others have come to believe that business education has more possibilities to offer than just the vocational preparation. In the past we, the advocates of business education, were almost compelled to believe that there was no cultural value in business education. Hence, it seems that we were satisfied to place emphasis only on the vocational possibilities.

True as this may have been, the subject of accounting contains many values for students besides preparing them to act as bookkeepers. A lawyer is really not capable of handling modern business legal problems without a knowledge of the fundamental principles of accounting. Salesmen, doctors, students all benefit by the study of accounting. Therefore, we may conclude that the study of this most valuable subject has certain social values. The accurate keeping of records is of the greatest importance at this time, and the demand for records is increasing yearly. Roger Babson recently said that 85 per cent of all business enterprises organized either failed, had to reorganize, or were forced to sell out. Many such failures may be traced to the lack of knowledge of keeping accurate records.

Today we are somewhat bewildered and confused because of the large gap existing between the program of production and the lag in distribution. For the closing of this gap we should not look to politicians but to men whose education is fundamentally business—to the economists and the masters of finance as the individuals capable of bringing about improvements in distribution and trasportation as well as equitable apportionment of labor, hours, and wages. All of these tasks call for a thorough mastery of the fundamental principles of accounting.

Production and all of the activities incident to the revolving of the economic world involve the making of accurate decisions. Practically all production and transfer of commodities call for the use of money and credit which cannot be handled through guess work. These all call our attention to the importance of business transactions being properly recorded. The accountant realizes the importance of handling money and the need of absolute precision.

There is a very important place in our educational system for the study of accounting and other business subjects. Dean Carl. E. Seashore of the Graduate College of the University of Iowa says: "The skill acquired in bookkeeping and stenography is one which transfers as a mental habit to many other intellectual pursuits, and particularly to the study of other subjects. Bookkeeping and stenography, therefore, constitute a most valuable training before or at the early stages of higher education." Any subject that is taught should contribute to the social order. If it does not, it really has no place in the schools. Bookkeeping or accounting is one subject that contributes practically and socially.

One of the most widely accepted definitions of education is "the systematic training of the moral and intellectual faculties." Still another definition is "being able to undergo new experiences readily and to succeed in them." Dewy in *Democracy and Education* defines education as "that reconstruction or reorganization of experiences which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience." In any event education must teach one to face the facts. In addition to providing a systematic record of business transactions, accounting classifies, analyzes, summarizes, and interprets, thus forcing one to face the facts.

There are many values in business subjects which upon careful analysis appear to have the same values that are found in the so-called academic subjects. Most business subjects present an attainable goal, and the student knows that he has a definite task to complete within a certain given time; he also knows when he has attained the goal for which he is working .

We have been taught that one of the chief purposes of going to college is to learn mental discipline, to acquire self-control, and thus learn better how to live. We are also taught that we do not study mathematics for its own sake but in order to learn mental discipline and poise. Accounting develops the same logical reasoning ability that is found in algebra and geometry. The objective of any subject should be its general educational objective, the development and improvement of one's mental qualities, which enable one to tackle life's problems with zest and understanding. In the past many have thought that any subject that was useful generally lacked educational value. However, the modern psychologist says that in any organized body of reliable subject matter, general educational value to the pupil depends more upon the manner in which the subject is taught than upon the subject matter.

The worth of any education, like

most anything else, depends upon what is done with it after it is obtained. Its potential value must be realized in a practical way. Education has also an association value. We find some who have classified education as cultural and practical. Cultural education is supposed to give one mental dignity, while practical education is thought of as an aid to earn money but without giving polish. A practical education was thought of as training the hand but not the mind. For a long time all business was said to be of this type, but now most schools give consideration and attention to the mental and social training along with the business instruction.

In his address at Geneva before the Conference of Commercial Education, July, 1929, Dr. Herman Chen-en Liu, President of Shanghai University, is quoted as saying: "When a student comes to the University of Shanghai to study commerce, I say unto him, 'Why do you wish to study commerce?' and if he answers 'To make money,' I say to him, 'Depart from me, I will have nothing to do with you.' But if he tells me that he wishes to learn commerce so that he may be able to serve his fellow men better, I say unto him, 'Come to my heart and I will teach you.' If he is willing to go to the worst place for the minimum salary and maximum service, I have a place for him."

