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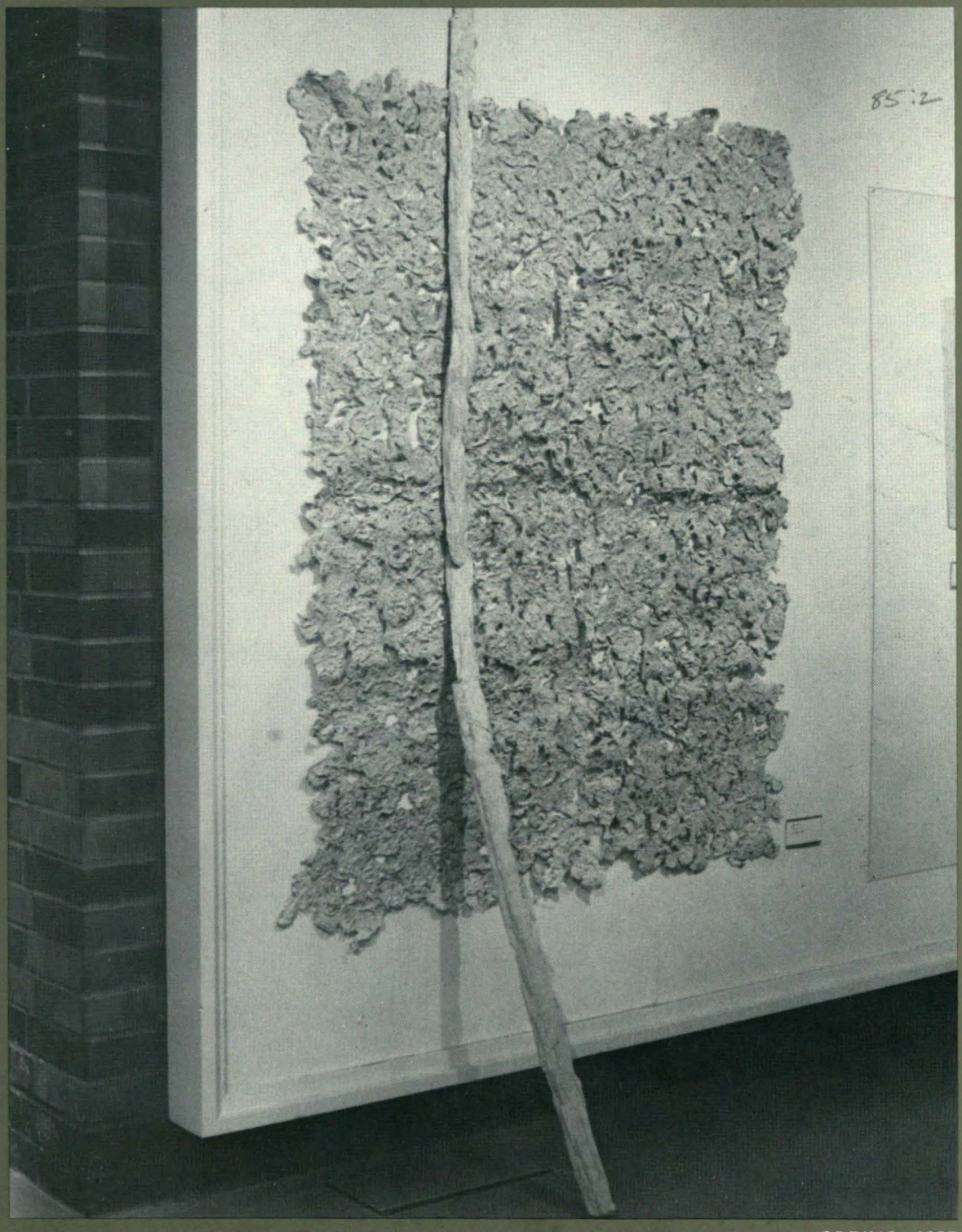
SCHOLARSHIP·IN·REVIEW

THE MAGAZINE OF RESEARCH & SCHOLARLY ACTIVITIES AT CENTRAL WASHINGTON UNIVERSITY



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A Message From The President

The purpose of **Scholarship•In•Review** is to share with you a sample of the professional work being done by the faculty of this university. As at any university worthy of the name, continuing scholarly work is an expectation of each faculty person.

