FIRST GENERATION PIONEER LIFE IN THE PRAIRIE REGION WEST OF THE MISSISSIPPI FROM THE WORKS OF SELECTED MIDWESTERN WRITERS

by

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INTRODUCTION

The American pioneer is a character unique in history. Nowhere before in the world had economic, social, cultural, and political forces operated together upon people of such widely different origins to produce, in such a short time, a new stock with a common culture and outlook.

It is the purpose of this thesis to discover the aspects of pioneer life as they are shown in the works of certain writers who have used as their setting the prairie states from approximately 1850 to 1890.

An attempt was made to determine how the first generation pioneer homesteader lived in a definite geographical area, in which he developed, to some extent, a common culture and economy; and to gain from this picture, if possible, some indication of the salient traits of the pioneer character and an understanding of the place of the early prairie farm family in the literature of the Middle West.

As the frontier moved westward, pioneer life wherever or whenever found had some characteristics in common. There were, however, a number of differences. The lapse of time between the beginnings of pioneering in the colonies and its last appearance west of the Mississippi is, with certain other factors, responsible for many changes. For the purpose of this study it was, therefore, necessary to determine upon certain limits or

boundaries. These restrictions were chosen to focus attention on the pioneers in the plains area west of the Mississippi, who were farmers, and who were the first generation on the soil. In general, this type of pioneer was a homesteader who settled upon land where the fertility and rainfall appeared to be such that his labor and that of his family could produce a living.

The settlement of the prairie regions west of the Mississippi which began before the Civil War, was given impetus by the passage of the Homestead Act in 1862, and continued steadily until about 1890. Literature dealing with the earliest period is not plentiful. Pioneering as a subject for serious fiction did not appear in American literature until after the Civil War. Eggleston's Hoosier Schoolmaster, 1871, is the first work to treat American rural life as a subject for the novel. The later, more spectacular migrations to the prairies of the Mississippi Valley inspired many such volumes.

Geographically the area studied is the great plains region west of the Mississippi River and north of the Oklahoma-Kansas boundary. Literature concerning Oklahoma was not used because this territory was opened for settlement so much later than most of the prairie that industrial progress had changed many aspects of rural life.

The western boundary of the region is somewhat indefinite. There is no clear cut geographical line that divides the farms of relatively small acreage from the more pretentious cattle ranches that developed farther west. The homesteader was

limited to the area where he could raise corn or wheat and other small grains, and often the settlers determined the boundaries of this area by the costly and inefficient method of trial and error. In general they discovered that the height of the grass they found growing in any locality was a good index to the chances for successful agriculture. Where tall, rank grasses grew, seed crops could reasonably be expected to flourish.

The books studied for reference have been limited in this way: they must be about the Middle West and the first generation pioneer farmer. This was done in order to be certain that references taken from works of different authors were about the same general type of pioneer. If the characters were of a similar social and economic status, if their agricultural enterprises and the hardships due to natural conditions were about the same, then a composite picture of their lives might be constructed from literature covering the period 1880 to 1890 and having its setting in the prairie states.

The authors who best meet these conditions in at least part of their works are Willa Cather, O. E. Rölvaag, John Ise, Mari Sandoz, Herbert Quick, Hamlin Garland, Bess Streeter Aldrich, Sarah Louisa Sweeny, and Margaret Wilson. Not all of the works of these writers apply to the area and the time considered, but at least one book by each of them is devoted wholly or in part to picturing the life of the homesteading settler west of the Mississippi.

Rölvaag in Giants in the Earth told the story of life on a homestead in the South Dakota grass region. First generation rural pioneering in Iowa was found in the biographical A Son of the Middle Border by Garland, and in Vandermark's Folly, a novel by Quick. Nebraska is represented by three women writers: Sandos, with Old Jules, the story of her father, and Slogum House, a novel of western Nebraska; Aldrich, with three novels, A Lantern in Her Hand, Spring Came On Forever, and Song of Years; Cather, with the novels My Antonia and O Pioneers!. The material on Kansas was taken from John Ise's biography of his parents, Sod and Stubble, and from Harvest of the Wind, by Sweeny. Although many other volumes were used in this study the ones listed above were found to be most valuable for the purpose.

The settlers who moved into the Middle West were found to be of two general types. Some were native Americans, chiefly New Englanders, who left districts where the land was poor or the taxes oppressive in order to obtain free land in the west.

> Thus it happened that during the winter of '49 the New England farmer who could hardly find money enough to pay his taxes, was reading tales of golden sands and flourishing prairies in the best.[1]

A New Englander, explaining his decision to sell his farm and migrate, wrote "I've harvested my last crop of rocks."[2]

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1. Hamlin Garland, Trail-Makers of the Middle Border, p. 49.
2. Ibid., p. 54.

> In this phrase, "crop of rocks", may be found the explanation for a large part of the New England exodus which Nathaniel had joined. Returns to farmers were meagre, even for those who tilled the valleys, and for those on the hill-farms the soil was cruelly unrewarding. The oft repeated jest, "Have to sharpen my sheep's noses so't they can git at the grass between the stuns" carried a touch of bitter truth in its humorous description...
>
> "I'm going where I can clap a hoe into the ground without striking fire," he stoutly declared. "I want to own and drive a team of horses the way John Bridges is doing. All my life I've crawled up and down these hills. I began life with stun bruises on my toes, and I've carried stun callouses on my hands all the rest of the time. Right here I quit the job of watching for rocks to hop out of the ground. I sold my farm for just about what the barn cost me, but no matter. I'm going where land is not only good, but cheap."[3]

The other type of settler represented many of the nationalities of Europe. In many cases these were the second generation of their stock in America. The first generation had arrived at the eastern cities hopeful of a new life in the New World, but economic pressure or the desire for land had sent them or their descendants westward.

Native born and immigrant pioneers had some important traits in common. They were individualists; they loved the soil; they believed in the dignity of labor, and above all they believed in the principles of democracy and individual freedom. The common people of Northern Europe believed in these principles and after centuries of effort had attained some degree of recognition for them. Immigrants from this region brought with

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[3] Ibid., pp. 54-55.

them these ideals and a determination to realize them in the new land.

In 1848 a constitution with restricted popular suffrage was established in Holland. By that time there was universal manhood suffrage in the Swiss Confederation. The reign of Christian IX of Denmark (1863-1906) was largely occupied with a struggle between the king, his ministers, and the Landsthing, as opposed to the peasants and the Folkething in their desire for the privileges of suffrage and education. Nineteenth century Norway was a country of small farms whose owners were economically independent and were inclined to be contemptuous of titles of nobility.

All over northern Europe, in the nineteenth century, the common people began to assert themselves. Where the ruling class was strong the struggle was likely to cause emigration. Sweden was held down by a rich noble class and the veto of the king. Government was by a clumsy device called the Four Estates (nobles, clergy, burghers, peasants). Since the peasants of Sweden had the same aspirations as their fellows in other countries, but were too weak politically to gain their ends, many of them went to the New World. Sweden lost a million people by emigration in the last half of the nineteenth century.

The prairie settler from New England came to the west to satisfy his ambitions to own good land and to be independent. The immigrant settlers came to continue life in the pattern of democracy as it was being worked out in Europe, or because in

his particular country there was little progress toward that end and he wished to live in a society where democratic ideals were prevalent. Therefore, even though this study found that living conditions were sometimes almost primitive or medieval, it was also found that the pioneer in these works was not at all medieval in his character. His resourcefulness, his individualism, and his democratic outlook made him different from the common people of other times. He was a progressive and exerted a strong influence on the literature and history of his country.

In this study no attempt has been made to dramatize the life of the pioneer, to read into the material any impressions that are not expressed by the authors themselves, or to supplement the material from the fictional or biographical sources with purely historical information. Some investigation of the origins of the settlers was made, but only to understand better their characteristics as they are brought out by the authors studied.

The close correlation in the story of the pioneers as told by different authors is evidence that it is authentic. There are gaps in the story because many important features of the life of the prairie are not given attention in the best works about it. Some events that had far-reaching effects are ignored, but the picture in many aspects is given in interesting detail.

PRAIRIE LIFE

The Land

Foremost in the thoughts of the pioneer as he sought a homestead was the land that he expected to till. Native and immigrant alike felt a respect that almost amounted to reverence for the soil in which they planted their crops. Land-fever brought people across the ocean and halfway across the continent; they could not soon get over the magic of free soil. In Europe the right to own land was one of the greatest of privileges, and for many land was so expensive as to be completely unattainable. We can understand Per Hansa's excitement at the first sowing:

> How could he steal the time to rest? Was he not the owner of a hundred and sixty acres of the best land in the world?[4]
>
> He filled the seed bag, hung it over his shoulder and was ready. His whole body shook.[5]

Aldrich tells how every member of one family turned out to witness the first breaking of the sod, and Rölvaag records the intensity of feeling in the people who craved land as others had craved gold.

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[4] O. E. Rölvaag, Giants in the Earth, p. 110.

[5] Ibid., p. 207.

> But no sooner had they reached America than the west-fever had smitten the old settlements like a plague. Such a thing had never happened before in the history of mankind; people were intoxicated by bewildering visions; they spoke dazedly as though under a spell..."Go West! -- Go West, folks! -- The farther west the better the land'"[6]

The Home

After choosing the land, the settler thought next of a home. Pioneer families were likely to be large.

> Since the day of the first McLaughlin alighting, there had arrived altogether, to settle more or less near him, on land bought from the government, his three brothers and four sisters, his wife's two brothers and sister, bringing with them the promising sum of sixty-nine children, all valiant enemies of quietness and the fleeing rattlesnake.[7]

For such families large houses would seem a necessity, but the kind and size of home the settler built was determined almost entirely by other considerations. Available material, distances involved in transportation and the time and labor that could be spared from the tilling of crops were the most important factors. No one type of dwelling was used exclusively in any locality. The settlers had to build their houses from the material at hand. At first they were likely to try to build, in spite of expense or inconvenience, the kind of dwelling that was used in the country from which they came. Some were determined to own houses built of sawed lumber which they hauled long miles and then had very inferior houses to show for their labor.

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[6] Ibid., p. 227.
[7] Margaret Wilson, The Able McLaughlins, p. 2.

