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INFLUENCE OF GEOLOGICAL STRUCTURE ON
HISTORY IN THE UNITED STATES.

BY PROF. A. F. BECHDOLT, OF THE MANKATO NORMAL
SCHOOL.

Shell heaps found upon the coasts of Europe and the materials recovered from about the habitations of the Swiss lake dwellers show positively that prehistoric man lived upon the game yielded by the forest and waters about him. The diminution of game, increase of population and pressure from without forced the various tribes to restrict their wanderings to certain limited areas and to devote themselves to the rearing of cattle. The earliest records bring us in contact with cattle raising people. Thus we find that feuds among herdsmen led to the arbitration between Abraham and Lot. With the increase of population and growing pressure from without the struggle for existence became more intense. The stronger peoples, secure in their possessions, came to depend upon the soil for food and in part also for clothing.

An agricultural people have one advantage over a pastoral people; the latter, on account of their migratory habits, must have a government of a patriarchal type. An agricultural people, from their settled habits and the necessity of being prepared at all times to defend their property, gradually evolve a form of government in which the best men rule. At first the best men are those who can most successfully organize resistance to forays from neighboring migratory bands. This mode of life leads to centralization of power and makes such people stronger than less organized migratory bands, because power is here definitely organized.

There is but slight division of labor among a purely agricultural people. The master of each house is both smith and

carpenter. The wife weaves and makes the garments for the family. As farmsteads were crowded closer together and hamlets became towns and towns cities, only then did a division of labor spring up. When the relations of men became more involved and interdependent, then did man devote himself to mining, manufacture and such other forms of labor as stand most intimately connected with the geologic peculiarities of his surroundings.

What took place in the long reaches of the world's history and in man's infancy, when the evolution of each step was slow and modified by only the simplest causes, takes place to-day among the most civilized people, where thought and action move with ever increasing speed through wider and more complex orbits.

Every nation, community, and one might almost say, city, has a spirit and culture peculiar to itself in consequence of this differentiation. Athens differed from Sparta, and to-day the underlying social spirit of Boston and Chicago differ almost as widely. Many such peculiarities are the accretions of time, handed down from generation to generation as a kind of general inheritance. Ultimately the explanation of all such inheritances is to be found in the geological structure of the region inhabited by a people.

As far as concerns physical peculiarities, it is easy to explain the sallow face, loose-jointed body and drawling speech of the Missouri Pike, the large bones, nasal, slurring speech of so many New Englanders, the dark complexion and rapid speech of the frontiersman of the Northwest, by the country in which they live. Malaria in Missouri, a mountain home and mountain fogs in New England, the dry, bracing but changeful climate of the Northwest—these seem sufficient causes to account for such peculiarities. We love to think of the narrow mountain valleys of Greece, its balmy air and clear skies and the laughing ripples of the island-gemmed Ægean as among the primal causes that inspired the pen of a Thucydides or an

.Eschylus, that shaped the marbles of the Acropolis, or moulded and expanded the Indian myth into Olympus and the gods of Greece. It would be hard to conceive of Socrates and Plato teaching his pupils in the malarial plains of the lower Danube.

In application of what has been said, I wish to bring before you some thoughts on the influence of geological structure on history in the United States.

Such causes are as yet not widely nor markedly noticeable because of our youth as a nation. The influx of foreigners with the migrations of our own people makes it impossible in all cases to disentangle the web of influence and ascribe to geology its own proper part. In the older states we can find several marked cases in which geologic causes have clearly modified the status of society, modes of thought current, and in general, the history of the people.

The State of Pennsylvania is represented upon the map by a great rectangle, running east and west, with its eastern side wanting and replaced by two nearly equal triangular projections, made by the bends of the Delaware river. The apex of the northern triangle is where New York, Pennsylvania and New Jersey meet. That of the southern triangle is nearly opposite Trenton, New Jersey, and the re-entering angle between is near the mouth of the Lehigh river. The state is crossed from the north-east to the south-west by the Alleghany Mountains and their eastern outliers, the Blue and the South Mountains. These mountains are cut by the Delaware and Susquehanna and in part by the Lehigh, Schuylkill and Juniata rivers. The rivers and intersected mountain valleys furnish lines of communication between the north and south, east and south-west.

The South mountains enter the state near Easton and are largely made up of Azoic rock. To the north and west of these mountains lie immense deposits of hard, blue, Silurian limestones, shale and haematitic iron ores. These rocks are

tilted up at all angles and present many excellent exposures for mining. Along the southern slopes of the Blue Mountains lie large deposits of roofing slate; and to the north and west of these mountains, entangled in their western outliers, between Wyoming and Pottsville, lie the anthracite coal beds. Several patches of semi-bituminous coal on the Alleghany Mountains connect the anthracite with the bituminous beds of the western part of the State.