In recent years it has been fashionable to suggest that research and scholarly work are done always at sacrifice to students and teaching. Far too many have been willing to repeat this notion which I believe is incorrect. None of the scholarship herein presented was done at sacrifice to students or classroom. Central Washington University is that kind of institution. That is the way it should be at a university, and I feel confident that is the way it is at most.

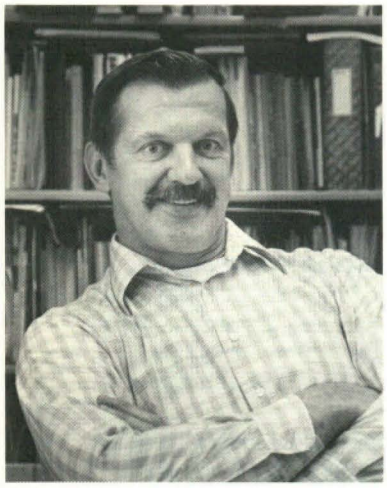
The dual responsibility of teaching and sharing with students on the one hand and the development of knowledge on the other is unique to the university. Each of us as faculty is expected to toil in the field of our scholarship and to share it with our students. We are obliged to do so whether or not we receive grant support. The important thing is that we are constantly testing and adding to our best approximation of truth.

Another aspect of scholarly work is that it must be shared. The very nature of scholarship is that it is offered to others for their use, understanding, testing or refutation. This publication represents our effort to help in that sharing.

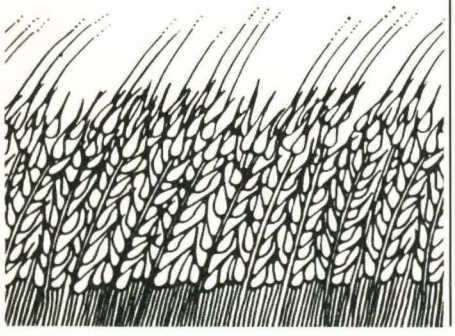
I hope that this publication gives the reader a sense of the breadth and vitality of the scholarly activities which are a part of the daily life of this university.

Donald L. Garrity
President

Big Bend Wheat*



Professor George Macinko's teaching is largely within the areas of physical geography and environmental studies. His major research interests are in land use and environmental philosophy, with particular emphasis on rural land use and the reclamation of land.



Introduction

The Big Bend is a five county area in Central Washington (Figure 1). This is sagebrush country comprised of flat plateaus and rolling hills in the rain shadow of the Cascades (Figure 2). The country rises from a low of just under 400 feet in the southwest to nearly 2,700 feet in the northeast. Annual precipitation ranges from about six inches in the southwest to more than twelve inches in the northeastern uplands with most of the area receiving between six and ten inches (Figure 3). The Columbia Basin Project Area in the southwestern part of the Big Bend merits particularly close attention as here dryland wheat farming was attempted under conditions more arid than anywhere else in the United States.

My examination of the first half-century of wheat farming in the Big Bend challenges the popular notion that a changing climate was largely responsible for the ebb and flow of regional wheat farming. Though precipitation is conceded to be the single-most important factor in dryland wheat production in the Big Bend, the ups and downs of wheat production there is best explained by a combination of factors other than a supposed "changing climate." In particular, the first decade of the twentieth century was marked by attempts to grow wheat even in the driest western portions where unfavorable soil and rainfall precluded hopes of long-term success. And, in the better favored but still marginal remainder of the Big Bend, the farming techniques and tools of the day were not sufficiently adaptive to overcome the recurrent variations in precipitation that are normal features of a "changeable" but not "changing" semiarid climate. By the mid-thirties, however, advances in agronomic research together with improved agricultural techniques and implements set the stage for a sustained reversal of the earlier decline in wheat farming that refutes the changing climate contention. In short, the activities of man rather than the vagaries of nature must be looked to as the prime mover in the ebb and flow of wheat farming in the Big Bend.