> ...we could have built better and warmer, and prettier houses than the ones we put up, of the prairie sod which we ripped up in long black ribbons of earth; but we were from lands of forests, and it took a generation to teach our prairie pioneers that a sod house is a good house. I never saw any until the last of Iowa was settling up...[8]

For the same reason a Swede was likely to choose a locality where he could build of stone, even though that meant taking a rocky claim where the soil was thin and poor. As the agricultural frontier moved westward, however, the settlers profited by the experiences of others and sod houses or "sod-dys" as they were called, were often built.

The Deal family in Nebraska used sod strips three feet long to build a two room sod house thirty by eighteen feet, an unusually large one. It was the envy of the neighbors because it was warm in winter and cool in summer. One of these same neighbors lined his poorly built frame dwelling with burlap in an effort to make it a little warmer the first winter.[9]

Sod houses were common in the Dakotas, in Nebraska, and in Kansas. Other types of construction seem to have been exceptions in western Kansas.

> A few log cabins could be seen as they passed along, occasional stone huts, and at long intervals, frame houses that seemed palatial, but oddly inappropriate in their surroundings. Nearly all the houses were sod dug outs, most of them scooped out along the banks of creeks and draws, with sod walls rising two or three feet above the ground, with sod roofs, and protuding above each, a chimney, perhaps also of sod, or a few inches of rusty stove pipe.

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[8] Herbert Quick, Vandermark's Folly, p. 226.
[9] Bess Streeter Aldrich, A Lantern in Her Hand, p. 76.

> On a few of the roofs, gravel had been thrown to fill the cracks between the strips of sod; and on the roof of one of the sod houses Rosie saw flowers planted -- wild verbenas, prickly pears and portulaccas.[10]

In western Nebraska the "soddy" was also common:

> By this time Buedy had a one-room soddy that seemed to grow out of the earth and was a part of it, much as a rabbit's hole in the bluff or the eagle's nest on the crag at the head of Spring Branch Canyon. The soddy was plastered inside with mud from a buffalo wallow, a soft, light gray, and the curtains at the windows were of turkey-red calico from a Syrian peddlar.[11]

It was generally agreed that these sod houses, small and dark though they usually were, were the best and least expensive dwellings that settlers of limited means could build for their first few years on a homestead.

In regions where some timber grew, log cabins were common. They required more tools and labor to build than did a "soddy" and they were not as warm in winter, but many of the settlers were familiar with their construction, and since forested land needed to be cleared anyway, they were likely to use some of the logs for a dwelling. As the logs were green they were subject to shrinkage. This loosened the mud chinking, which in winter was apt to fall out and leave cracks that let in the wind and snow. But these log houses were often only temporary dwellings; after a winter or two in them the settlers were strongly impelled to build something better.

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[10] John Ise, Sod and Stubble, pp. 2-3.

[11] Mari Sandos, Slogum House, p. 53.

The McLaughlin family, after a few years, used their log cabin as a woodshed. In 1863 they built a fine frame house of lumber hauled only forty miles from the railroad, which had come many miles farther west since the days of their first dwelling.[12]

A Kansas housewife in 1875 was pleased with her new log cabin home when she first arrived.

> While greetings were being spoken, Rosie's eye took in the premises: cabin of hewed logs, with sod roof, apparently twelve or fifteen by eighteen -- almost spacious compared to the dug-outs she had seen on the way that morning -- with a home-made door and three small windows...[13]

She later discovered, however, that her log cabin did have definite disadvantages.

> The cracks in the floor and in the log walls afforded a rendezvous for various pests that kept Rosie in a militant mood much of the time; and the battle front between her and the bed bugs shifted back and forth, with never a decisive victory. Every day she went through the bed, tick and all, and every Saturday searched the house, with a kettle of hot water in one hand and a can of kerosene and a feather in the other.[14]

As soon as she had them nearly eradicated, moving settlers might spread blankets on the floor for a night and the bedbug army would be reinforced. Even a travelling preacher was likely to bring a new supply. She was, however, fortunate in one respect: there were fleas in most sod houses, but in her log cabin they stayed in the cellar under the board floor.

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12 Wilson, op. cit., p. 2.
13 Ise, op. cit., p. 7.
14 Ibid., p. 18.

Until a settler had time to build a cabin he and his family might live in some temporary makeshift. A family in Nebraska lived, after the fashion of the Lincolns in Kentucky, in a sheep shed with a quilt hung over the open side.[15] Even in a society where privileges were few there were those who, temporarily at least, might be called the under-privileged.

If there was some variety in the houses of the prairie, there was even more in the furnishings. A Bohemian immigrant home in Nebraska is a good example of one extreme. The house, being a cave with one small room, was not large enough for beds. Smaller caves dug into the back wall and padded with straw were the sleeping quarters.[16] A Kansas home of 1875 was better furnished but still not overstocked:

> ...a bed made of cottonwood boards, with a bed tick filled with straw, a table made also of warped cottonwood boards, and a tiny cooking stove. Two empty nail kegs and two boxes served as chairs, and on another nail keg by the door there was a dishpan, half full of soapy water. A hammer and a saw hung from the nails driven in one of the logs, a coffee grinder was screwed into the log just below, and a few other household utensils were scattered about the room. There was no bureau, no cupboard, no clock, no rug, no tablecloth; there were no curtains nor blinds on the windows, no sheets on the beds, no pictures on the walls.[17]

The Martin home, Nebraska, 1854, was a refreshing contrast.

> At the right of the main room a huge open fireplace, through which stars were visible in the daytime, held a four-foot back log and a wide swinging crane with iron pot. Iron shovel and tongs leaned against the wall. Wild turkey wings, tallow candles, and snuffers were on a mantelshelf topped by crossed

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15 Aldrich, op. cit., p. 20.
16 Willa Cather, My Antonia, p. 86
17 Ise, op. cit., p. 8.

> firearms, while another gun hung above the lintel of the lean-to door. In the middle of the shelf stood the clock, a big Seth Thomas timepiece...
>
> A walnut cupboard with plump knobs and wooden buttons for fastening its four doors was against one wall, a walnut bureau flanked another. Built-in shelves with calico curtains across them were in two of the corners, a walnut whatnot filled a third, and large braided rugs lay on the puncheon floor.
>
> Several chairs stood about, made from sturdy flour barrels out of which part of the staves had been sawed, the round head inserted for seats and the whole covered with red calico. A large arm chair held the place of honor near the fireplace while a small calico-covered chair sat opposite it... A barrel stand was near the front door, this, too, covered with bright calico, and with a removable top which formed a receptacle to hold current pieces of sewing, while on it reposed the Bible,...and a spy glass...There were a few books in a corner shelf...[18]

An adjoining room contained, among other items, a walnut bedstead and a walnut chest of drawers. This home was, no doubt, exceptional among those of the original settlers. In general the homes far west on the prairies seemed to be the more poorly furnished. The difficulties of transportation may have been a reason for this. The farther a settler had to travel in his search for land the more likely he would be to sell or abandon heavy pieces of furniture.

Poorly furnished houses seemed to be much more common than the type represented by the Martin home. Hamlin Garland writes of his boyhood home in Iowa:

> Our furniture was of the rudest sort. I cannot recall a single piece in our house or in our neighbors' houses that had either beauty or distinction. It was all cheap and worn, for this was the middle border, and nearly all our neighbors had moved as

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[18] Aldrich, Song of Years, p. 39.

we had done in covered wagons.[19]

There were other furnishings and devices that today would be considered unusual. Since there were no screens "fly-roosts" of paper were sometimes hung from the ceiling and covered with spots of molasses, the idea being to entice the flies away from the food exposed on the table below. An innovation in Nebraska in 1[illegible] was a kerosene lamp with an adjustable wick and a glass bowl and chimney. Some housewives preferred to stick to candles because they did not have "chimneys to smudge" and because kerosene was considered expensive.[20] Others had iron tallow-lamps with homespun wicks and no chimneys. A much prized invention, too, was a flat-iron with a door and a chamber into which glowing coals could be placed for heat. It was, no doubt, much less convenient than the electric iron of today, but it was much admired then as being very efficient and ingenious.[21]

In these primitive homes there was, of course, no plumbing. In the first years even a well near the house was a source of pride and joy to a housewife.

> The well, only a few steps from the house, was a luxury that Rosie noted with joy, for at her old home she had always had to carry the water up from the creek, a distance of a quarter of a mile.[22]

Pumps, being heavy and expensive, were not used for many

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19 Garland, A Son of the Middle Border, pp. 92-93.
20 Aldrich, op. cit., p. 230.
21 Aldrich, A Lantern in Her Hand, p. 20.
22 Ise, op. cit., p. 7.

years after the original settlement of a community. Wells had to be laboriously dug by hand and two or three neighbors usually assisted with the work. Where the table water was at a considerable depth or lay under several strata of rock, a well was out of the question.

The net result was a scarcity of water in many homes, causing bathing to be infrequent and general sanitation to be poor. Bathing in a wooden tub with water carried from the creek and heated on the cookstove was very likely to be considered a waste of time and effort.

Heating a pioneer home was a problem that was seldom satisfactorily solved. Where wood was plentiful fireplaces were the rule, but they heated only one room at best and took an enormous amount of fuel to do that. They were built of stone with mud for mortar and since the proportions between opening and flue were seldom correct, they were likely to smoke when the wind was in the wrong direction.

Most stoves were of the cast-iron, flat-topped variety, with from two to six holes. A cabin in Nebraska is spoken of as being equipped with a four-holed stove.[23] A home with both stove and fireplace was especially well furnished.

A place to cook food, a table on which to serve it, and a bed or beds for sleeping seem to have been the minimum essentials in equipment. The poorest beds were piles of straw in

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[23] Aldrich, op. cit., p. 80.

the corners of the cabin, probably no improvement in either sanitation or comfort, upon those of medieval times. A slightly better arrangement was the bed built up with sod and covered with a straw tick. The still more fortunate might own a walnut bedstead and have a feather tick with which to cover it.