After this general description, to which I shall have occasion to refer somewhat later, I wish at first to speak more particularly of the Cumberland valley. This is bounded on the east and west by the South and Blue Mountains, a distance of twenty miles across. On the north-east it opens upon the plain of the Susquehanna at Harrisburg; on the south upon the plain of the Potomac at Harper's Ferry. It is continued beyond the Susquehanna by the Lebanon valley, giving access to the coal and iron centres, and on the south beyond the Potomac by the Shenandoah valley. As incidentally bearing on the subject, it is worthy of notice that in this valley Antietam was fought. Up this valley Lee marched to his defeat at Gettysburg. In this same valley beyond the Potomac Sheridan made his famous ride. A few moments study of the map will show its strategic importance.

The southern part of the valley in Franklin county is underlaid with Trenton limestone on the eastern side. Near the middle of the valley the friable Utica shale appears, and the two rocks fold back and forth until they sink under the Medina sandstone topping the mountains to the west. The country, viewed from the lower ground, seems rather to be a stony sea, billowing back and forth between two mountain chains, but looked at from the mountains the valley lies before the eye as one of the most beautiful of a beautiful state.

Like other portions of the state it has suffered much from denudation. At a place in Fulton county, a few miles west of

the valley proper, I have stood upon a fault in the strata, one foot on Trenton limestone, the other on Hamilton shales of the middle Devonian series, and looked on some monstrous fragment of Shawangunk grit, which had fallen from the eastern up-lift, had been caught in the chasm and lies revealed where the plane of denudation cut it. By piling, in imagination, mountain upon mountain, I have tried to picture to my mind the extent of this uplift, compared by Leslie, to a Hindoo Koosh. All this rock material has been swept away by denuding agencies and in consequence the anticlinal limestones, once the core of great mountains, now protrude their ridged backs in the lower grounds and the synclinal shales stand as sloping hills between. Numerous springs gush from the limestone ledges and form brooks. Wherever such brooks cross the shale the land slopes away into beautiful meadows, but where they cross limestone we find steep rocky banks matted with underbrush. Upon the limestone lies a heavy clay soil, of varying thickness and very stony. A soil hard to clear and cultivate, but with a generous heart and yielding for many years a rich return for all labor. The shale lands offer no such obstacle but, except under the highest cultivation, run down and when impoverished, are difficult to restore.

Into this valley in an early day came settlers of two nationalities. First came those of Scotch Irish descent, who made the frontier settlements of the state and in the troublous times of the French and Indian and Revolutionary wars presented a barrier to Indian incursions. In the families of their descendants one may still hear the story of the daring and privations of that early period. The war-whoop, and the flames of a neighbor's house were often the sudden warning that drove mother and children to cower among reeds and hiding in the underbrush make their way slowly to some fort, while below in the valley they heard the crash of rifles, and often saw go up in flames the home they just had left. These people bought the soil with their blood and became

attached to it by the same holy love the New Englander feels for the land where his forefathers fought. The fathers of these people had made the "Solemn League and Covenant," and they brought that covenant with them to their new home. They were shrewd and honorable in their dealings, good friends and good haters, great readers and students, good liver and good citizens.

These first comers settled upon the shale land, as being most easily brought under culture, and deemed the limestone land of little value. Gradually others came among them, German Anabaptists, the Dunkers, with the descendants of the Palatines, who, driven from their homes by the Thirty Years War and the War of the Spanish Succession, had sought a home in the New World where they could worship in peace according to the faith taught by Luther and Zwingli. The ravages of war had left to them nothing but life. On account of their poverty, unable to pay the expense of the voyage, they sold their labor to the ship masters for a term of years, who sold them in turn as bondmen at Philadelphia.

As these people gained their freedom they pushed into the interior and we find their children coming among the Scotch Irish of this valley and clearing with much labor small portions of limestone land. Poor and despised by the clannish Scotch Irishmen, with close economy and hard labor they slowly gathered wealth, and with it came some social standing, but not of such a character as would lead to a ready intermarriage of the races.

Their quiet demeanor, cheerful spirits, obliging ways and industrious habits compelled the respect of their neighbors, but they differed so much however, in their views of life and on matters of faith that the two races could not affiliate.