Early Settlement

In the Big Bend a post-Civil War land use system based on open range livestock grazing persisted into the late 1880's when scanty water supplies and a succession of hard winters, particularly that of 1889, caused serious losses. This, together with the success of wheat growing in the more humid Walla Walla and Palouse country to the east, set up the change from livestock to wheat.

The deep loessal soils of the rolling Palouse country had already proven to be a bonanza wheat region and settlement pushed westward from the 20 inch isohyet characterized by tall

The original version of this study was completed many years ago incidental to a broader study of contemporary irrigation agriculture. A CWU faculty research grant permitted me to update and refine that preliminary effort. An expanded, more fully documented version of this article appears in the April 1985 issue of* ***Agricultural History.*

sod-forming wheat grasses, through a bunchgrass zone, into a sagebrush area of increasingly less rainfall and lighter, sandier soils. In 1897, Lincoln County, in the northeastern portion of the Big Bend, experienced a "bumper wheat crop" when approximately 250,000 acres seeded to wheat yielded an average of twenty-nine bushels to an acre. As a result of this bumper crop nearly every tillable quarter section in the eastern Big Bend was purchased or leased for farming in the next year. Between 1900 and 1910 this push extended into the more arid southwestern portion of the Big Bend where, for the most part, annual precipitation averages less than eight inches and potential evaporation exceeds actual precipitation every month of the year.

Fair success attended these first efforts at wheat growing but were soon followed by failure, particularly in the dryer western Big Bend where initial success seldom lasted more than a few years. By 1911 decreasing yield suggested much of the area was unsuited to wheat production and a long decline set in reaching its lowest ebb about 1934. Secular rises based on short cycles of better than average rainfall or higher than average wheat prices interrupted but did not divert this long downward trend.

In the Big Bend, wheat acreage very closely approximates improved acreage. Historically some 85 to 95 percent of the improved acreage in the area has been devoted to the production of wheat--ninety-five percent if early small-scale irrigation efforts are discounted. Therefore, by checking improved acreage as recorded on county tax rolls, one can examine wheat growing on a township basis rather than the county-wide basis reflected by census data. Examination of tax rolls for Adams, Franklin, and Grant Counties from the earliest year of record reveals a rapid build-up of improved acreage that reached its peak in 1911 to be followed by a long decline reaching its nadir in 1934. This rise and fall of improved acreage is best shown in graphic form (Figure 4). By 1934 sagebrush and cheatgrass had invaded more than one-third of the land that had been in wheat before 1911. Land abandonment together with consolidation of the farms remaining left the landscape liberally dotted with abandoned farmsteads in the late 1930's (Figure 5).

Interpreting the Decline

The reasons for the ebbing fortunes of wheat farming in the Big Bend are varied and complex. Simple ignorance played a role, for the extent of aridity was not fully known at first, nor its effects fully appreciated. Witness the initial attempts at wheat growing even in those areas where annual precipitation shaded six inches.

A number of myths supplemented ignorance of physical conditions. First and foremost was the widespread belief that "rain follows the plow." The October 24, 1902 *Ritzville Times* said,"...that it is an acknowledged fact that as the country settles up, and with the planting of more trees, the rainfall increases, and the rainfall is now considerably greater than it was twenty years or even ten years ago..." And an editorial in the *Franklin Recorder* of May 1889 states: "Our theory that even windmills will be done away with is based on scientific principles. When the Willamette Valley was first settled they had scarcely any