The food, like the household furnishings, was frequently a very slight elaboration upon the minimum necessary to get along. These were the essentials for Per Hansa's home in South Dakota:

> Next the real needs of the household had to be met; flour was the most important item and came first on the list; then cloth, and tobacco and matches, and kerosene; after that coffee, and molasses, and salt.[24]

The tobacco is an interesting item on the list; it was always included. One might expect whiskey to be listed as another necessity; it apparently was not. Repeated references to its use as a medicine were found but it evidently was much too expensive to drink with any regularity in the first lean years.

Occasionally the settlers had to do without some of the things they ordinarily regarded as necessities, but any shortage of flour was really serious. Rölvaag relates that during the great snow of 1880-81 in South Dakota the people ground grain in their coffee mills for flour. In one neighborhood four families used one small hand mill.[25]

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[24] Rölvaag, Giants in the Earth, p. 178

[25] Ibid., pp. 426-428.

The flour was not always made from wheat. A diet composed principally of corn was no great hardship, as this menu of a Nebraska family in 1858 will show:

> All fall and winter it was to be their mainstay as wheat flour was almost prohibitive in price. No one could make such palatable things out of it, or such a variety of dishes as the Martin women. Corn-bread, hasty-pudding, Indian pudding, johnny cake, white pot, muffins, griddle-cakes, dodgers, samp, creamed dried corn, Indian dumplings, apple corn-cake...[26]

Hominy was a pioneer standby. Cooked with meats, nuts and herbs it might be the main dish of the meal. The necessities seem to have been about the same everywhere, but a failure of the corn crop was always a real calamity.

The long trip involved in replenishing supplies was a common difficulty. At a Norwegian settlement in South Dakota the families shared freely with one another the first year until supplies were nearly exhausted in every house. The men were convinced that the situation was really serious when they began to run out of tobacco. Then they met on a Sunday, no other day could be spared from the work in the fields, and planned a trip to town as a community project. Two men were chosen to make the wagon trip of seventy or eighty miles through desolate country.[27]

After the first year much of the food came from the soil, some from the gardens planted and tended usually by the house-

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[26] Aldrich, Song of Years, p. 234.
[27] Rölvaag, op. cit., p. 62.

wife and some from the native bushes and trees of the prairies. The following shows the foresightedness of a Kansas woman during the summer of 1855:

> She was kept busy with the preserving and storing of food. She made sauerkraut and packed it in large jars. She made hominy by boiling corn in lye water to remove the outer husk. She put dry corn in bags and hung them from the rafters in the loft. When cabbage was matured the boys helped her hill it in outside. A trench was dug deep enough to put in hay, then cabbage, heads down with roots on, more hay, and finally earth banked quite high, to keep out frost. By working from one end cabbage could be removed without disturbing the entire lot. Jams and jellies Louisa and Lizzie made in quantities, using sorgum for most, saving the precious white sugar for the choicest.[28]

Some of the wild berries and fruits used were grapes, blackberries, ground cherries, plums, gooseberries, and buffalo-berries. Sandoz describes the gathering and preserving of buffalo-berries in Western Nebraska.

> ...that afternoon they all went buffalo-berrying. Jules ahead with his shotgun for game, Mary carrying the pails, an old sheet, and the ax, the boys trailing behind with the dishpan and broomsticks. Marie had to stay home with the baby. Where the silvery buffalo-berry bushes were solid clumps of yellow or orange, the tiny, shot-like berries in round clusters all along the thorny stems, Mary held the bushes back while Jules chopped them off, to be threshed with broomsticks over the sheet.
>
> Dishpans full of berries were taken to the river for preliminary washing, the worm-lightened fruit floated away, until all the pails were full. Then there was a day of jelly making in the big copper boiler and the wine press, until six-and eight-gallon stone jars were filled with the wine-red liquor to cool and set into the firmest jelly for winter.[29]

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[28] Sarah Louisa Sweeny, Harvest of the Wind, pp. 127-128.
[29] Sandoz, Old Jules, p. 203.

Pioneer families were evidently very fond of preserves and jelly, great quantities having been prepared in summer and consumed during the winter months. Even this could, however, be overdone.

> Preserving was almost a mania with Mrs. Bergson. Stout as she was, she roamed the scrubby banks of Norway Creek looking for fox grapes and goose plums, like a wild creature in search of prey. She made a yellow jam of the insipid ground cherries that grew on the prairie, flavoring it with lemon peel; and she made a sticky dark conserve of garden tomatoes. She had experimented even with the rank buffalo-pea, and she could not see a fine bronze cluster of them without shaking her head and murmuring, "What a pity!"[30]

One of the problems in canning and preserving was the fact that sugar was always expensive. Sorghum from any of the common canes was the usual substitute. Maple sap for maple sugar could be collected in a few localities as far west as eastern Nebraska, and any surplus was a source of cash income.

The only fresh meat in the early years was whatever wild game could be found in the locality. The game supply varied with the seasons and the terrain; deer, antelope, and other large species were found in regions where there was waste land or virgin forest, but they lasted only a few years. In the winter of 1855-6 in Iowa the deer were almost exterminated.

> It was a terrible winter. The deer were all killed in their stamping grounds in the timber, where they trod down the snow and struggled to get at the

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[30] Cather, O Pioneers!, p. 29.

> brush and twigs for forage. The settlers went in on snowshoes and killed them with clubs and axes. We never could have preserved the deer in a country like this, where almost every acre was destined to go under the plow -- but they ought to have been given a chance for their lives.[31]

Few settlers had cattle to spare for butchering. A cow was much more valuable for her milk than for meat. Even the male calves often brought a cash price or had a trade value that kept them from being used as meat for the family.

Hogs were seldom raised in the first years. When the settler harvested his first crop of corn a small cash outlay bought chickens, and sometimes ducks or geese, that would supply both meat and eggs for his family. He could not keep hogs until he had feed for them and a fence to keep them at home. Some families such as this one in Kansas in 1855, who were fortunate enough to get good crops immediately, were able to keep both hogs and chickens from the start.

> The farm was well organized by this second year. Crops had been good. The fields were nearly all fenced. The little pigs from Kentucky were now big hogs with families of their own. Louise had a good sized flock of chickens...[32]

Such a wealth of produce was probably the exception. In contrast we have the story of a family in South Dakota in their second winter. Per Hanse's two boys, hungry for fresh meat, brought home part of a dressed badger and told their mother it was bear meat. When they confessed its origin she threw it out,

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[31] Quick, op. cit., p. 368.
[32] Sweeny, op. cit., p. 127.

saying that it was fit only for trolls.[33]

No doubt the settlers in later years made good use of the various methods of salting and curing meat, but there is little attention given to it in the stories of the first generation. The early privations were evidently considered more interesting than the plenty of later, more ordinary, times. We have ample evidence of the change, however, in descriptions of meals prepared in prosperous times for special occasions. This Iowa meal in 1875 is a good example.

> It was a good dinner. There were eggs, and pork and beans, and rhubarb pie, and preserves and jellies, and a roll jelly-cake. The fruits of the earth had come to the settlers with the years of settlement. The era of bran bread was ancient history. Corn and dairying and forage crops and hogs had partly ended the era of wheat and its blight and rusts.[34]

At a wedding dinner at the Deals in 1868, biscuits, pressed chickens, cakes, and lemonade were served very successfully, but one other dish excited considerable comment.

> Men folks, going home, asked their wives why in Sam Hill the potatoes were all cold, and their wives said to hush and not show their ignorance, that it was something new called "potato salad" and it was supposed to be cold. At which, most of the men laughed long and raucously and said by golly, for their part, they'd take theirs hot-fried or baked in the skins.[35]

It was plainly not a very sophisticated affair, but was, nevertheless, a great change from the covered-wagon etiquette of earlier days when spoons were sometimes licked clean, wiped

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[33] Rölvaag, op. cit., p. 186-7.
[34] Quick, The Hawkeye, p. 148.
[35] Aldrich, A Lantern in Her Hand, pp. 165-166.

on a sleeve and put away until the next meal.

The house, the home furnishings, and the daily menu of a typical pioneer family seem to have been the result of economic necessity rather than an expression of their cultural background. When good crops were harvested and incomes increased, the homes and the general standard of living showed rapid improvement.

Tilling the Soil

The settler brought with him an even scantier supply of equipment for farming his land than he did for furnishing his house. Something has been said of the attitude of the typical homesteader toward the land. He seemed to feel that the miracle by which he was able to own his fields was, in itself, assurance that he would be able to make a living. If he had a plow, a team of either oxen or horses to draw it, and seed for the first sowing, he felt quite equal to the job of planting and harvesting a crop.

Here the courage and resourcefulness of the people were shown again. They had, by the time they reached their homesteads, already overcome many difficulties; breaking the sod and building a home were tasks no more formidable than those they had encountered on the way.

The journey west was made by wagon and most of the transportation in the new country was dependent upon that slow and clumsy vehicle. It was used to haul produce to market and to

return supplies to the farm. A wagon and a team of draft animals were indispensable equipment. If a family had only one wagon, but needed two, they might build another themselves and thus save money for other necessary things.

> Hitched to this wagon and trailing behind it was another vehicle, home made and very curious looking, so solidly and quaintly constructed that it might easily have won a place in any museum. Indeed, it appeared strong enough to stand all the jolting from the Atlantic to the Pacific -- It too was a wagon, after a fashion; at least it had been intended as such. The wheels were made from pieces of plank fitting roughly together.[36]

In the eastern half of the plains region corn was usually tried for the first crop. Unfortunately, many came just in time to be caught in the great droughts of the 1860's. One family arrived in Nebraska in 1869. Since corn did not do well on newly broken sod land, they had a small crop the first year. In 1870 it was a little better, but 1871 brought drought. The next year there was a fair crop, and then in 1873 the locusts swarmed over the prairie. They came regularly just before harvest for six years. In 1873 the panic struck. Eggs sold for five cents a dozen, butter for eight cents a pound, cattle and hogs for two cents a pound, wheat for fifty cents a bushel, and the settlers burned corn, worth eight cents a bushel, for fuel.

Farming, then, during the 1870's was subject to the worst of difficulties. Very little progress could reasonably be expected. Yet such was the energy and resourcefulness of the

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[36] Rölvaag, op. cit., p. 4.

people that this is a description of a Nebraska community as it was in 1885, fifteen years after settlement.