In the past practical education was set up only as a money making scheme, but any system or plan of education should be evaluated in terms of the extent to which it meets the needs of individuals. Accounting really embodies vocational, social, economic, and educational values. The combination of these values should be included in every subject to prepare the student for the life of an intelligent citizen. It seems no more than reasonable that the citizen who has an understanding of the financial reports of the state and the national governments would more likely take an active rather than a passive interest in the financial affairs of our political units. If more of the citizens had a knowledge of accounting, no doubt they would demand more efficient operation of the government and perhaps require that public officers be trained to interpret financial figures properly and intelligently.

Educators agree that one of the chief aims of education should be the building of character. Accounting provides a stimulus to activity; it affords material for character building; it creates interest; it awakens social consciousness. This development of certain qualities of character is as important in accounting as is the vocational aim. The person who is neat in one thing is usually neat in others. In accounting there is a place for everything and everything must be in its place or one's work is of no practical value. Accounting develops a sense of order and system. The student of accounting learns to analyze, to verify, to record correctly, and to check for accuracy. With the formation of the habit of orderliness the student has a fundamental principle which will carry over to other work.

The study of accounting more than any other subject develops profound respect for accuracy. The student of accounting must acquire the habit of concentration and thoroughness. He has a double check on practically all of his work and he knows how to find his errors. All of this develops self-reliance, for the student of accounting is made to feel responsibility and to carry out the orders that are given him. He is trained to work consistently and patiently for the final result. If properly studied, accounting will also develop a standard of honesty.

Accounting increases the ability to think as much as the study of any cultural subject. It is impossible to analyze and set up many business transactions without inductive thinking. The student learns more thoroughly through participation than through observation, a method which is paramount in the study of accounting.

The matter of developing thrifty habits and spending wisely are emphasized in accounting. Wise spending brings into practice the making of budgets. This, perhaps, is one of the greatest values derived from the study of accounting. The importance of a personal budget cannot be over-emphasized. There is nothing of greater value to the student than the budgeting of his time or the correct planning for his various duties. The budgeting of one's time is just as important as the budgeting of his spending.

A knowledge of accounting is valuable to all because it has been proved that those who have a mind well trained in accounting grasp details quickly. However, things are not so quickly taken for granted; they are approached with an inquiring and analytical attitude. The ability to analyze enables one to see the weakness of a proposition more readily and to arrive at a decision with less trouble. All accounting procedure must be carefully planned. As far as careful planning leads to intelligence in the operation of business and to the development of social life in the community, it is educational. Any education, to be satisfactory, should be part and parcel of the community life.

CAMPUS ACTIVITIES

Gladys Swarthout, Metropolitan Opera diva, was the outstanding feature of the annual music festival held at the College from April 25 to May 1. Miss Swarthout, who is well known not only in the realm of the opera but also to radio and picture fans, was heard in a concert Friday night, April 29, in Carney Hall.

Miss Mary Karpinski of the foreign language department has spoken recently before different educational organizations, the Columbus and Independence branches of American Association of University Women, and the Pittsburg C. P. of P. E. O. on European student life, experiences as an A. A. U. W. European Fellow, and a summer in Europe with Sita.

The Winfield K. S. T. C. alumni and former students who dined together at the Gipsy Trail Tea Room, March 16, and listened to President Brandenburg's broadcast elected the following officers: president, Miss Anne Burdette; vice-president, Mrs. Lyle Cranston; and secretary-treasurer, Miss Alma Brown. Miss Jennie Walker and Miss Lula McPherson were their guests from K. S. T. C.

Under the new plan, which will go into effect at the fall enrollment next September, the price of the activity ticket will be raised from $3.50 to $4.50 per semester. Holders of two consecutive activity tickets will be eligible for one copy of the Kanza when it is published in the spring. Those who have been enrolled for but one semester may receive the year book by paying an additional dollar. Thus everyone will get a Kanza at sixty per cent of the former price, which was $3.50.