BIG BEND COUNTRY

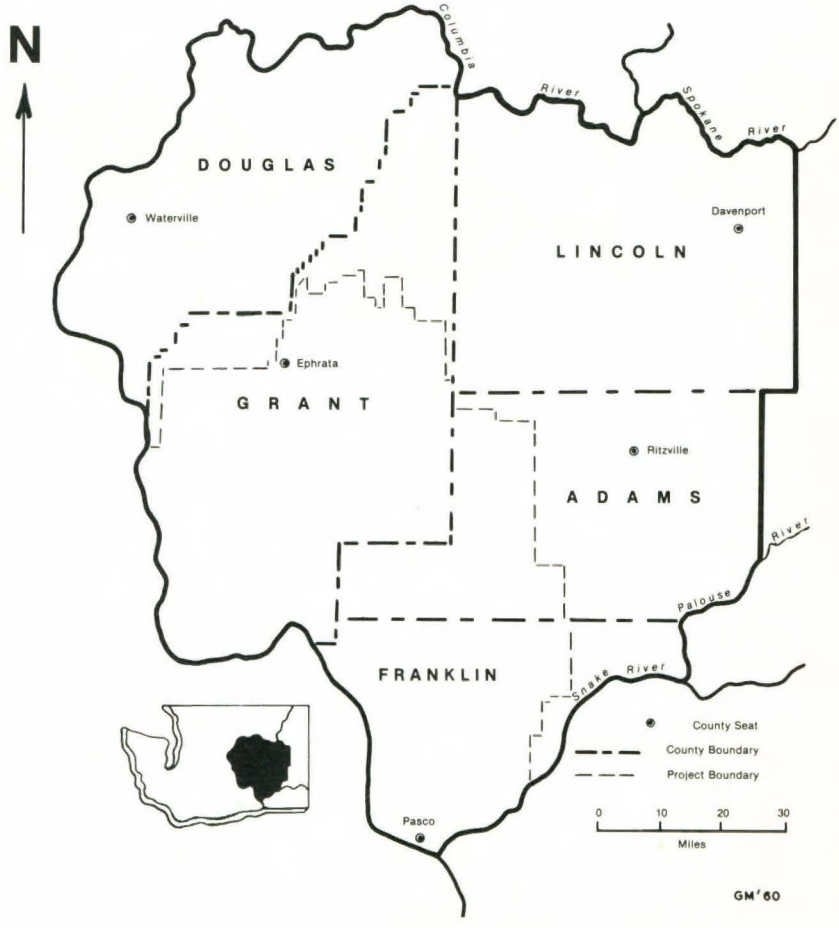


Figure 1.

more rainfall than we now have. The change was brought about by the shifting of the earth's poles. The same change is still going on and the rainfall reaching further east, and if the next five years show as marked increase in the precipitation as have the past five years, the people of Franklin County will cease to long for an irrigation canal."

These early hopes faded as yield declined and were replaced by the oft-voiced complaint that, "the climate has changed" and "it's dryer than it used to be." This was especially true after the particularly severe windstorms of 1908. The climatic record does not support these assertions of increasing aridity. As is true in most semiarid climates, the rainfall in any given year can vary significantly from the mean, and these variations are important, but the fact that the long term decline in wheat growing persisted through periods of better than average rainfall and better than average wheat prices suggests other factors were decisive.

The early settlers attempted to plow and crop their land each year. The yields were so low that it soon became apparent that alternating summer fallow with wheat would be needed to conserve enough moisture for a profitable crop. Even universal adoption of summer fallowing, however, was not enough to offset the deleterious effects of contemporary plowing and weeding procedures that aggravated wind erosion tendencies already becoming significant as land clearing operations intensified. A closer examination of the non-climatic factors that contributed to the initial success of Big Bend wheat in the first decade of the century, to the decline experienced during the next quarter century, and then to the eventual sustained resurgence of wheat beginning in the mid-1930's is in order.

Wind erosion intensified with the clearing of ever-larger tracts of sagebrush. Pioneer homesteaders had settled government land first. Because the Northern Pacific Railway Company owned all odd-numbered sections of Franklin County there was little wind damage there for several years. Within a decade much Northern Pacific land had been purchased and the sagebrush cleared. Sagebrush clearance also proceeded apace elsewhere in the Big Bend during the first decade of the century. Given a free sweep over vast stretches of cleared lands, wind erosion and drifting soil increasingly caused problems.

