An intellect most unusual, not only in its thirst for knowledge (which is not a very rare attribute) but in its power to pick out the *important* facts which he gained through reading and through his amazingly keen faculty of observation of things around him, and then in its power to retain and correlate these important facts with what he already knew. Always, everything he learned had a place in his interpretation of life as a whole.

In his work, a perseverance and patience very rarely found. When he wished to complete a project, no failures could stop him. His imagination supplied him always with a new method of accomplishing his end, and his power of concentration kept him doggedly at his work; so that he was scarcely conscious of a setback that would have made another man give it all up in discouragement.

His eyes were always on the big problems—away from pettiness, from personalities. And so, although his religion might have been termed a materialistic one, he was a truly spiritual character, for he lived his life for his ideals and not for material goods as an end.

And finally, an interest in people whom he met everywhere and in every sphere of life—in their histories and their capabilities, that made him remembered wherever he went.

ARTHUR J. MASON

A CORN BELT WITHOUT CORN

A Paper Read Before the Chicago Literary Club Thirty Years Ago

By Arthur J. Mason

ONE of the faculty at Nebraska university, in an essay on his native state, remarks: "The prairies and the farms as they are now are surely much what they will be through as many centuries more, perhaps, until a new age of ice comes again to drive away their summers."

This utterance fairly expresses the comfortable—shall I say, smug?—state of mind universal. There is not the slightest chance of Nebraska's continuing fertile land until "another ice age." There is not, in my judgment, the slightest chance that it will continue fertile for a century hence—under present cultural practice.

The tradition of the permanence of agriculture is so grounded that facts make no impression on the public mind. Very little I find does make its mark on the public mind, unless it be dramatic, hence newspaper headlines. As all the great, the essential changes, physical, moral, or intellectual, seeing they come by slow

and small increments, are covert, we have the spectacle of society never knowing "where it is at" until it is confronted by a calamity, big or little.

Professor Thomas C. Chamberlin (of the University of Chicago), in that lofty and informing speech on soil wastage before the conference of Governors in Washington in 1908, refers to the situation in China as "the pitiable struggle of certain oriental peoples to retain and cultivate the scant remnants of once ample soils."

To understand China one must clearly get this picture—400,000,000 people slowly compressed into the small area of remaining fertile lands. It is like building a skyscraper on a lot twenty feet square, unstable and hopeless. There is no surplus of food in China for domestic animals, either for work, for food, or for that essential thing, milk. The situation has obtained so long that it saturates the national character. People acquiesce in being without space and opportunity. I will later measure these conditions in a comparison with our own. A pathetic relic is seen in their veneration for antiquity—for them the days of plenty and opportunity. The China which gave to the world printing, gunpowder, paper, the mariner's compass, porcelain and other things, was a land of space, of opportunity, of movement—not the moribund China of today.

Even the China of today survives probably because of the whimsical natural freak which dripped the dust of central Asia—in inexhaustible loess soils, often 1,000 feet deep—over a part of north China.

China's total harvest may be said when brought to a common denominator to be 15 bushels of grain per capita. While much less than half our people are engaged in similar agriculture, our corresponding figure is 100 bushels per capita.

The poor Chinaman eats his 15 bushels all himself, does all the work with his own muscles. He has no great surplus to support those faithful servants, domestic animals, or to form a stimulating, energizing meat diet. Most of all he has no surplus of manhood to mine, to manufacture, to transport, to amuse, to instruct, to form, in short, a great country like this. Everybody works, merely to keep going.

Allow me to conduct a simple experiment. I take a pail full of water; first resting the pail on the ground I gently pour it out—it slowly saturates the surface. I next raise a full pail, shoulder high, and rapidly establish a cataract. Any man with eyes must see that in the case of the last pail emptied, the soil is torn and washed. Here in a nutshell you have an image—the first pail resembles the rainfall in the permanent agricultural land of north Europe, the second pail the temporary countries.

I will now make two statements with complete confidence—first, that the surface of the earth with a rainfall corresponding to the first pail is very small indeed, and second, that the United States, decidedly, emphatically belongs to the area corresponding to pail number two, the cataract pail.

It must be claimed that warnings enough have been given. When I came to write this paper I found how little I could add, yet I do not think any serious impression on the public mind has been made by the ample literature already available.