On April 2 the Kansas Association of Teachers of Mathematics held its thirty-fourth, and the Kansas Section of the Mathematics Association of America, its twenty-fourth annual meeting at the College. A joint session was held in the forenoon at which President W. A. Brandenburg gave the associations a cordial welcome. Dr. A. R. Congdon, guest speaker, University of Nebraska, gave two addresses on mathematical topics during the conference. Papers were read by Dr. U. G. Mitchell, University of Kansas; Dean R. W. Babcock, Kansas State College; Prof. C. B. Read, University of Wichita; and others. A luncheon and social hour was a feature of the day's activities.

The Department of Industrial and Vocational Education held a meeting March 30, attended by members of the Department staff, graduate students, seniors, practice teachers, and industrial-arts teachers from nearby towns, for the purpose of receiving and discussing the report of a committee appointed to study ways and means of cooperating with teachers in the field and raising the standards of industrial-arts teaching. The committee consisted of Franklin H. Dickinson, chairman, Robert D. Thompson, and Harry V. Hartman.

The Department of Mathematics has been building up an excellent collection of meteorites during the past few years. The collection was started in 1931 by securing a fifteen pound specimen of meteoric iron from Meteor Crater near Flagstaff, Arizona. Specimens from Meteor Crater are to be found in almost all of the museums that have collections of meteorites. The next specimen was added in 1934 through a contribution by Mr. and Mrs. Conrad of Parker, Kansas. Since that time a number of other specimens have been secured through the Ninninger Meteorite Laboratory in Denver, Colorado. The collection now comprises specimens of the three main types of meteorites—stone, stony iron, and iron. This collection is on display in the mathematics office.

Dr. William T. Bawden, head of the Department of Industrial and Vocational Education, represented Kansas State Teachers College at the seventh annual convention of the Southeastern Arts Association, held at the University of Tampa, Tampa, Florida, March 10-12. He spoke at two general sessions of the convention and at two industrial-arts section meetings.

Dr. Brandenburg's silver anniversary brought many alumni back to the campus.

In the home economics department the following graduates and former students returned for the celebration:

Effie Hackney, Columbus; Evelyn Hackney, Dennis; Martha Trinder, Parsons; Jeannette McGregor, Columbus; Frances Wallbank, Arma; Virginia Dickinson, Morehead; Ana Trout, Mulberry; Ruth Walker, Wichita; Irene Meyer, Altamont, all from Kansas; Mrs. Ruby Wacker Richards, Kansas City; Miss Reevil Kimme, Kansas City; Ruth Wilson, Lamar; Ruby Emmitt, Morrisville; Theodorea Stebbins, St. Louis; Mrs. Lola Brandenburg Leedham, St. Louis; Winfred Yancey, Columbia from Missouri; and Viola Lacher Holmes, Tulsa; Claire Donnelly Ratzlaff, Vinita; Virginia McMaster and Ethel Marchbanks, Copan, Pearl Ross, Tulsa, from Oklahoma.

FIELD NOTES

Ben Ahrens, who taught in the high school at Raymond, Kansas, last year, is now teaching in Arapahoe, Nebraska. Mr. Ahrens received the B. S. degree in history in 1936.

Carroll Swanson, B. S. in history, 1937, and John Hutchinson, B. S. in history, 1936, are teaching history and social sciences in the Chanute Junior High School. Mr. Hutchinson was editor of the 1936 Kanza.

Jack M. Burnett, M. S. '36, who has a scholarship in the department of Bacteriology at Washington University, returned for the reunion of biology majors during the Brandenburg Silver Anniversary celebration. Mr. Burnett will be in Woods Hole, Mass. this summer, where he will continue his research.

Louis V. Blubaugh, B. S. '30, is employed in the research department of the Wm. Merrill Chemical Co., Cincinnati, Ohio. His work is in bacteriology, immunology, and biochemistry. Mr. Blubaugh, who was student assistant in the department of biology here, was a fellow in bacteriology at Brown University where he received the M. S. and Ph. D. Degrees.