Wind erosion as a direct consequence of land clearance was not the only adverse effect of such operations. As the native vegetation was removed and the land put into wheat and summer fallow each year, much of the soil's original organic matter was lost. This loss was serious, not only because it lowered the productive potential of the soil, but, even more so, because soil with low organic content was less able to resist wind and water erosion.

Farming practices as dictated by the agricultural equipment then in use contributed to the deteriorating wheat picture. These practices caused excessive soil pulverization and the concomitant destruction of soil binding properties.

The moldboard plow turned the soil completely over and buried the stubble leaving the surface unprotected and open to the

Figure 2. Steppe grass - sagebrush typical of the Big Bend.

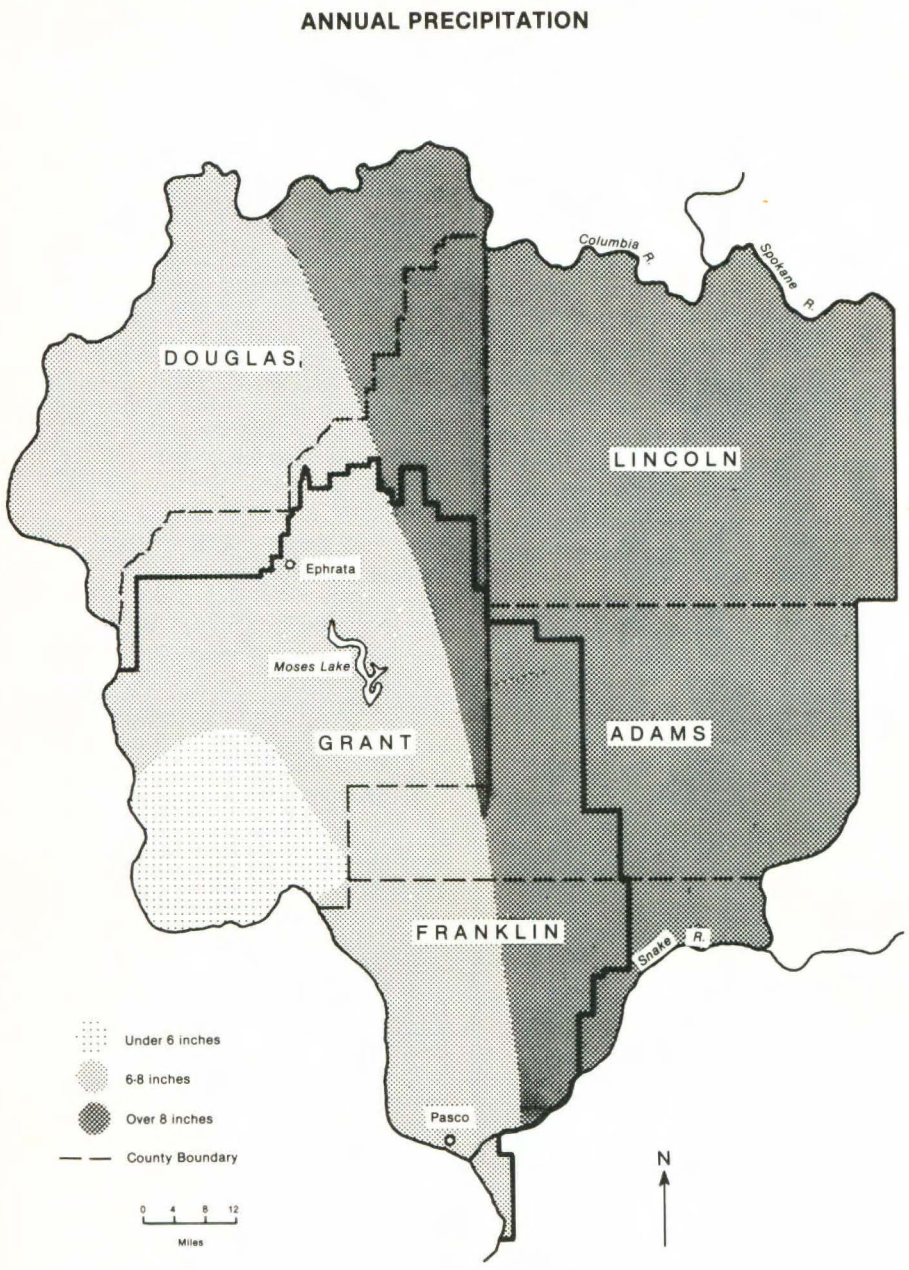


Figure 3.

drying action of the wind. Harrows were used to keep down weeds in the summer fallow. Here, where moisture was at a premium, several weedings of the summer fallow contributed to the breakdown of the soil structure and the soil binding properties that formed the chief defense against wind erosion.

Furthermore, motive power for farm operations was provided by horses, mules, or some combination thereof, through the 1920's, and tractors did not assume dominance until the 1930's. Even with the impressive animal teams common to this region (combine operations frequently used thirty to fifty animals) farming operations were slow and could seldom be completed when soil moisture was most favorable. The net result of the moldboard, harrow, and the horse and mule was a farming operation which made less than optimum use of scarce soil moisture.