> ...the land was largely fenced. Crops were good. Some of the outbuildings were new -- corn cribs and a hay barn. Trees were much larger, the cotton woods and the elms. Orchards were bearing -- Amalia could make Äpfel-butter and pflumen-butter every year. There were elder-berries, choke-cherries, and wild grapes in the woods, and goose-berries and currants in the yard. All the land was taken. Homesteads were now farms.[37]

All this had been accomplished although fifteen years before it had not been unusual for an entire neighborhood to own but one plow, one rake, and one mowing machine.

Breaking sod was the hardest kind of drudgery. Hamlin Garland was pleased at first to be considered man enough to drive a team and plow.

> But Alas! My sense of elation did not last long. To guide a team a few minutes as an experiment was one thing -- to plow all day long like a hired hand was another. It was not a chore, it was a job. It meant moving to and fro hour after hour, day after day, with no one to talk to but the horses. It meant trudging eight or nine miles in the forenoon and as many more in the afternoon, with less than an hour off at noon. It meant dragging the heavy implement around the corners, and it meant also many ship-wrecks, for the thick, wet stubble matted with wild buckwheat often rolled up between the coulter and the standard and threw the share completely out of the ground, making it necessary for me to halt the team and jerk the heavy plow backward for a new start.[38]

At this time Garland was ten years of age. The first winter on the Iowa homestead he broke sod until late in November, preparing a total of seventy acres for sowing in the spring.

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[37] Aldrich, Spring Came on Forever, p. 156.
[38] Garland, op. cit., pp. 60-64.

A pile of brush pulled with a team was used to break the clods and form a seed bed after the sod was turned. There were manufactured wooden harrows on the market but for years few farmers could afford that more efficient tool.

A settler usually arrived at his claim in late summer. By the time he had broken the sod and prepared a dwelling it was often too late in the season to sow seed the first year. Either corn or wheat could be planted the following spring. Corn was planted in hills by hand and wheat was sown broadcast as in Biblical times. The brush harrow was dragged over the scattered seeds to cover them. Such a sowing was sure to be irregular and the number of seeds adequately covered was largely a matter of chance. The result was usually a very uneven stand of wheat.

Winter wheat, which was introduced into Kansas and Nebraska in the 1870's, proved to be a great improvement over the spring variety. Alfalfa for hay and forage was introduced at about the same time.

> That fall Abbie put in her first small sowing of winter wheat, the new experiment about which some of the farmers were talking. In November, with a light dash of snow on it, the small rectangle of vivid green stood out on the landscape like a bit of spring which had lost its reckoning of time. The crop in its experimental stage did well enough so that she added to her list a small sowing of the other new one, alfalfa, the tiny bluish-purple flowers later sending out a haunting fragrance that vied with the fresh sweet odor of the red clover.[30]

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[30] Aldrich, A Lantern in Her Hand, p. 247.

The task of making farms out of the prairie would have been much easier if the settlers could have waited just a few years for the changes industrial progress was soon to make in farm implements, or even if they could have afforded the improved tools which were already on the market. In Iowa the change had started while settlement was just beginning farther west.

> In 1856 we cut the grain with cradles. In 1857 Magnus and I bought a Seymour and Morgan handrake reaper. I drove two yoke of cows to this machine and Magnus raked off. I don't think we gained much over cradling, except that we could work nights with the cows, and bind daytimes, or the other way around when the straw in the gavels got dry and harsh so that heads would pull off as we cinched up the sheaves. At that very moment, the Marsh brothers back in DeKalb County, Illinois, were working on the greatest invention ever given to agriculture since the making of the first steel plow, the Marsh Harvester.[40]

The same process of evolution was still under way in 1874, the improved implements moving gradually westward as the settlers acquired money enough to buy them.

> Our reaper in 1874 was a new model of the McCormich self-rake -- the Marsh Harvester was not yet in general use. The Woods Dropper, the Seymour, and Morgan hand-rake"contraptions" seemed a long way in the past. True the McCormich required four horses to drag it but it was effective. It was hard to believe that anything more cunning would ever come to claim the farmer's money.[41]

They had heard rumors in Iowa at that time of the machine that did the binding as well as the cutting and raking, but it

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40 Quick, Vandermark's Folly, p. 209.
41 Garland, op. cit., pp. 148-149.

did not come to the prairie farmers until years after the first settlement.

On most farms the wheat was stacked at the edge of the fields after harvest. Then some member of the family began the long grind of plowing again while others went to trade work with the neighbors during the threshing. After plowing and threshing were over there was corn to husk, if there happened to be a crop, and the round of toil was kept nearly unbroken throughout the year.

Recreation

In their recreation the settlers of the prairie were divided into two groups. The reason for the division was logical but still rather surprising. One group was made up of people who saw no harm in dancing; the other was composed of people who thought of dancing as a sin or a sacrilege. This division of opinion seems to have existed to some extent in every community. Sandoz says of western Nebraska, 1886:

> Everyone was young and optimistic and sociable. The communities split into the dancers and those with Methodist feet, as Elmer Sturgis called them. The former attended everything, even the dances at the edge of the sandhills. They sprinkled sand over the slick ice of the Niobrara crossing. If a horse went through the channel they pulled him out and drove him warm.[42]

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[42] Sandoz, Old Jules, p. 92.

The same restriction was upon the moralists in Iowa, but there a scheme for lessening, to some extent, the stigma attached to dancing was devised.

> Now there was a difference between a play party and a kissing bee, as we used to call it. The play party was quite respectable, and could be indulged in by church members. In it the people taking part sang airs each with its own words and moved about in step to the music. The absence of the fiddle and the "calling off" and the name of dancing took the curse off. They went through figures a lot like dances; swung partners by one hand or both; advanced and retreated, "balanced to partners" and balanced to places, and the like...[43]

A similar idea in Kansas was to use an accordion for the dance music instead of the usual violin. The strict moralists of the community agreed that, while the violin was undoubtedly an instrument of the devil, the accordion was much less to be condemned. The need for some form of social entertainment was so great that many who would not actually take part in the main activities went to watch the fun, or to visit with neighbors.

The parties, of whatever type, were a medium for the expression of the folk songs and ballads of the prairie. Some of the songs or melodies seem to have been used in nearly every community. This group included "Buffalo Girls", "Old Dan Tucker", "We'll All Go Down To Rousers", "Weevilly Wheat", "The Miller Boy", and several others.

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[43] Quick, op. cit., p. 202.

Occasionally a party lasted throughout a day, a night, and into the following day. Seventy or eighty people might be present, some of them having ridden a distance of forty miles on horseback or in wagons to get there. After a night of dancing the men spent most of the day sleeping in the haymow while the women spread quilts in every available space in the house. The hospitality of the prairie found expression here; strangers, often ragged and hungry, were welcomed, warmed, and fed.

Husking bees, or bees for other purposes, and feather stripping parties to prepare feathers for feather beds, are mentioned by several authors but they seem not to have been as popular as parties with purely social motivation.

Another type of gathering was the debating clubs, or literary societies, as they were usually called. The procedure followed was to divide the organization into two or more groups to take opposing sides of supposedly debatable questions.

> ...the "Prairie Stampers" and "Pumpkin Canaries"... debated fundamental questions of the day: "Resolved that intoxicating liquors have caused more misery than everything else combined;" "That popularity elevates a person more in society than merit;" "That this is the age of humbugery;" "That a liar does more harm in a family than a thief;" ..."That the mind of woman is equal to that of man;" "That a dirty, good-natured wife is better than a neat, scolding wife."[44]

One society in Nebraska was divided like Gaul into three parts. The parts were called "Reds", "Yellows", and "Blues",

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[44] Ise, op. cit., p. 165.

and they all met through the winter in a kind of round-robin cycle of debates and forensic contests.

> That winter the schooner Hesperus was wrecked, little Paul Dombey died, Hamlet met his father's ghost and the Raven quothed more times than there were meetings -- new "pieces" being at a premium, as they were.[45]

Whole families came to the meetings in wagons or bob-sleds, and everyone joined in singing rounds, "Three Blind Mice", or "Scotlands Burning"; or they might sing "Juanita" or "Annie Laurie" in unison.

They debated serious questions too, such as freedom for the Irish, or the merits of General Grant as a soldier. Final authority on any subject was either the dictionary or the Bible. Once these two did not agree and the result was the loss of neighborly relationships between two settlers who had been good friends.

There were more simple pleasures, too. If the family was fortunate enough to own an organ, or even some smaller instrument, and had someone to play it, there were evenings at home devoted to singing. "The Lying Cowboy", "My Angel Little Nell", "The Drunkard's Lone Child" were favorites, since taste on such occasions seemed to tend toward pathos, although the more lively "Susanna, Don't You Cry" was popular too.

Church services were a social occasion for the people of the prairie. Most of them were devout, or at least respectful

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[45] Aldrich, op. cit., p. 127-128.

of religion, but in the early years religious gatherings were likely to be infrequent. Like the dances, husking bees and other socials, any meeting, no matter for what purpose it was held, was well attended because it was a good chance to visit with the neighbors.

> Whenever a preacher came into the community, a meeting was arranged at the home of one of the settlers, and someone tried to get word to as many of the neighbors as possible. People would come long distances -- ten or twelve miles, or even farther -- to attend these meetings, driving their lumber wagons or even walking -- perhaps barefooted -- if they had no teams. One night when a meeting was being held in Henry's cabin, so many crowded in that the floor began to sag dangerously, and in the midst of services Henry had to ask the worshippers to step out-side until he could go down into the cellar and brace up the floor with poles.[46]

Correct decorum at these home services allowed some odd arrangements. Per Hansa's sod house in South Dakota was so crowded that the men had to stand during the sermon but considered that no particular hardship since there was still an open space of floor where they could spit.[47]

Sermons were likely to be grave; punishment, redemption, prayer, and predestination were common subjects; the settlers took their religion in strong doses. This account of a revival in Nebraska probably records an extreme case.