Quoting now from the same speech of Professor Chamberlin, in Washington;

"Let us turn at once to the basal factor in the problem, the rainfall, the soil, and the soil-wastage, the special theme of this hour. The rainfall is an inherited asset, the soil is an inherited asset, even a little soil removal is an asset, but reckless soil-wastage is a serious error. Soils are

the product of the atmosphere and its waters modifying the rock surface. When the atmospheric waters have aided the air in producing soil, by rock decay, they may pass, on the one hand, into plants or back to the surface soil, and thence to the atmosphere by evaporation, or, on the other hand, they may pass on down to the ground-waters and thence into the streams. The alternative is to rush away as foul erosive floods on the surface, wasting soil and plant food, gullying the surface, choking the ravines, flooding the valleys, silting the pools, filling the reservoirs, sweeping out the dams, barring the streams and clogging the harbors. If it shall be found that all or nearly all the waters should go into the soil and thence into the underdrainage, coming out slowly and steadily by seepage and by springs into the streams, clear and pure, these streams should present nearly ideal conditions for water-food, for power, and for navigation. The solution of the soil problem may therefore be, in large part, the solution of the whole complex of problems of which navigation is the last term. It may thus prove to be the key problem."

In another place Chamberlin says: "Under such an estimate, to preserve a good working depth, surface wastage should not exceed such rate as one inch in a thousand years. If one chooses to indulge in a more liberal estimate of the soil-forming rate, it will still appear, under any intelligent estimate, that surface wastage is a serious menace to the retention of our soils under present modes of management. Historical evidence enforces this danger. In the Orient there are large tracts almost absolutely bare of soil, on which stand ruins implying former flourishing populations. Other long-tilled lands bear similar testimony. It must be noted that more than loss of fertility is here menaced. It is the loss of the soil-body itself, a loss almost beyond repair. When our soils are gone, we too must go, unless we shall find some way to feed on raw rock or its equivalent. The immense tonnage of soil-material carried out to sea annually by our rivers, even when allowance is made for laudable wash, and for material derived from the river channels, is an impressive warning of the danger of negligent practices. Nor is this all; the wash from one acre is often made the waste-cover for another acre, or for several."

The instinct we all feel about good land is sound—perhaps it is a latent feeling, that only from good land can a robust stock of men come forth and one need not go far to verify this, no further at least than Kentucky, contrasting there the mountaineer with the bluegrass people. For my part I never meet the mountain people without seeming to see evidence of former cultural qualities, not visible in the modern instance—perhaps it is because I have seen cattle deteriorate in poor country.

TO GO back to my two pails of spilt water. A whole school of agronomists point to Europe, an old country whose fertility is on the increase, and thus allay the feeling of alarm at decreasing fertility in this country.

I would first point out that these men always quote northern Europe, a land of small annual rainfall in inches, but frequent rains, a land having ideal conditions for the creation and retention of soil, a land of clear streams. Let those same men quote the south of France. The loss of soil in the south of France is the despair of its people; it has involved enormous expenditures to arrest, in any degree, and is the subject of a large literature. Now what is the difference between these two parts of France? They have about the same annual rainfall, allowing for bolder

topography in the South. Merely this, as our returning young soldiers can testify—in the North it rains about 200 days in a year, in the South the fall more largely accompanies thunderstorms. Perhaps there are half as many days on which it rains, and the total rainfall in both cases is twenty to thirty inches.

The whole question of rainfall is a strange and interesting one, full of surprises. London and the Sacramento valley of California have a not very different annual rainfall. London the ever wet—Sacramento valley the almost ever dry. In one case frequent little rains all the year, coming on 200 days. In the other all the rain coming in three months, on sixty-five days, and for six months parched, baked, dustiness everywhere.

I wish I could get the job of allocating the rainfall as we in Washington were supposedly allocating everything during the war. One could so easily and advantageously take fifteen to twenty inches off the Middle West and bestow it on the great arid region beyond the 100th meridian. Inasmuch as in all probability about the same amount of moisture passes over the United States each year and inasmuch as one cannot have a cake and eat it, then too much rain here means a drought there. In the summer of 1919 we had an unusual drought; contemporaneously all the East suffered from too much rain.

Strangest of all, at Culebra, Isthmus of Panama, our government found that it could not maintain a vegetable garden without irrigation; this in a place where it rains about 200 inches each year.