Weeds also played an important role as the initial succes of the early wheat growers was followed after several years of cultivation by the encroachment of weeds not present earlier. Consequently, there was the need to "stir up the surface" far more than had been required earlier under more weed-free conditions. Destruction of weed growth was essential to the success of dry farming in this area as a Russian thistle growing in spring wheat or in the fallow during the summer could remove moisture enough to supply growth for several wheat plants.

The Transformation

Eventually a new set of agricultural tools and techniques was to revolutionize dry farming operations in the Big Bend beginning in the late 1920's and early 1930's. Tractors which had been used for several decades as a source of threshing power now began to be used for a variety of mobile field operations. Like wheat itself, tractors were introduced to the Big Bend from the more humid Palouse country to the east. In the dryer Big Bend, problems with dust made the early tractors almost inoperable. But by 1926 tractors began to replace horses and improvements in crawler tractors in the 1930s sped up the transformation. The tractor permitted much better timing of farm operations which now could be conducted under optimum moisture conditions.

Farmers had long recognized the desirability of plowing fallow early in the spring to prevent the loss of soil moisture and plant food. The slowness with which animal-powered farming operations were conducted meant, however, that large acreages did not get plowed until much later than was ideal. The advent of improved tractors that permitted better timeliness in farming operations did much to relegate this problem to the past.