> It had been a fine spectacle, with folks as thick as flies around a puddle of syrup and that sky pilot, with his red beard cut like Christ's in the Sunday-school pictures, preaching hell and damnation from the back of a grasshopper buggy, and

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46 Ise, op. cit., p. 24.
47 Rölvaag, op. cit., p. 371.

> women crying and men ripping their only shirts. Then they all moved into the lake and the preacher stuck them under like so many rag dolls until the Flats smelled of stale water and dead salamanders.[48]

The preacher had to take as pay whatever the settlers could give. Chickens or pork, or even corn for his team were given and gladly accepted.

Later, churches were built. Funds for the material were donated and the men of the neighborhood contributed their own labor. Since none of the works used for this study are more than passingly concerned with religious organizations as such, little information on the development of the various denominations or sects was found. The first church services in the communities were neighborly affairs with little emphasis on any particular creed. Except for certain communities that settled as religious groups, division into separate denominations came later and belongs to the story of later years along with mechanized farming and the railroad.

Hardships of Prairie Life

In his introduction to a series of letters on pioneer life which he edited for publication,[49] John Ise stated that he hoped the book would correct the popular impression that pioneer life was an interesting and exciting adventure. Mr. Ise's own work, "Sod and Stubble", makes it dull enough, certainly. Hardships were great in the first years, of course, and none of the

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[48] Sandoz, op. cit., p. 150.
[49] Howard Roede, Sod-House Days, Introduction, p. x.

writers studied made any effort to conceal the fact. They did not, however, make the life completely grim and monotonous. It is possible that Mr. Ise, like Hamlin Garland, was influenced by a personal dislike for life on the farm. That is supposition, of course, but even Mari Sandoz, whose childhood in western Nebraska was not particularly happy, does not make homesteading on the prairie as dull an existence as Mr. Ise seems to feel that it was.

Of all the privations and troubles that the settlers had to face, the most serious was drought. It threatened their very existence and was a danger against which they were powerless. Other troubles might be overcome by hard work or careful planning, but droughts in varying degrees of severity came many times to the prairie, and then even the best of farmers could not raise a crop.

In the worst seasons some settlers left, but most stubbornly remained on their land and hoped for better times. One community, at least, tried to bring rain by firing gunpowder, and several communities hired persons who professed to be rainmakers.

> At Goodland, Kansas, Melbourne and his assistant produced half an inch of rain in forty-eight hours for a thousand dollars. They were given the same offer at Sidney, south of the Platte. Jules mounted on a sturdy pinto he got from the Indians for two eagles, rode down with several of the Flatters...[50]

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[50] Sandoz, op. cit., p. 149.

The attempt at Sidney was a failure. There were only a few drops of rain, and faith in such methods was badly shaken. This inscription carved on the door of an abandoned shack gives with graphic clearness the result of drought on the plains:

> 30 miles to water
> 20 miles to wood
> 10 miles to hell
> And I gone there for good.[51]

Along with the drought and perhaps because of it, there was the danger of prairie fires. When the grass became dry and there were many sections of unbroken sod around a homestead, fire was a very real and very terrible danger. If there was sufficient warning the settlers were sometimes able to plow furrows around their crops and their homes, thus saving them. Winning such a battle did not, however, mean that the farmer's war with the forces of nature was waged successfully.

> Always the prairie loomed there before them lonely with silence -- a sullen giant waiting to trap them with blizzard or windstorm, drouth or flood, redskins or fire.[52]

Contrary to general opinion the danger from the Indians seems not to have been a very serious one for most communities. By the time the homesteader arrived, the hunters, the trappers, or the gold seekers had driven the tribes farther west. For most communities there were Indian scares rather than active raids. Aldrich tells of such a time when the people of a neighborhood gathered at the largest and strongest house and prepared

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51 Ibid., p. 213
52 Aldrich, Spring Came on Forever, pp. 101-102.

to defend it from attack. They later discovered the report of the approaching war party was only rumor, and the affair amounted chiefly to a great deal of inconvenience to the frightened families.[53] None of the communities described in the works used in this study actually suffered in the raids that took place in a few districts in the plains wars. However, the indigent bands of Indians who went through the country demanding food were a great source of worry to the women -- another trial to add to the many that they had to bear.

When the wife of a settler was unable to cope with the problems that beset her - loneliness, hard work, cold, heat, and privations -- the result might be, as in this Nebraska home, the grimmest of tragedies.

> Early in January George Klein pushed his team through the snow to Pine Ridge for wood. When he came home he found his house dark, the fire out and his wife and three children dead -- gopher poison and an old case knife worn to a point. The woman had been pleading and silent for a long time, but her husband had hoped for better crops, better times, when he could buy shoes for the children, curtains for the windows, maybe a new dress for his wife and little luxuries like sugar now and then.
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> "If she could a had even a geranium -- but in that cold shell of a shack --" a neighbor woman said sorrowfully as she helped make white lawn dresses for the three children, something nice for the funeral.[54]

A family was never too poor to give aid and comfort to friends whose troubles were greater than their own. The fundamental decency and dignity of the people was well shown

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[53] Ibid., p. 101.
[54] Sandoz, op. cit., p. 180.

by their conduct after the death of a neighbor.

> When Death entered a community it came as a mighty Power whose presence was acknowledged by a cessation of activities. Men hearing of a death unhitched their teams and went to the house, thinking it not seemly to appear unaware of the grim rider. So the field work and the house work ceased...[55]

The death rate was high. There were few doctors and, transportation being what it was, they were likely to arrive at a homestead after it was too late. In many cases the doctor was sent for only as a last desperate chance and when the trouble was snake-bite, blood poisoning, or one of the more dangerous fevers, the delay was often fatal. Abbie Deal was very frightened when the family sent for the doctor for her sister's baby..."for she well knew that a doctor was the last resort for saving one who was sick."[56]

The individualism and independence of the pioneer found expression even here. They liked to use remedies that they themselves could prepare. Goose grease was a favorite for colds; baked onions and various herbs were used for compresses on the chest. A Norwegian settler's treatment for blood-poisoning was to have the patient drink a cup of whiskey into which a tablespoonful of pepper had been stirred.[57]

If a settler died in the winter months it was sometimes impossible to dig a grave through the frozen earth for immediate burial. In the winter of 1863-64 in Nebraska and again in

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55 Aldrich, Song of Years, pp. 231-232.
56 Aldrich, A Lantern in Her Hand, pp. 90-91.
57 Aldrich, Song of Years, p. 138.

South Dakota in 1880-81 it was necessary to put the caskets in snowbanks until the ground thawed in the spring.

Kindness and helpfulness were always the rule in times of stress; all that was finest in the pioneer character showed to advantage in days of adversity. Sandoz developed the thought that the settlers were able to derive some good from even these seasons of worst privation:

> But the hard times were not an unadulterated calamity to the Panhandle. The shiftless, and those who lived from the prosperity of their fellows drifted to greener fields early. Only the strong and the courageous, the ingenious and the stubborn remained. Common need knit them closer. It was no longer the Americans, the Hollanders, the Germans, the Slavs, the Swiss. The Catholic Church lifted its steeple over a depopulated Mirage Flats, but over one that would know little of racial or religious antagonism for a long time to come.[58]

Childhood and Education

Children of ten years of age, or even younger, were an economic asset to a pioneer family. New settlers could afford hired labor and there was always more work than could be done, no matter how early the day began. Getting up very early, perhaps at four A. M., certainly by five, seems to have been a Spartan tradition of the frontier, and was, according to Garland, one of the greatest and least justifiable hardships of childhood.

> Getting up at five A. M. even in June was a hardship, in winter it was a punishment...That did

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[58] Sandoz, op. cit., p. 180.

> we gain by this disagreeable habit of early rising? -- This is a question I have often asked myself since. Was it only a useless obsession on the part of my pioneer dad? Why couldn't we have slept till six, or even seven? Why rise before the sun?
>
> I cannot answer this, I only know such was our habit summer and winter, and that most of our neighbors conformed to the same rigorous tradition. Some of us got rich, and as I look back on the situation, I cannot recall that those "sluggards" who rose an hour or two later were any poorer than we. I am inclined to think it was all a convention of the border which might well have been broken by us all.[59]

The boys of a family did their first hour of work before breakfast. "Doing chores" it was called, and consisted of such tasks as milking cows, feeding hogs and other livestock, and harnessing a team when needed for the day's work. After breakfast the labor of the day really began.

Mention has been made of the drudgery that was the lot of a boy who had to drive a team at the plow. Most other jobs were not as long or as monotonous as plowing; but many of them such as tying sheaves, or husking corn, for example, could definitely be classed as heavy labor. Nearly all boys were required to do such tasks as soon as they developed the requisite strength and skill.

There were, however, some compensations in prairie life. Wild life was plentiful in most regions, and in winter hunting and trapping were a pleasant relief from farm toil and school confinement.

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[59] Garland, op. cit., p. 118-119.

> They dug wolves and badgers out of their holes. They knew the nests of the sand-hill and whooping cranes, almost as well as did the birds themselves, and they caught and tamed their young, as well as the young of the geese. There is a flock of Canada geese in that neighborhood yet, descended from their captures.[60]

Hamlin Garland, who often expressed his dislike for farm life in his stories about it, seems not to have had particularly distasteful memories of his boyhood on a homestead in Iowa. Along with accounts of the toil of harvesting and plowing he tells of pleasant afternoons spent observing the wild life of the prairie, and enjoying the sense of a world of romance. From Iowa this world stretched away in all directions in boundless space with wide plains and wild Indians to the west, the great woods in the North, and to the east and south the huge cities of Chicago, Boston, and, of course, Hesper, Iowa.[61]

The girls in a pioneer family had as many daily tasks to perform as did the boys. They helped with every detail of the cooking, mending, and scrubbing that went on in the household and had, in addition to all these, a special job that required almost constant attention every hour of the day; they were the custodians of all the smaller children.

> Marie, no one's pet, learned conformity early and developed a premature responsibility. She was expected to look after the boys, keep James from building fires, Jule from breaking his father's

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60 Quick, The Hawkeye, p. 53.
61 Garland, op. cit., pp. 101-109.

> delicate tools, both from fighting, the baby from crying while the parents were in the field or repairing fences.[62]

When we consider the facilities in the home and the lack of playthings, or of even a safe place outdoors to play, there were rattlesnakes everywhere on the prairie, we realize that this task of nursemaid must have been a difficult one.