What is the situation in little green England where our traditions were established and slowly indurated in the mass of minds? When the annual accounts are cast up it is found that the total rainfall of London and the eastern counties is but two-thirds that of Illinois—specifically, twenty-six inches per year in London and thirty-eight or thirty-nine inches in Illinois, an average of the state, of course. Precipitation is but thirty-six inches in Chicago. The English rainfall more resembles our practice of sprinkling lawns—the best of reasons why the lawns are green as their fields are green.

The streams of England are clear, stocked everywhere with the carnivorous game fish, preserving almost a uniform flow. Tennyson's "Brook" joins a brimming river—brimming, but not in flood—normally brimming and clear. Such streams in agricultural regions can only exist where the rain comes often, but not much at a time. For then the water enters the ground, finding its way into the streams through springs, that is, underground. In this case no soil removal occurs.

One might here announce, agricultural regions with dirty streams are, must be, temporary. Agricultural regions with clear streams are, must be, permanent.

There is no doubt about it, the fertility and the very body of the soil itself increases in Great Britain. That is more or less so, with a strip a few hundred miles wide across northern Europe—but where else is this so? I know of no place, except overflowed or bottom lands. The permanence of England is no whim. It is enshrined in the face of nature and worked into the character of the plants and the animals, of fish, as well as men. It is the hand of Jehovah himself. So thither we must look for what leads to permanence.

THE legend of the stability of agriculture saturates poetry and all literature, like the legend of the Eternal Hills. It so dominates us that we are blind to the most obvious, or open our eyes too late. I picked up lately in Memphis a Southern agricultural journal, astonished indeed to find half of the space devoted to questions affecting the washing away of the land,

urging contour plowing, such as we now so commonly see in the state of Georgia, and other devices or practices of the kind, shutting the stable door after the horse is stolen.

My special interest, centers in this greatest of all continuous bodies of good land, the center of which we call the Corn Belt. Every discerning traveler recognizes it as the greatest feature of this country—a tract about 1,000 miles square with Illinois near the heart.

Without this great productive area there could be no New York city or Woolworth building; no Detroit with 3,500 Ford motors daily; no great orange groves in California; no United States Steel corporation; no Standard Oil Company. The whole fabric of American success is squarely founded on this aggregation of homesteads.

I have lately acquired a farm; 160 acres of black corn land, not over 25 miles from this spot—smooth summit land without a ravine or waste place, every inch cultivable. For several years now I have affectionately watched this tract. There is no part twenty feet higher than any other. It has been under cultivation fifty years. Already the soil is gone from all the bumps—formerly the best part. My scrutiny led to the estimate, that almost half the soil has disappeared. When I came to compare this belief with the views of two excellent old Germans, quite observant men, who had been on the farm from boyhood, their independent judgment had formed the same conclusion. The loss of soil is obvious, plain to any eyes that care to scan.

A fair estimate for the whole countryside is that four or five inches of mould have gone. The soil and subsoil are very ferent in color—black the one, yellow the other. Let any man watch the plowed lands of this state; see the color change, in the depressions black, thence up the gentlest slope getting gray, then almost yellow on the prominent bumps; once it was all black.

A good deal has been said within ten years about soil erosion: Unhappily indignation has been switched into a wrong channel, as usual a scapegoat is found and our wrath is poured out on the man who cuts down trees—"Woodman spare that tree"—another dramatic, easily roused sentiment, for we all love and enjoy trees.

Now the fact is our prairie good lands were treeless. It is nearly always a sign of change from good to poor land to find woods appear—the black land is congenial to willows and cottonwoods; the oaks prefer slopes and breaks to creeks, where the gradient and accumulation of surface water-flow has naturally prevented the accumulation of mould. This is a fairly general rule.

Not forests, but well-grassed sod surfaces are the real creators and preservers of our vegetable mould. Such were our prairies when Abraham Lincoln was a boy; such they had been for thousands of years.

The sheltered mellow land with its network of grass roots, mocked at erosion—it held the rainfall and led it underground. We now know that when that first sod turned, a revolution took place, from stable to unstable. That beautiful black crumbly mould had then insufficient powers of resistance against a downpour of nearly forty inches of fierce rainfall. In its unprotected condition it must pass off principally as coloring matter in dirty water—some to raise the level of bottom lands, some to pass off to the sea—in neither case doing any good to offset the first injury.