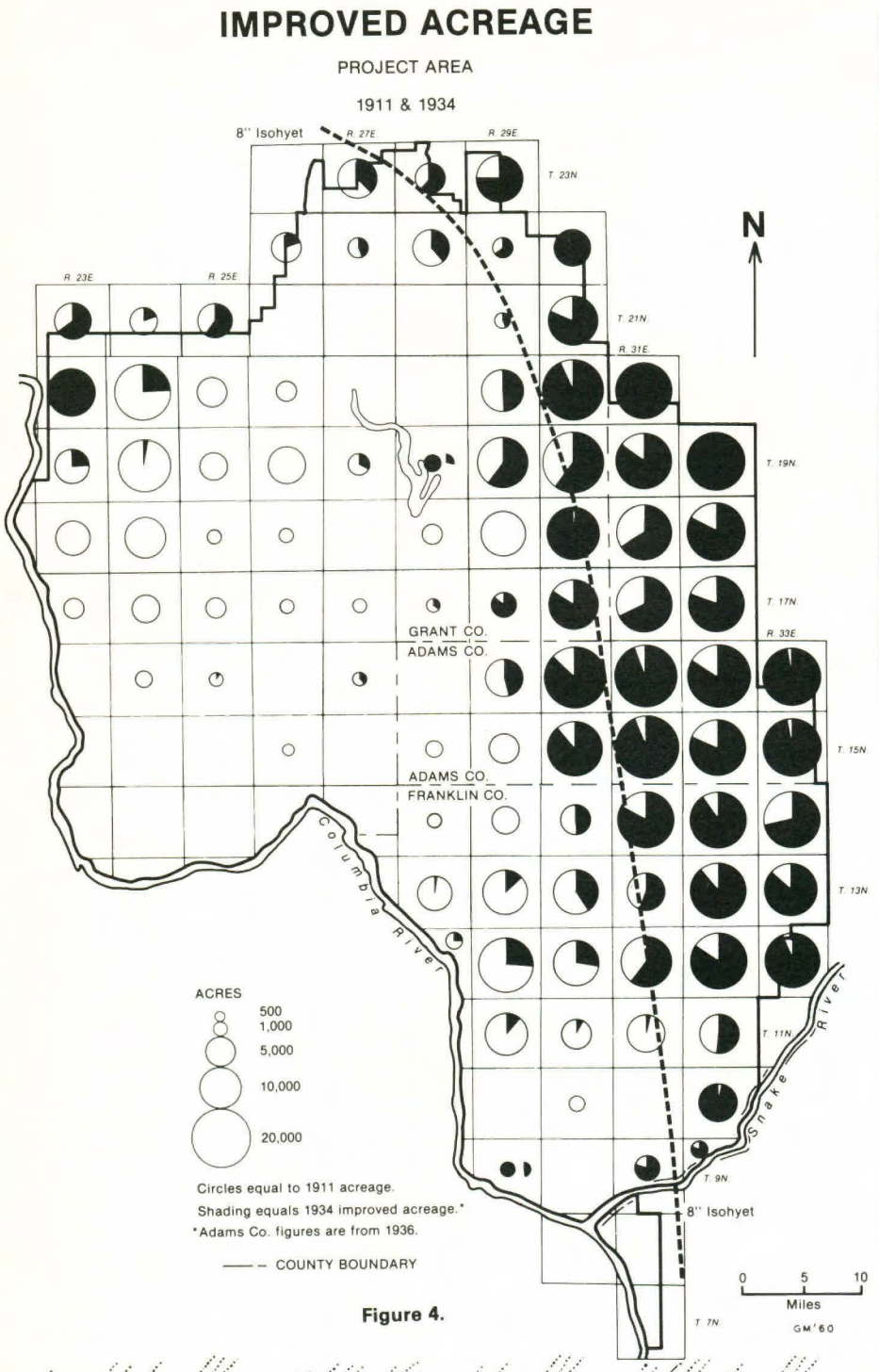
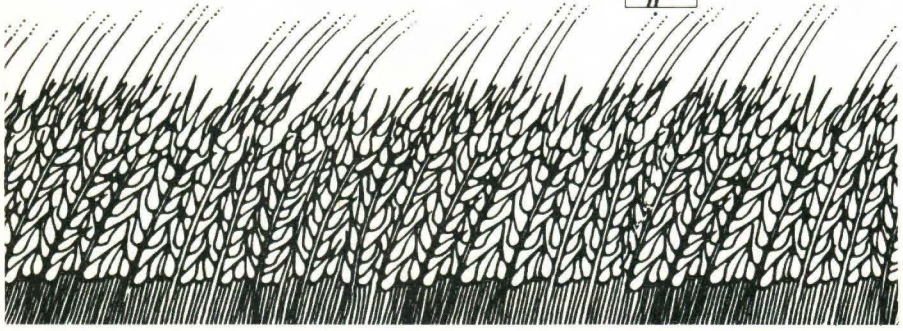


Figure 4.



Disc plows replaced moldboard plows and these implements turned the soil on its side instead of upside down. Stubble exposed at the surface now provided some protection from wind erosion and, additionally, conserved more soil moisture.