During the first and second winters the settlers often had neither the time nor the materials to construct a school building. In that case school might be taught during three or four winter months in the homes of the neighborhood. In a settlement in South Dakota the school was taught by a young bachelor farmer and held a week at a time in each house. Such a gathering had social as well as educational interest; all who could, whether young or old, attended. Since there were only two pencils in the entire settlement and no paper at all, writing was done with charcoal on whittled boards. Only the simplest of arithmetic problems were attempted. The most important feature of the curriculum was the telling of stories in English to aid the immigrant settlers in learning the language of their new country.

Even after a schoolhouse was built and a teacher employed, the necessity for working at home or the frequent periods of inclement weather kept many children from attending more than a few sessions.

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[62] Sandoz, op. cit., p. 266.

> The children's attendance at school was broken constantly by severe snowstorms, so that Abbie again did much of the teaching herself. She often searched her mind for new ideas, trying to think what more she could do for the children. Time was slipping away and conditions were no better. Even if she must face the hard fact that she could never do anything for herself, the children must have some of the best things of life. Will was working night and day, making an old man of himself before his time. She must do more for the children some way. She must not let them grow up without a taste for good things. They ought to know more about music and have more reading material, and because they were not getting them, in some way she must instill in them a desire to have them. They must never be satisfied with things as they were. Even if she and Will were to live in a soddie all their lives, cut off from those things, the children must want to have them. If this desire were deep enough, they could find a way to seek them out as they grew older.
>
> She began getting down the Shakespeare plays for a while each evening, and required Mack and Margaret to learn a passage or two. Over and over she made them repeat:
>
> "The quality of mercy is not strained
> It droppeth as the gentle rain from heaven
> Upon the place beneath."
>
> Or, perhaps:
>
> "There's a divinity that shaped our ends,
> Rough-hew them how we will."[63]

The great colleges and universities, and the general support of and belief in education we now have in the prairie states, are evidence that the pioneer mothers did instill a desire for better things in the minds of their children.

The authors studied devoted many more words to discussions of the social life that centered in the school house of a community than they did to the educational program that was conducted there for the children. Perhaps, in the early years,

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[63] Aldrich, A Lantern in Her Hand, pp. 133-134.

one function of the building was as important as the other. As to the structure itself, we have this description of one in Iowa:

> The school-house which was to be the center of our social life stood on the bare prairie about a mile to the southwest and, like thousands of other similar buildings in the west, had not a leaf to shade it in summer nor a branch to break the winds of savage winter. "There's been a good deal of talk about setting out a wind-break," Neighbor Sutton explained to us, "but nothing has as yet been done." It was merely a square pine box painted a glaring white on the outside and a desolate drab within; at least drab was the original color, but the benches were mainly so greasy and hacked that original intentions were obscured. It had two doors on the eastern end and three windows on each side.
>
> A long square stove (standing on slender legs in a puddle of bricks), a wooden chair, and a rude table in one corner, for the use of the teacher, completed the movable furniture. The walls were rough plastered and the windows had no curtains.[64]

Discipline was severe. Ability to control the older pupils was the most important requisite for a successful teaching career. Some of the students in every district were products of the worst in the pioneer environment, and often the teacher was not much more advanced in cultural attainments. Roughness in manner and speech, rebellion against authority and anger in enforcing it were part of the daily atmosphere of the schoolroom.

> School discipline was always a serious problem, anyhow, when the pupils had to sit three in a seat, when a few of them had no books, or even slates or

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[64] Garland, op. cit. p. 95.

> paper or pencils with which to keep themselves occupied, and when the cult of the boys was a hoodlum heroics that flourished under the harsh discipline that some of the teachers tried to impose. "Lickin' and larnin'" were supposed to be reciprocal functions of teacher and pupils; and some of the teachers did their part religiously, if not with any great cultural results. Like so many people of the time, they thought they must have strict discipline, not as a means or condition to the education of the pupils, but as an end in itself.[65]

A boy might, under the system, be beaten with a rubber hose or a heavy stick, often for a trivial offense, until the teacher was too tired to continue. The result was a fashion in deportment and attitude that carried over into other relationships.

> There was not much chivalry in the school -- quite the contrary, for it was dominated by two or three big rough boys and the rest of us took our tone from them. To protect a girl, to shield her from remark or indignity required a good deal of bravery and few of us were strong enough to do it. Girls were foolish, ridiculous creatures, set apart to be laughed at or preyed upon at will. To shame them was a great joke.[66]

One feature of the instruction given in the first prairie schools seems to have been more important, in so far as results were concerned, than any other. This was the work from the McGuffey Readers. From these remarkable books the student could gain some understanding and appreciation of the great classics of literature, and a working knowledge of the English language, even in this discouraging atmosphere and under incompetent instruction, most of the teachers having had little or no training

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[65] Iles, op. cit., p. 232.
[66] Garland, op. cit., pp. 96-97.

for their work.

While some of the early settlers were educated folk, Jules Sandoz or Hamlin Garland's mother, for example, the average adult had very little formal education. The immigrants who came west were usually of the untutored peasant class; some instruction, about present day elementary school level, in the writing schools of New England was the usual educational attainment of the native-born settlers.

Reading material was scarce in most homes and the few periodicals that found their way to the frontier were much prized. Foremost of these was the "New York Weekly".

> But I can only pause to lay a wreath on the biers of Robert Banner of the "New York Ledger", Street and Smith who published the "New York Weekly", its great competitor, and whoever it was in Philadelphia who got out "The Saturday Night".
>
> All praise to them from a great people famished for reading! They brought to thousands and thousands of humble, isolated homes the nearest approach to literature that was available, in a day when books were costly and the good magazines were not only more so, but were pitched in a tone too high or too dull for these low-brows of mine."[67]

Garland describes the "New York Weekly" as "A paper filled with stories of noble life in England and hair-breadth escapes on the plains, a shrewd mixture, designed to meet the needs of the entire membership of a prairie household!" His family also subscribed to the magazine "The Hearth and Home", and he and his sister read from it the serial The Hoosier Schoolmaster by

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[67] Quick, op. cit., p. 42.

Edward Eggleston, which he speaks of in A Son of the Middle Border as a "perfectly successful attempt to interest western readers in a story of the middle border."[68]

Some of the current novels of the time found their way into the homes of the prairie. Uncle Tom's Cabin was read aloud in many family circles and did its part to arouse the settlers against slavery, just as it did elsewhere in the North. With the relatively well educated people the reading of books was largely determined by the supply; with the others it was left for the following generations.

Prairie Characteristics

In the first six sections of this study some aspects of the pioneer farm family's daily existence have been reported. Some details of the land and crops, the homes, the recreation and various other concrete subjects have been given as they were found in the works of the authors studied. There are, however, in each of the novels or biographies about the prairie and its people, highly significant elements of the story that cannot be easily classified. Unexpected sidelights and illuminations that portray the pioneer character with graphic clearness, and often have no set relationship to the story, are plentiful.

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[68] Garland, op. cit., p. 114.

Rölvaag's account of the claim stakes is a good example. Per Hansa, a Norwegian homesteader, discovered that strangers had placed claim stakes on land already selected by his neighbors. The neighbors' claims had not been filed at the land office and to keep them from being forfeited Per Hansa removed the stakes. Per Hansa was a very moral and religious man and such an act would have been a very serious offense in his native country, but with the inspiration of his new freedom in America he determined the justice of the case on its merits as he saw them and decided that his neighbors should not lose their land.[69]

This ability to interpret justice for himself was a tremendous stride in independence and individualism for a man born in the rigid traditionalism of Europe. Perhaps it was just as well, however, that not many achieved the nonchalance of the settler who said of "claim jumpers 'n' horse thieves 'n' sich ... Hang 'em in summer, 'n' poke 'em under the ice in winter." Individualism could go to extremes![70]

In a country where facilities for transportation and communication were poor, it was a temptation to deal out justice as one saw it rather than to wait for the law to take its course. The Law and the McLaughlins treats of the problem at length. Two men, believed to be horse-thieves, were lynched in Squire McLaughlin's wood. The Scotch settlers were horrified and set

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69 Rölvaag, op. cit., pp. 116-124.
70 Aldrich, op. cit., p. 68.

out to bring the culprits before the law. The identity of the men involved was established, but everytime a posse attempted to bring them in, they were warned and helped to escape by neighbors who felt that the men hanged had received their just desserts and that the incident should be dropped. Even when the men were finally captured a jail-break was arranged by their friends. During the controversy a powerful sermon on the necessity for allowing the law to take its course was preached by an itinerant minister. Part of his text was as follows:

> "There is no risk, I say to you, in being first generation pioneers. You, the first generation, come from settled, law-abiding places blessed with the memory of law-abiding lives. But your sons have no such memory. To the young men who listen to me, Scotland is but a word, a legend. They remember no courts. They remember none of the courses of justice. They now have seen violence. And the danger is for them. You know that even in your own State, in some counties men have now organized societies to protect their horses from horse thieves, and they say, openly, 'If we catch a horse thief we will lynch him.' And I will tell you why they say it. Their fathers were careless about landmarks. Their fathers were pioneers in Texas, or Kansas, or Illinois. And before that their grandfathers were pioneers in Indiana or Ohio. And before that their great-grandfathers were pioneers in Virginia or Pennsylvania. For three generations, for four or five, men, without the memory of settled justice, in their greed have succumbed to the hates and violence of communities where as yet there was no established law. So their sons can truly say, 'Our fathers lynched and we will lynch...'[71]

The fact that lawlessness was not more prevalent must have been due to a realization of this principle and to an innate

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[71] Wilson, The Law and the McLaughlins, pp. 242-243.

respect for orderly government; certainly taking the law into their own hands would have been simpler for many of the more isolated communities.

Hardships and privations seemed to bring the women of the prairie together in a spirit of friendliness which helped, to some extent, to stiffen their resistance to the rigorous environment. A Bohemian emigrant gave to her neighbor some dried mushrooms that she had brought with her from Bohemia. Her supply of these highly prized delicacies was limited; she had no way of securing more, yet she shared them with a friend.