Each year more than twelve inches of water runs over the whole surface of this State on its way to some water course. This would not be so serious but for the fact that it takes place in a short space of time, bringing to the same grass-mulch-

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tearing and transporting energy. This force is given its maximum injurious power by our form of agriculture. During June, July and August, the period of severe storms, we stir the surface of our corn lands as though to emphasize their helplessness.

Cotton culture is equally vicious. Our two principal crops, therefore, are just such as some far-seeing evil spirit might devise to assist the national nemesis in sooth the devil of our forefathers.

When Lincoln was a boy, the streams abounded in bass and other game fish. These fish are largely departed—their places taken by carp and catfish. The popular legend regarding this substitution runs: "These detestable German carp have driven out the game fish"—to my mind about as logical as to say that the rabbits, still with us, have driven the wolves out. Disappearance of game fish permits abundance of the helpless vegetable-eating fish, who are the provender of the carnivorous game fish. "Kill the mountain lions and deer increase."

The fact is our dirty streams are congenial to the fish which survive. Game fish must have clear water to see a potential breakfast, to follow and capture it. They are not provided with feelers and great eyes like the fish of dirty streams which are adapted to feel their way to a loathsome breakfast of mud, containing minute vegetable and animal life.

I love to hear some doting grandad prate of the big bass he caught in '58 in Skillet Fork. Are any bass there now? His grandsons knowing the slimy stream today believe the old man is talking through his hat.

Come with me into the definite realm of measurement. It so happens in the state of Illinois we have over 300 miles of what agronomists would call a check strip running from Chicago south. The Illinois Central railroad came early into possession of a right of way 200 feet wide—an unusually generous width. In open country there is nearly always a space between the margin of cut or fill and the enclosing fence. This strip has remained for 60 years, mostly untouched and carpeted with the old sod.

If all that has been previously alleged be true, if the erosion—widespread surface erosion over hill and dale—be really serious, surely it is only a matter of digging in the virgin soil of the right of way and contrasting such a hole with a competitive one on the cultivated field adjoining.

It was the purpose in this paper to report such a series of tests for 150 miles southward before this time, but the outrageous winter and still more outrageous spring has made it impossible. We have only examined the first thirty-five miles. As one goes southward from Chicago, the rainfall increases steadily all the way to the Gulf of Mexico, especially that portion of the rain which falls during severe storms, so that there is little hope of finding things better—rather the dismal certainty of their getting worse.

The United States is not a permanent country like north Europe. It is a country like north Africa, where the splendid Roman ruins of cities attest the fact that the economic basis for such cities has been in some manner withdrawn.

I don't think we have any evidence of change of climate in north Africa. *Remove the soil from any region and without diminution of rainfall it becomes arid. Without soil there is no local water storage.* The rainfall runs off as it does from a slate roof.

Remove from human society all the agencies for water storage and most of us would speedily die of thirst, which is just what plant life with its limited reach does in these devastated washed areas. Some of this audience somewhat dimly, perhaps, hark back to the days of the great American desert, including what is now pro-

ductive Kansas. The same thing happened in Australia. I know of fertile, happy regions in that country in what was first pronounced desert. This always happens in new extensive areas. The explorer without water storage facilities or knowledge of how and where to find water, suffers as though in a veritable desert, and such he dubs it. Water storage facilities tide over human society between rains. Soil performs the same service for plant life.

My case stands or falls on the test which anyone can quickly carry out by digging on the old public roads,or railroad rights of way. If it be true that the cultivated lands show the substantial loss, as I have indicated, then to death and taxes we must add a third—the disappearance of the soil by erosion, an inevitable, silent, malicious enemy.

Was it always so? Our undisturbed railroad right of way furnishes the answer. In the field a yellow harsh soil, leaving the plow in clods, resisting the harrow's teeth, remaining lumpy when the black soil under similar treatment is crumbly and smooth, finally yields a crop not worth the trouble. Beautiful black soil lies but twenty feet away on the railroad land; in no case did we find less than eight inches.