Dr. Charles A. Newcomer, B. S. '23, is professor of modern languages at the Michigan College of Mining and Technology at Houghton, Michigan. He received his Ph. D. in Spanish last June at the University of Wisconsin.

Glenn "Chub" Meisenheimer, 1927, who has taught manual training and coached athletics at Bonner Springs since graduation, resigned his position April first. He has accepted a job as youth employment counsellor at Topeka.

Mrs. Paul Jamieson, who as Miss Ruth Jane Kirby was instructor in French and Latin here some years ago, is now a graduate student in French at Columbia University. Mr. Jamieson is professor of English at St. Lawrence University and is now on leave, completing work for his doctorate at Columbia.

Miss Agnes Crowe, B. S. in 1921, is a supervisor in the teaching of mathematics in the Detroit school system. Miss Crowe was supervisor of the teaching of mathematics in the Michigan State Normal School at Ypsilanti before going to Detroit. She is one of the leaders in progressive mathematical teaching in the state of Michigan.

Orin Shearer, 1932, teacher of physical education at Allison Intermediate School in Wichita, is the president elect of the Kansas Health and Physical Education Association.

Albert B. Ratzlaff, president of the senior class and B. S. in history in 1928, has for several years been principal of the senior high school at Vinita, Oklahoma. Mr. Ratzlaff was enrolled in the Graduate School of K. S. T. C. last summer.

Word has been received of the change of position of Jane Potter-Evans. Last year she taught in the high school at Mineral, Kansas, but at present is teaching in the high school at Columbus, Kansas. Mrs. Evans received the B. S. degree in history in 1923.

Mrs. Zena C. Wallace who received the B. S. in 1921, has been teaching in the Los Angeles city schools for a number of years. At present she is teaching mathematics in the John C. Fremont High School which has an enrollment of approximately 3800 pupils. Mrs. Wallace was formerly Miss Mabel Elzena Carl from Arma, Kansas. Mrs. Wallace recently became a member of Kappa Mu Epsilon through the non-resident plan worked out by the national officers of Kappa Mu Epsilon of which Prof. J. A. G. Shirk is national president.

Six teams playing in the Kansas State High School basket ball tournaments were coached by K.S.T.C. graduates. In the class A tournament at Topeka, Coffeyville was coached by Leland "Babe" Lewis '31, Columbus by Paul McCoy '34, and Wellington by Melvin "Pete" Buzzard '28. In the class B tournament at Salina, Frontenac was coached by Barney Getto '28, Stanley by Arthur Best '31, and Corning, winner of second place, by Eugene "Stu" Stewart '32.

Mr. Daniel Pease, who has been teaching at Douglas, Kansas, for the past four years, has been introducing considerable field mathematics into the class work in geometry by means of equipment made by Mr. Pease and members of the class. Interesting measurements have been made on the school ground and in the community. The most interesting project was the determination of the height of a grain elevator which was checked by the owner and found to be a very good determination. An expansion of this type of laboratory work in geometry is recommended strongly by leading educators.

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.

An excerpt from a letter of Gladys Rinehart, describing South America.

ALL SOUTH AMERICA IS A "HIGH SPOT"

Before coming to South America I looked forward to three "high spots," the Inca country of Peru and Bolivia, the Chilean Lakes, and Iguazu Falls up the Parana River. I have been to the first two and leave for Iguazu Tuesday. The few days of comfort here in Buenos Aires are welcome after two days and nights of desert train travel across Patagonia from the lakes.

The Chilean Lakes are of great natural beauty with snow-capped volcanic peaks rising high above the shore. Osarno, a perfect cone, rivals Japan's Fujiyama in appearance. The lake waters change from green to blue. We had perfect weather as we moved from place to place first by bus and then by boat as we went from lake to lake. The hotels are of the Swiss type and both picturesque and comfortable.