> When Mrs. Shimerda opened the bag and stirred the contents with her hand, it gave out a salty, earthy smell, very pungent, even among the other odors of that cave. She measured a teacup full, tied it up in a bit of sacking, and presented it ceremoniously to grandmother.[72]

The fact that the family receiving the gift could not identify the strange food and were afraid to eat it did not detract from their appreciation of the generosity of the act. Differences in nationality and background became of small importance to women with similar problems in the common enterprise of making homes on the prairie.

This story of the flowers in a pioneer woman's garden gives a picture of the great migration which is as significant in its way as the dreams of an empire of free land that brought the men of her family to the West:

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[72] Cather, My Antonia, p. 90.

> That rose, the lady explained, she had brought with her from Davenport, in a little box with grape cuttings and the peony, which she had carried in her lap in a covered wagon long before there were railroads to the town. She had brought it to Davenport coming down the Ohio and up the Mississippi soon after she was married. A woman had given it to her when she left Ohio for the West. The peony her mother had brought from eastern to western Ohio many years ago, and when she died the daughter had chosen the peony for her share of the estate. Her mother had got it from her mother, who came a bride to Ohio from western New York, clasping it against her noisy heart, out of the way of the high waters her husband had led her horse through, across unbridged streams, cherishing it more resolutely than the household stuffs which had to be abandoned in the pathless woods. Her great-grandfather had brought it west in New York in his saddle bag, soon after Washington's inauguration as he returned from New York City. She supposed that the Dutch had maybe brought it from Holland to Long Island. There had been tulips, too, but the pigs had eaten them in Ohio. She had wondered sometimes if it was the fate of the peony to be carried clear to the Pacific by lonely women. At least, if she gave a bit of it to Mrs. McNair, it would be that much farther west on its way to its destination, which she, for one, hoped it might soon reach, so that there would be some rest for women.[73]

There were men of the border, too, who carried on the tradition begun in the Northwest Territory by Johnny Appleseed. Old Jules, living in the barrenness of the Nebraska Panhandle, experimented with varieties of fruits and shrubs to find those that would live in the unfriendly climate.

> By crossing selected wild plums with choice tame varieties, but not quite hardy, he developed a new plum that stood the winter, was free of insect pests, of delicate flavor, and tender skinned. In addition he experimented with cherries and apples, and grew all kinds of small fruit between the trees to hold the sand and snow. Every spring he gave away wagonloads of shrubbery, sucker plums, asparagus, horseradish, and pieplant roots to anyone who would promise to care for them.[74]

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[73] Wilson, The Able McLaughlins, pp. 162-163.
[74] Sandoz, op. cit., p. 248.

Such people brought civilization to the prairie. They caused homesteads to become farms and made rough settlements grow into thriving communities.

Greatest of all the forces of the pioneer character was faith in the future. It caused the settlers to plant and build in the face of all disasters, and to believe that better days would come. To men of less vision and courage the difficulties would have been insurmountable. Others, years before had passed over the prairie and seen it as a land too big and too unfriendly for man to conquer. It was still huge and awe inspiring and nearly empty of human beings when California became a state in the union. "Although the soil over which they trod was black and rich and fertile, few had lingered. The very vastness of the prairie regions had staggered the mind."[75]

Even after the farmers stayed and began to break the sod the prairie did not offer encouragement.

> Of all the bewildering things about a new country the absence of human landmarks is one of the most depressing and disheartening. The houses on the divide were small and were usually tucked away in low places; you did not see them until you came directly upon them. Most of them were built of the sod itself, and were only the unescapable ground in another form. The roads were but faint tracks in the grass, and the fields were scarcely noticeable. The record of the plow was insignificant, like the feeble scratches on stone left by prehistoric races, so indeterminate that they may, after all, be only the markings of glaciers, and not a record of human strivings.[76]

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[75] Aldrich, Spring Came On Forever, p. 81.
[76] Cather, O! Pioneers, p. 13.

But the strivings did persist and the record has become unmistakable. It is the accomplishments of a people composed of many races having in common an unwavering faith in the reality of one standard of value, the wealth in the soil.

> Even yet he could scarcely believe that there existed such an expanse of eager virgin soil waiting for whoever would husband it. Ten years of storm-bound winters and fever-shaken, marketless summers before the war had not chilled his passion for it -- nor poverty so great that it sometimes took the combined efforts of the clan to buy a twenty-five cent stamp to write to Scotland of the measureless wealth upon which they had fallen.[77]

SUMMARY

This study was an attempt to picture the life of the pioneer settlers and their most important character traits, as shown in the works of selected writers. From these works it was found that pioneers and pioneer life in the prairie states had the following characteristics:

1. The settler was motivated by a desire to secure land, and he respected the soil and believed in the dignity of labor.

2. The pioneer home was a dwelling constructed by the settler himself to meet the minimum needs of his family, and furnished primarily for purposes of utility, without the conveniences and refinements common at that time in more settled regions.

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[77] Wilson, op. cit., p. 22.

3. The agriculture of the prairie was nearly primitive in its lack of equipment and diversity in the early years, and was carried on under extreme difficulties and discouragements.

4. The pioneers were gregarious and social in their recreational activities, the result being a breaking down of social and religious barriers.

5. Pioneer life abounded in privations and hardships. The worst of these were drought, poverty, drudgery, and loneliness.

6. Children in the pioneer family were an economic asset because much manual labor was necessary. There was however, in some families, a strong belief in education and a determination that the new generation should have increased opportunities.

7. The pioneers possessed the qualities that we like to consider typical of the best citizens of our country. Some of these qualities were individualism, integrity, courage, ingenuity, and faith.

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reached.

Blackman and Matthaei (1905) investigated the influence of light intensity upon the photosynthetic rate with a full realization of the importance of other factors and under well controlled conditions. They concluded that if the temperature and carbon dioxide are in excess the rate of photosynthesis is proportional to the intensity of the incident light.

Adams (1925) emphasized that temperature must be considered in experiments dealing with the reaction of plants to light. Plants showed as good a growth under exposure to 569 hours of daylight at a mean temperature of 60.8° F. as they did with an exposure to light of 500 hours at a temperature of 68.2° F. Apparently no definite correlation between temperature and percentage heat injury to plants could be observed in this problem. Although temperature variations may have had an effect, light is considered the major factor in developing resistance to high temperatures in these tests.

Finkner (1940) concluded from his studies that light and carbon dioxide have a marked effect upon the resistance of seedling wheat plants to high temperature. Results indicate that the products of photosynthesis are instrumental in causing plants to be resistant to high temperatures. There seems to be little doubt but that photosynthesis is a partial cause of resistance although other mechanisms are probably involved. Hardening ability probably depends upon the amount of photosynthetic products manufactured under the different light intensities.

Research workers including Harvey (1930), Dunn (1933), Dexter (1935a), and Suneson and Peltier (1938) increased the cold resistance of plants by gradually lowering the temperature. In this experiment, heat resistance was developed by exposing seedling plants to moderately high temperatures of 100° and 110° F. (Plate V, Figures 1 and 2).

The changes occurring within the plants to make them more resistant to heat when given a pre-treatment at 110° F. apparently had the following characteristics: The rate of induction of this change was rapid as a three-hour pre-treatment immediately before the final treatment was effective. The pre-treatment on the first day was more effective in developing heat resistance than those on the succeeding days. After the third day very little resistance was developed in the plants by pre-treatments. Hardening was induced at 100° and at 110° F., however, a pre-treatment at 110° F. was the more effective. The induced heat resistance was not permanent as it was lost in a period of from six to eight days lapse after a pre-treatment. However, exposure of plants to 110° F. for three hours on each of three consecutive days induced heat resistance that was apparent for about a week. (Plate VI)

There are several possibilities as to the changes occurring within the plants to make them more resistant to high temperatures. The rapid and marked effect of so short an exposure as three hours at 110° F. suggests that a shock response not correlated with the product of time and temperature of exposure

EXPLANATION OF PLATE V

Fig. 1. Hardening to heat by exposure to heat.

Two pots of wheat seedlings were placed in the heat room at a temperature of 126° -- 128° F. for a period of five hours. Previous treatment was as follows:

Pots on left. Plants were not pre-treated.

Pots on right. Plants were exposed to 110° F. for three hours, the day preceding the test treatment.

Plants were photographed 32 days after the final test treatment.

Fig. 2. Hardening to heat by exposure to heat.

Two pots of sorghum seedlings were placed in the heat room at a temperature of 130° -- 132° F. for a period of five hours. Previous treatment was as follows:

Pot on left. Plants were exposed to 110° F. for three hours, the day preceding the test treatment.

Pot on right. Plants were not pre-treated.

Plants were photographed 13 days after the final test treatment.

PLATE V

Fig. 1

Fig. 2

EXPLANATION OF PLATE VI

Rate of loss of artificially induced heat resistance in plants.

All nine pots of sorghum were placed in the heat room at a temperature of 130° -- 132° F. for a period of five hours. Previous treatment preceding trial was as follows:

Pots, number one through eight, were pre-treated with heat three hours per day for three days at 110° F.

Pot	1	2	3	4	5	6	7	8
No. days lapse before final treatment	8	7	6	5	4	3	2	1

Pot 9. Plants were not pre-treated.

Plants were photographed nine days after the final test treatment.

PLATE VI

might have induced the resistance. Changes within the plants similar to those inducing drought resistance reported by Newton and Martin (1930) might have increased resistance to high temperatures. Factors suggested include an increase in the amount of bound water, a change in the osmotic pressure of the plant cells, or the reaction of unidentified physico-chemical properties.

A temperature of 110° F. is approximately 35 degrees above the temperature at which plants are normally grown in the greenhouse. The thermal death point of most plant cells lies between 113 and 131° F. According to Maximov (1938) as a temperature of 110° F. is approached there is a disturbance in the coordination of the biochemical processes taking place in the cell and poisonous substances of the types of toxin accumulate for death usually begins at temperatures slightly above 110° F. Coagulation of the protein substances of the protoplasm might also begin at this temperature. A by-product of one of these breakdown processes might induce heat resistance, at 100° and 110° F. and yet the temperature would not be high enough to kill the cells.