The Scotchman, in spite of his economy as time wore on, became poorer, whereas his German neighbor gained wealth with each revolving year and was always prepared to buy a favored bit of meadow with ready money. Many of the

Scotch Irish, who held their own, have done so by a series of family intermarriages that materially lessened the vitality of their descendants.

To-day the descendants of the Germans own the richest parts of the valley. This is so noticeable that if a farm is seen to be in good condition and indicative of the wealth of the owner, such fact is held to be presumptive evidence that it is owned by a "Dutchman." The children of the Scotch Irish have gone west and aided in building up every western state on the same lines of latitude. The churches, where David's Psalms and the Westminster Catechism were as law and gospel, are now either forsaken altogether or open their doors to a dozen old men and women.

It must not be understood that the accident of settling on different geological formations is regarded as being the only reason for this great change in people, but that it was one of the more important operative causes is shown in the fact that it is often given as the cause by the people themselves.

A somewhat similar change has come over other and more crowded portions of the state. Until 1840 the interests of Pennsylvania were those of a farming state. The people lived at peace with the fields about them. Their wants were few and their ideas were restricted to the work of the fields.

Prior to this time the state had made some attempts at internal improvement, as a canal, now part of the Pennsylvania R. R. bed, and among other things a railroad from the neighborhood of Gettysburg into the South Mountains,—a matter in which Thaddeus Stevens was somewhat interested. This road was never completed and, after large sums of money had been spent upon it, was sold for a trifle. Under the popular name of "Tape Worm Railroad," it is pointed out to visitors among the mountains as a piece of monumental folly. The matter is of interest in this connection, as illustrating the simplicity of the times. Local gossip says that it was asserted in open debate in the legislature at that time that this road, if

built, could not be used in winter because of the snow; and just as publicly was it asserted that snow never fell, beyond a slight sprinkle, in the mountains of that portion of the state.

Here for the first time the state had to deal with a problem entirely new to the people. Such misstatements in regard to the possibilities of railroad engineering and the physical geography of the country could pass unchallenged only among a people ignorant of these matters, who rarely saw other than their own country side.

Often at that time the personal efforts of a well known man counted for far more than the best secured pledges of a company. Asa Packer, at that time by no means the wealthy man he afterward became, had to use his personal influence and pledge his own credit to induce the farmers to part with the right of way to the Lehigh Valley R. R. although the construction of this road within a few years largely increased the value of farms along its line.

There are yet many nooks in the state slightly removed from the regular lines of travel, where the spinning wheel makes a noisy accompaniment to the slow tick of the tall corner clock. There had been from the earliest times, small iron furnaces scattered along the mountains, where wood, lime, ore and water power were abundant, giving employment, at most, to a few men for part of the year.

The development of the anthracite coal mines and improvements in the means of access hastened a change.

At first coal was laden at Mauch Chunk into rough boats, or boxes, called arks, made in the neighborhood out of the pine lumber abundant at the time. The river was dammed where necessary. The arks were collected above the upper dam and when the flood gates were opened, rode down upon the swell of the waves to the dam farther down. These arks were broken up at Easton and sold for fuel.

The Lehigh Navigation Company's Canal came from this crude method, along with the Morris Canal across New Jersey, and the Delaware Canal to tide water on the Delaware.

With the coming of the railroads the iron industry developed as by magic until the Lehigh and Lebanon Valleys were filled with furnaces, machine shops, nail, wire and steel works.

From these iron and coal centres radiated, in turn, lines of canals and railroads in every direction. One railroad extended a long arm across New York, along Lake Champlain to Canada and is about to reach out another arm to Buffalo.

The interaction of mining, manufacturing and railroad industries has brought into play new social forces. Welsh and Irish laborers flocked into the state by thousands. The consolidation of industries created gigantic corporations, who base their claim on the might of capital and frequently exercise undue influence on legislation. Organization among the employers had its counterpart in corresponding organization among the employees and trade unions sprang up, whose influence is felt oftener in strikes than in measures tending to progress.

Secret societies, as the Molly Maguires, arose among the ignorant Irish miners of the coal fields. Denied appeal to reason and legal measures by their own dense ignorance, they sought to accomplish their ends with the murderer's bullet, and cast over the whole coal regions a pall of fear and terror.

New ideas on tariff and finance crowded fast and faster, and with them came a sea of social questions to vex the peace of the community.