Cuzco, the ancient capital of the Incas, almost seems like a dream to one here in a modern hotel at Buenos Aires. Two days and a night of mountain train ride, at times over 14,000 feet above sea level, took us there from the coast. In Cuzco, alone, one is repaid for the trip to South America if only to sit in the plaza for a few minutes and watch the unusual people and sights. Droves of llamas pass by, their lovely heads held high with dignity and their ears pointing forward over sensitive, inquisitive faces. Their keepers are Indians, both men and women, whose costumes are most colorful, the women with red hats, red blouses, dark full skirts, colorful shawls held with enormous silver pins, and the men with gay ponchos. The women carry heavy loads on their backs, a baby or a bundle. They often spin as they walk along.

To one side of the plaza is a cathedral built at the time of Pizarro; to another side across the street are little open shops filled with Indian articles for sale. Children beg. Church bells ring every few minutes.

A market is around another square a few blocks away. The Indians come in from the country and sell articles we would discard: empty ink bottles, bits of lace and embroidery, a handful of nails, battered cooking utensils, and of course fruits, vegetables, and herbs. Another large enclosed market has everything for sale that the surrounding country affords. All are Indians, picturesque, colorful, mysterious, and filthy. They appear to have no standards of cleanliness as we see them. They chew the coca leaves, which furnish us with cocaine, are oblivious to discomfort, and seem contented.

Far above Cuzco lie the greatest Inca ruins, Macchu-Picchu, and farther away the ones at Pisac. I visited both. One was reached by mule, the other by horse. Far above the valley on a narrow trail, only wide enough for a sure-footed animal, we wound to dizzy heights from where we could see the wonderful old terraces of the one time prosperous Inca farmers below on the mountain sides and their ruined city perched on the highest peak. It is surprising to think that a handful of Spaniards conquered and enslaved that proud, powerful, and prosperous people all through trickery and cunning, but that is history which I wish to read when I get back home.

We crossed Lake Titicaca going to La Paz, Bolivia. The evening sunset to the west and the snow-capped Andes to the east of that lake in the clouds were beautiful beyond description—anyway it is now time for lunch and then more sight seeing. All South America is a "high spot," so *Adios, hasta luego.*

—Gladys Rhinehart

The following excerpts are taken from a letter of Catherine Murdoch, a former student, who is teaching in Honolulu.

February 20, 1938

I wonder what the people of Pittsburg would do if they were to have an earthquake such as we had Jan. 2. Did you read about it? It lasted sixty seconds but was so violent it scared us all pale. When I got up to walk around, I was as dizzy as if I had been riding a small merry-go-round. The house in which we live sounded as if it were being wrenched to pieces. However, it stood the strain and no harm was done. The geologists say this quake was not volcanic in origin; therefore it was more dangerous to Hawaii than the earthquakes we have had in former years. You see old Kilauea on the big island (Hawaii) is a vent to this group, and we feel security in knowing that the steam and fumes which accumulate can escape in that huge opening called Halemauma in Kilauea crater . . .

You may be interested to know that I have three Chinese boys whose names are Hing Sun Wong, Hing Bun Wong, and Bung Hong Lum. We have students in school whose last names are Ching, Chang, Chong, and Chung. It sounds like chimes but not musical ones. Hing Sun and Hing Bun are brothers.

COMMENTS ON BOOKS

Heads and Tales
By Malvina Hoffman
Scribner's, 1936

Heads and Tales is the story of the adventures and experiences of the author of "head hunting" in near and far corners of the earth, and how the hundred racial types in the "Hall of Man" of the Field Museum in Chicago were selected and modeled on the road.

The book carries one rapidly through the experiences in the early life and training of the author which led up to her selection for so important a commission and discusses vividly her preparation before the round the world head hunt trip begins. One lives with Mrs. Hoffman through these early chapters and then with the racial types around the world. It is a fascinating word picture supplemented by 277 illustrations that carry the reader along with Mrs. Hoffman's party from which one doesn't want to drop out till the last type is modeled.

To those who have traveled, it is rich with associations; to those who have not, it takes them to new and fascinating experiences.

—O. P. Dellinger

A College Cirriculum Based on Functional Needs of Students
By Kenneth L. Heaton and G. Robert Koopman
The University of Chicago Press

This book very interestingly displays the planning of a college curriculum, based primarily on the students' needs, in the Central State Teachers College of Mount Pleasant, Michigan.