The exact nature of physiological adaptation to cold is still unknown. Many correlations have been noted between cold resistance and certain plant characteristics such as structure and the chemical and physical properties of the cells. The general effect of low temperatures on plant tissue has been thoroughly reviewed and investigated by many investigators.

The quantity of hydrophilic colloids contained in pressed juice of hardened leaves was found by Newton (1924) and Dunn (1933) to be proportional to winter hardiness.

In summary, Martin (1927) stated that hardy plants are characterized by low moisture content of tissues, high percentage of total solids in juice, high freezing point depression or osmotic concentration of juice when plants are actively growing, high percentage of bound water in juice, low rate of respiration at low temperatures, and frequently by a long period of vegetative growth.

Dexter, Tottingham, and Graber (1930), within limits of their investigation showed that there exists a correlation between know hardiness of alfalfa roots and the degree of retention of electrolytes by the tissues after freezing.

Schaffnit and Lüdthe (1932) in their studies conducted with winter wheat, winter vetch, and cabbage found that the entire relationship of the nitrogen compounds was altered by low temperature.

According to Dexter (1935b) more water is left unfrozen in hardened plants than in unhardened ones, and the concentration of minerals is lower in the unfrozen water in hardened than in unhardsned plants.

Scarth and Levitt (1937) summarized a linked series of changes associated with hardiness.

1. Complicated hydrolytic breakdown of carbohydrates increases the osmotic pressure of the cells and also

in hardier plants the non-solvent space in the vacuole at the expense of starch and other reserves held in the cytoplasm.

2. Due to similar changes in the protoplasmic colloids the whole cytoplasm, probably, and the plasmic membranes, almost certainly become more hydrated.
3. As a consequence of this change the viscosity of the protoplasm is lowered.
4. Because of the change in the membranes in particular, cell permeability is increased.

The exact nature of cold resistance must await a better knowledge of the structure and the physiology of the plant protoplasm. Perhaps, the same factor or factors causing cold hardiness also make plants more resistant to heat as plants given a pre-treatment to cold were decidedly more resistant to heat than untreated ones. (Plate VII)

The close analogy between cold resistance and resistance to high temperatures is further strengthened by the studies made on the heat resistance of wheat dehardened to cold. Several research workers have given consideration to the loss of cold hardiness in plants when exposed to conditions for normal growth.

Suneson (1930) noted that loss of hardiness under constant greenhouse temperatures was readily discernible in from 24 to 48 hours. According to Salmon (1928), this was previously observed by Bayles.

Tumanov (1931) worked with hardened wheat plants and found

EXPLANATION OF PLATE VII

Hardening to heat by exposure to pre-treatments of heat and cold

Three pots of wheat were placed in the heat room at a temperature of 126° -- 128° F. for a period of five hours. Treatments preceding trial were as follows:

Pot 1. Plants were not pre-treated.

Pot 2. Pre-treatment of cold at 34° -- 40° F. for three hours on the previous day.

Pot 3. Pre-treatment of heat at 110° F. for three hours on the previous day.

Plants were photographed eight days after the final test treatment.

PLATE VII

a definite loss of hardiness in a single day with plants maintained at greenhouse temperature.

According to Anderson and Kiesselbach (1934) wheat plants may decrease in cold resistance following a few warm days in winter. As the crop loses its hardiness with the approach of early spring, its cold resistance is reduced. Data in this problem indicate that plants dehardened to cold in the greenhouse gradually lost their heat resistance. (Plate VIII) An explanation of the loss of cold hardiness might explain the loss of resistance to heat if it is assumed that the same factor or factors are responsible for cold and heat resistance in plants.

Dexter (1933) in his study of the loss of cold resistance believed that the retention of hardiness is dependent upon the preservation of an adequate supply and concentration of organic food. This supply is ordinarily depleted by respiration. If production or elongation of new leaves is stimulated there is a rapid decrease in hardiness, presumably because of the labilization and use of organic food.

Laude (1937) studied the changes in cold resistance during transition from dormancy to active growth in winter cereals including wheat, rye, barley, and oats. Water content and amount of expressed sap increased as active growth began after dormancy. The total solids in the sap decreased. Cold resistance changes were negatively associated with H_2O content, refraction of sap, and expressed juice during the first half of the transition

EXPLANATION OF PLATE VIII

Heat resistance of plants dehardened to cold.

All seven pots of wheat were placed in the heat room at a temperature of 126° -- 132° F. for a period of eight hours. Treatment before trial was as follows:

Plants were hardened outside to natural winter conditions and then brought into the greenhouse.

Pot	1	2	3	4	5	6	7
No. of days in greenhouse before final treatment	0 (4 hrs.)	1	2	3	4	5	6

Plants were photographed 15 days after the final test treatment.

PLATE VIII

period and similarly associated with pressed juice during the last half of the period.

Aamodt and Johnston (1936), Kondo (1931), Krassnosselsky-Maximov and Kondo (1933), and Shirley and Meuli (1939) have either observed or suggested that hardening of plants by soil drought or by limited exposures to atmospheric drought increased resistance to exposures of severe atmospheric drought.

Drought resistance in plants is considered a result of the interaction between many complex physiological processes and physiological and anatomical responses. Newton and Martin (1930) summarized diagrammatically the principal factors affecting drought resistance. They outlined in detail absorption and transpiration but did not attempt to elaborate wilt endurance which is still an obscure physiological adaptation enabling plants to maintain life when the moisture content of the tissues becomes abnormally low. Certain physico-chemical properties of the leaf tissue fluids agreed closely with the drought resistance of various crops. Bound-water content served as a reliable index to use in classifying crops relative to their ability to resist drought.

Vassiliev and Vassiliev (1936), in their study of all the factors causing drought resistance in wheat found that carbohydrates aid markedly in regulating the osmotic pressure of the plant cell. Carbohydrates also play the role of a protector in preventing coagulation of protoplasm when influenced by harmful factors. They believed that the accumulation of hemicellulose

during the stage of water loss is a means of resistance and a natural reaction of a wheat plant towards drought. Accumulation of soluble carbohydrates by a plant is a means of increasing its drought resistance.

In this problem, drought treatments contributed to a less vigorous development of the vegetative organs and definitely hardened the plants to high temperatures. (Plate IX) Hardening of the treated plants may have been caused by one or by a combination of several factors including the accumulation of soluble carbohydrates or hemicellulose, an increase in the amount of bound water, a change in the osmotic pressure of the plant cells, and the reaction of certain unidentified physico-chemical properties. To this may be added anatomical changes induced by drought conditions which might interfere with the plant processes of absorption and transpiration. Periods of drought for as short a time as five days gave a marked difference in the resistance of plants to high temperatures in certain tests. Although complex physiological changes may have occurred within the plant in that length of time it is very probable that some factor or group of factors, either those already suggested, or variations of them, induced heat resistance in the plants. Hardening may also have been caused by some factor as yet not studied or understood when the plant entered a stage of temporary dormancy because of the drought treatment.

EXPLANATION OF PLATE IX

Two pots of corn seedlings were placed in the heat room at a temperature of 130° -- 132° F. for a period of five hours. Treatment preceding trial was as follows:

Pot on left. Plants were not watered for six days preceding final heat treatment. Plants were watered thoroughly on the morning of the final heat treatment.

Pot on right. Plants were not pre-treated. Plants were growing under normal conditions in the greenhouse; watered daily.

Plants were photographed seven days after the final test treatment.

PLATE IX

SUMMARY AND CONCLUSIONS

1. The effect of certain environmental conditions on the resistance of corn, wheat, and sorghum seedlings to high temperature was studied. Four main tests were made: (1) the effect of varying intensities of light upon the resistance of seedling plants to high temperatures; (2) the effect of moderately high temperatures upon the resistance of seedling plants to high temperatures; (3) the effect of moderately low temperatures upon the resistance of seedling plants to high temperatures; and (4) the effect of drought treatment upon the resistance of seedling plants to high temperatures.

2. Results of the experiments with varying intensities of light indicate that light is a major factor for developing heat resistance in seedling plants. Although temperature may have had an effect, light was considered the major factor in developing resistance to high temperature. Heat resistance was directly correlated with increasing intensities of the light pre-treatments.

3. Plants subjected to pre-treatments of moderately high temperatures of 100° and 110° F. for three hours developed heat hardiness. Although some heat resistance was developed in plants after three successive days of pre-treatment, marked influence occurred in the first three days, especially the first day. A pre-treatment at 100° was slightly less effective than one at 110° F. Rate of induction of heat resistance by pre-

treatment at 110° F. was rapid as a pre-treatment of three hours immediately before the final test to determine percentage heat injury increased the resistance of the plants to high temperature. Artificially induced heat resistance was gradually lost. Very little, if any, artificially induced heat resistance remained 12 to 14 days after the last pre-treatment.

4. Plants subjected to pre-treatments of moderately low temperatures of from 34° to 40° F. for three hours developed heat resistance. Added heat resistance was induced in wheat by two and three days of pre-treatment. Pre-treatments to heat at 100° or 110° F. were apparently more effective than pre-treatments to cold at 34° to 40° F. in developing heat hardiness in seedling plants.

5. Wheat plants were hardened to cold through exposure to natural winter conditions. Heat resistance of the plants decreased rapidly after the first day and little resistance remained after five days of dehardening to cold under normal growth conditions in the greenhouse.

6. Pre-treatments of drought induced heat resistance in seedling plants. Plants not watered for from five to 15 days until the day of the final test treatment to determine percentage heat injury were more resistant to heat than plants watered daily.

7. It may be concluded from these studies that conditions such as varying intensities of light, moderately high temperatures, moderately low temperatures, and drought have a marked

effect upon the resistance of corn, wheat, and sorghum seedlings to high temperatures. A close similarity was observed between heat resistance and cold resistance. Apparently the same factor or factors inducing cold resistance in plants may also induce heat resistance. The resistance to high temperature artificially developed in the seedlings by various pre-treatments is considered a result of the interaction between many simple or complex physiological processes and physiological and anatomical responses. No factor or factors studied so far serve as a reliable index to use in classifying crops relative to their ability to resist drought.

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