To form some idea of the immensity of this change let us glance at Bethlehem—the Bethlehem referred to by Longfellow in his "Hymn of the Moravian Nuns." There are yet standing the "brothers" and "sisters" houses where long before the days of Brook Farm, those who so chose lived as one family. In the God's Acre sleep these self denying missionaries and their Indian converts. Before the new life compelled the Moravians to adopt other and more modern habits they were as peculiar in their polity as the old Quakers. The church was with them the centre. They worked for the

church and the church gave to each one support. The brethren decided by means of the lot, cast by the elders, whether it was pleasing to God for any two to marry. As a people they loved music and nature passionately. Even in that early day their missionaries found time to write treatises on the speech of the Indians and to note their observations on the botany of the valley. Over this vale a Sabbath quietness reigned. To-day along the slope beside the river runs a railroad, on which there is the ceaseless clatter of coal trains. Beyond this lies the canal. On the other side of the river another railroad skirts the brink and beyond still another branches off toward Philadelphia. In the angle formed by these two railroads, stand furnace stacks behind furnace stacks. The clang of hammers and the clatter of machinery goes on day and night and night is changed to day by the ceaseless rush of flames from furnace mouths. Going down the river to its mouth, a distance of twelve miles, we pass one series of furnaces after the other. Up the river, we pass Allentown with its rolling mills, Catasauqua and Hokendaqua with their immense furnaces, by Slatington with its slate quarries, and the gloomy portals of the mountain gap open upon the busy turmoil of the coal traffic at Mauch Chunk.

If we turn to the western part of the state, and leave out of consideration the coal, steel and glass interests of Pittsburg, we find the petroleum traffic the all absorbing topic. As an industry it is not yet of age in years, but it has already so far changed the political interests of that part of the commonwealth that the question of being set off as a separate state is much agitated.

All these great changes have come about in this state within the last fifty years, and have sprung from the development of the mineral resources:—that is to say—*are due to the influence of geological structure.*

If we glance at New England we shall find that the occupations common to that section are determined by the ab-

sence of ore bearing rock and the abundance of excellent water power. Driven from the sea by various causes, and in part forced to give up farming by the greater fertility of the regions to the south and west, the people adopted lines of manufacture that may be loosely described as comprising those articles of luxury that civilization has made necessities, and generally comprehended under the name Yankee notions.

It is further of interest, as having a general bearing on this subject, that the more prominent of our Atlantic sea board cities, as Boston, New York, Philadelphia, Baltimore and Richmond, are on Azoic or Paleozoic rock. The great mass of our population, out of all proportion to the extent of the rocks, is living on the older strata. In how far the fertile lands of the lower Mississippi may change this remains to be seen. I have but little doubt however that where mining and manufacturing establishments are formed there men will tend to crowd, and an inspection of a geological map of the United States will show that the greater number of such centres must be on the older rocks.

The same blind feeling impels man toward such centres as draws the English boy to London. "He is near and nearer drawn, as he sees in heaven the light of London flaring like a dreary dawn." The most of those who come to such centres are lifted to a higher plane of culture. In a farming community, the tendency is toward individualization. There is no pressing competition, no strife of the one to excel his neighbor, but each one is independent within his own narrow circle.

In manufacturing towns men become dependent on one another. Such interdependence begets eagerness among workmen to rise above their fellows in wealth, in skill and in intellect. It is true that manufacturing towns are also the places where noisy revolutionary societies flourish; however such a ferment is not that of decay but rather of the kind which changes grape juice into wine.

In olden times when men wished to study they withdrew to the cloistered cell of some quiet monastery. To-day we find our great educational centres near our large manufacturing towns, and deriving their support and encouragement from our merchants and manufacturers. A New England manufacturer, when asked why he did not move his factory to southern Pennsylvania or eastern Ohio where the materials used by him, as well as the means of living, are cheaper, answered that the tendency of the people in those places was as yet toward agriculture. His employees would leave him and it might be difficult to supply their places; or if they remained they would be discontented with their surroundings on account of the want of a sympathetic neighborhood.

If it be admitted, that in the cases cited the advance in progress and the general change in the character of the people was in great part, if not entirely, due to the assigned geologic causes, and if it be permitted, on these few premises to generalize, it may profit us to look forward into the near future and see the promise of the day to come.

With only a passing reference to the mineral deposits about Lake Superior and to those rumored to exist within and near the northern bounds of our own state, (even a partial development of which must work an immense change in the northeastern part of this state,) let us glance at that portion of our country so lately spoken of as the "Solid South".

In so far as there has been any radical difference of views in the past between North and South, setting aside the question of slavery, the grounds therefore must be sought in the real or assumed difference of interests. Unity in sentiment will come with unity of interests. When this is once brought about whatever differences remain will be in minor local matters, never in those affecting the nation.