The erosion I am now dealing with is sheet erosion, not gully erosion. Sheet erosion naturally shows first on the gentle rises of our prairies—like the bald spot on a man's head it begins at the top. Each year it gets a little larger, proceeding down the gentle slope, expanding like a loathsome infection; a comparison unfair to the loathsome infection—for it commonly leaves behind an immune zone to be rejuvenated. Our erosion leaves in its rear permanent ruin.

For thirty years now we have been nearing of the worn-out lands of the East. Like the ringworm or erysipelas the failing land story creeps West. Iowa the new has supplanted Illinois the older, in the last few years. How many more such jumps can there be? None as you know. The public mind has somehow supposed this wearing out to be loss of fertility merely, that is remediable. Instead we have here a loss of the body of the land which, carried too far, is hopelessly irremediable. We have, heretofore, had new lands to move onto, the best lands of all.

Sheet erosion is most active in the finely divided clayey soil of the Corn Belt just because it is so rich and light, but perhaps most of all for the reason that in this latitude there is no time after the last cultivation of corn for a protective crop of weeds to grow.

South of the center line of Kentucky a labyrinth of weeds springs up between the rows during fall and winter. Northward, especially in Illinois, the unplowed land lies as bare as one of our asphalt street surfaces. As for the plowed land, God help it. You see it slipping down hill, glacier-like. The beautiful fine mould appears more a jelly than solid land. The richer it is, the deeper it is, the worse the sheet erosion in spring.

How may this pending calamity be averted? First, it may be noted no country has in the past proved permanent under our climatic conditions. The sign and badge of this is the terrace. In all old countries, when too late, folks try to keep some of the soil from running down hill and away to the sea by the device we call a terrace. Whether in China, Korea, Central America, it always fails. In some cases the very race who built the terraces disappears. We must do better than others of the past. One thing is fairly sure: *We must abandon the cultivation of corn, that is, maize, and cotton as now carried on.*

It must sound like a death sentence to our people to be condemned to go without corn. The fact is corn has not produced a single domestic animal. It duplicates, but

the choice parent stock always comes from countries where corn in unknown. Hereford, Shorthorns, Jerseys, Holstein, sheep, horses, both light and heavy; poultry, excluding the turkey, all come from cornless places. We still keep up our quality by importing choice studs, the parents of the future, from these places—England, north France, Holland, Belgium and contiguous countries, which support twice as much stock per acre as we do; they have no corn.

We must shift to a form of culture which keeps the soil bound together and protected by some form of sod. Of all such plants alfalfa stands head and shoulders above the rest. If our corn lands were converted into alfalfa fields we could support twice the weight of domestic animals we now do, and this is the purpose the Corn Belt lands now serve, the support of domestic animals.

It is a curious thing that wheat, which mankind of our breed mostly rely on, is the crop grown on the fringe or frontier of agriculture—western Kansas, the Dakotas, northwest Canada, Australia, Argentina, the semi-arid places. Wheat is a pioneer culture. As soon as a region advances in comfort and wealth it drops wheat growing and devotes itself to the job of raising meat or dairy products.

This paper has quite failed of its purpose unless in your minds it has established the fact that no time can be wasted. We must look this thing in the face squarely, with a view to action, coping with our greatest enemy, which, strange to say, is also our greatest friend—the rainfall.

There must in this country be a return of interest in the commonplace, and away from the dramatic. One of my Yankee neighbors and professors lately remarked: "One of the greatest assets of Great Britain is the fact that its people can be interested in the commonplace." You will remember how Taine, the Frenchman, accounted for the survival of the British aristocracy, when he found a duke to be the best judge of turnips.

If the argument here advanced be sound, how much more important the matter is than the result of the next national election or the world's series of baseball occurring about the same time.

What does it matter whether China is a republic or otherwise when the poor people are without space of good land to found what we call a happy or vigorous nation? How can they, without domestic animals or meat, compete with us who have both in abundance? What shall we be when we don't have them both in abundance? We know surely from the present situation of much of Europe. How much of our comfort is due to the bounty of nature? How much to our superior intelligence and energy?

The United States is not a permanent country like north Europe; cannot be, unless we turn to the task of making it one by conduct altogether different from present practice. Within a century as we now go, Illinois, from being the envy of the world for its rich lands, will change to a harsh, unproductive waste. If we have lost four inches of the best soil in fifty crops, the remainder will disappear in about the same time, for it is a case of unstable equilibrium. The more soil we lose the faster the remainder goes.