The writers' discussion of the achievement of three closely related purposes which were essential to the formulation of such a curriculum may be summarized as follows: (a) the development of a general college curriculum at the junior-college level which would meet the common needs of students and be preliminary to professional or other specialized instruction, (b) the development of a teacher preparation more adequate to the present needs, and (c) experimentation with plans and techniques for the discovery of student's needs and the the appraisal of the results of the college program.

Up to the present time the major emphasis in curriculum planning has been upon the general-college curriculum and related experimentation with methods of appraisal in this general area. The discussion in this book concerns itself only with the pre-professional or general program of instruction.

This study recognized the fact that in addition to giving the student an opportunity to become proficient in the various skills and understandings which are necessary to success in his chosen profession, he must be prepared to function as a responsible and contributing member of the community and as an efficient participant in the relationships of the home or family group.

It is also recognized that there is a movement in administration toward growing participation of both faculty and students in the formation of those major policies and plans which have hitherto been delegated as the responsibility of an overburdened president and perhaps a few individuals associated with him in administrative responsibility. In curriculum development the trend is toward the gradual reorganization of the total program of the college to resemble, as nearly as possible, an ideal democratic society.

This book is well written in a brief, concise manner and will prove a source of enjoyment to all those interested in the reorganization of college curricula.

—Russell B. Myers

Divided We Stand: The Crisis of a Frontierless Democracy
By Walter P. Webb
Farrar and Rinehart, 1937

Since Frederick Jackson Turner read his paper at the American Historical Association meeting in 1893, few American historians have been able to ignore his conclusions. Walter Prescott Webb shows this influence in his recent work which analyzes sectionalism in the United States. His *Divided We Stand* is given the subtitle, *The Crisis of a Frontierless Democracy*. By the time the reader has finished the 239 pages he does have a feeling of crisis.

This study is likely to provoke much controversy. Professor Webb says that the division of the United States is greater in a material way than it was in 1860. He states that new governing powers have arisen that contradict democracy in their methods of control and purpose.

Dr. Webb writes of the three sections, North, South, and West. His West starts with the second tier of states west of the Mississippi. Minnesota, Iowa, Missouri, and Maryland are listed as northern.

Corporations are considered important in the study of sectionalism. The bulk of their concentrated capital is in the Northeast. By Supreme Court decision the corporation gained the status of a privileged person. This privilege has a solid basis in the government's guarantee of profits, something that no other class gets. The ablest students in college are often drawn into the service of corporations after their training in public institutions.

Fven philanthropy has a sectional significance. Fortunes have been gained by collection from all sections of the country. In 1936, northern colleges, libraries, and museums received six times the gifts of southern institutions and five times those of the West.

Mr. Webb says that relief began with our national history. The public domain was the original relief fund. The homesteader "lived a little and lied a lot" while the WPA man "lies a little and leans a lot." Railroads, cattlemen, miners were cut off "relief" when the frontier was closed, but tariffs, patents, and pensions continued. Since most of the beneficiaries of these favors lived in the North, that section profited largely from these forms of public benefits. The influence of pensions on the economic development of the North is hinted as well as the political effect of this largess from the public treasury.

Two modern features of American life, moving pictures and automobiles, results of mass production, vary the picture a little. There is concentration of investment but diffusion in matters of employment. The general demand for operators, mechanics, filling station employees, and similar service has lessened the number of small town loafers and "domino players."

Some of the proposals under "Is There a Way Out" would be classed as very radical. But Mr. Webb believes that all programs will fail if the people do not maintain a sustained and increasing interest in government and if all parts of the country are not well informed.

This book would be more valuable if it had a bibliography and an index. There are a few minor errors in fact and the documentation is sparse. Tables, charts, and diagrams give valuable statistics in usable form.

Although this work is most interesting and stimulating, it can hardly be called objective. There can be no doubt about the author's sectional interest, nor his political philosophy.

—Elizabeth Cochran