The mountainous parts of the Virginias have been opened to settlement within the last decade by railroads up the valley of the Shenandoah and by the Chesapeake and Ohio Rail-

road which crosses the immense deposits of cannel and bituminous coal of West Virginia.

Settlers from the North are pressing into the mountain valleys and gradually opening up the large beds of iron and coal. Hitherto want of people, of roads and of money has prevented all energetic action. The panic of 1873 found these and other Southern states just recovering from the effects of the war. They could neither move forward nor backward. In spite of this, new blood came into these states, and with the revival of prosperity, we can already feel its beating in the changed tone of the Southern press.

In eastern Tennessee and Kentucky we find deposits of copper, iron, marble and coal, and mountain plateaus of great fertility. The new railroad, running southward from Cincinnati, and the establishment of the colony of Rugby, under such favorable auspices, may be expected to do much towards the development of the material interests of these sections.

Hitherto the mountaineer has been debarred from a market for his grain on account of poor roads. Shut out from a market he had to limit his comforts to those of the savage or as moonshiner convert his grain into illicit whiskey and seek for it a sale in that concentrated shape.

Northern Georgia has already awakened to a new life. Atlanta is described as more of a northern than southern city.

From Chattanooga southward towards Atlanta a dozen iron furnaces stand along the base of the hills beside the road.

The mountains of North Carolina and of the states further south are as yet an almost unknown land. Scientific societies and colleges send exploring expeditions to these mountains, as they would to the Yellowstone and the Amazon. We know something of mica mines and corundum deposits, worked in a heartless, shiftless way, and their products marketed over miserable mountain roads,—something also of gold, copper, lead and iron along the mountain slopes. Those who have penetrated into the wilderness of these mountains, speak of waterfalls, fair rivals of our largest.

After the war immigration set in, and all these states have been gaining in population, more especially along the mountain slopes, at such a rate that the showing of the last census is a matter of general surprise.

With the renewal of prosperity railroads are following population, and within the next ten years we may confidently expect a development of the mining industries of these states at a rate hitherto unprecedented. Manufactures will follow. When these people can obtain at home all the machinery needed to make cloth from cotton and to refine crude sugars, the development of these manufacturing industries will come. All such changes will bring with them a corresponding change of sentiment.

At present the people of this section are in a transition state. The old generation, nursed under the poisonous influence of slavery, are fast dying off. The negro, born in slavery, will go with them. The new incoming people, having no sympathy with the old patriarchal system of the South, bring schools and school masters with them.

Gradually those of the new generation of southern men are drawn away from and lose sympathy with the philosophy of their fathers. This hanging on to the issues of the past will linger longest on the flat Tertiary lands of the coast. Regeneration will work its way from the mountains toward the coast,—outward from these giants of the earliest geologic days, whose ribs are formed of the materials civilization and progress demand. I believe that in the end our mountain chains will tie us together as a people in closer bonds of sympathy than our rivers.

It is said that a man from the prairies waited in the White Mountains during a whole week of fog and rain to see the sun rise upon the mountain tops. When at last one morning the billowing fog was rent and the peaks were bathed in a glorious burst of sunlight, he swung his hat with the cry, "Hurrah for God!" He saw in them the majesty of their

Maker. All that is God-like,—freedom, civilization and culture, has spread from them in all ages, and from the development of their resources will come the dawn of a new day for the South.

RED LAKE NOTES.

BY MISS FRANC E. BABBITT, OF LITTLE FALLS.

A lady begs leave to submit to the attention and keeping of the Minnesota Academy of Natural Sciences, a small box of pottery fragments collected, for the most part, from various points upon the shores of Red Lake, Red Lake Odjibwa reservation, Beltrami county, Minnesota. These objects have been secured through the good offices of resident sub-agent Mr. Jonathan Taylor, and of his family; a considerable share of them having been obtained directly from the soil through the personal efforts of Mr. Taylor's son, Elmer Hamilton. Rev. Fred Smith, native missionary at Red Lake sub-agency, has also kindly contributed groups of broken pottery herewith transmitted, which were collected at Black Duck Creek, and on lands between the mouth of that water-course and the agency.

These earthen remains are put into the keeping of the Academy, not in virtue of the purely historical interest attaching to them, but on account of their scientific aspects and uses, and, in particular, because of the aid which they may be expected to afford archæology, in fixing a distinct line of demarkation between the workmanship of living aborigines of the Northwest, and that of prehistoric peoples.

The value of the rude fragments presented is due almost exclusively to the circumstance that they have been distinctly traced to their source, as to race, as to place, and approxi-