Knife blade (bar) and rod weeders, operating below rather than at the soil surface, replaced harrows in summer fallow weeding operations. The early varieties of the blade weeders had been in operation for some years but were less than satisfactory because they quickly "plugged up" with weeds requiring the operator to stop frequently (sometimes each twenty feet) and clean the cutting bar. The revolving rod weeder, self-cleaning and virtually foolproof in operation, formed the third leg of the agricultural equipment revolution in the Big Bend.

A lesser, but still important component of this revolution, was the deep furrow grain drill introduced about 1927, which, by planting seeds deeper, enabled farmers to make better use of subsoil moisture. This proved to be especially useful in the more arid western Big Bend.

One should note that these improvements in agricultural equipment were introduced into the Big Bend at various times during the late 1920's and early 1930's. They did not come together as an effective package until the mid 1930's however, and it took the entire package (along with some innovations in addition to improved equipment) to rejuvenate wheat farming in the Big Bend.

Among these other-than-equipment innovations was the increasing emphasis on winter wheat and the improved varieties of both winter and spring wheats. The transition toward winter wheat, which outyields spring wheat in the Big Bend, gained momentum in the 1920's with the introduction of Turkey Red, an ideal winter wheat for areas of

low rainfall. Ideally, the winter wheat plant becomes well established in the autumn, forming a strong root system and, therefore, permitting more vigorous growth in the spring. It thus passes through its critical growth and flowering stages before the hottest, driest summer weather sets in. Winter wheat tends to be more effective than spring wheat in combating weeds, and in controlling soil erosion. These advantages are further enhanced in the Big Bend where winter is in the season of maximum precipitation.

Summary

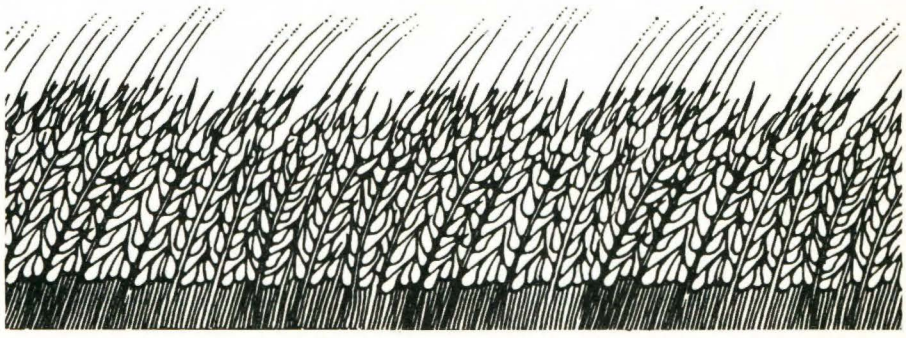
The ebb and flow of wheat farming in the Big Bend from its beginnings at the turn of the century until World War II was marked by a limited initial success when weed-free virgin lands with a fair degree of residual organic content permitted the expansion of wheat farming for a decade. Even during this period, however, considerable wheat acreage was abandoned though these losses were offset by the exuberance of pioneers who continued to break out new land in ignorance of the true nature of the Big Bend environment and sustained by myths foretelling increased precipitation as the result of land cultivation.

By the end of the decade the limitations of both the physical environment and an agricultural system that did not optimize soil moisture conservation set in motion a long-term wheat farming decline that was not reversed until the middle 1930's. The cry that "the climate was changing" was often voiced to explain this setback. The climatic record does not sustain this observation, but reveals instead a cyclical pattern of higher and lower than average precipitation that is normal to semiarid climates.

Periods of higher than average precipitation especially when combined with better than average wheat prices interrupted but did not reverse the long downward trend in wheat farming, especially in the western Big Bend. The reversal in wheat growing fortunes was not accomplished until a package of improved agricultural tools and practices came together in the Big Bend in the middle 1930's. The change from horse to tractor, from moldboard to disc plow, and from harrow to revolving rod weeder, along with the introduction of the deep furrow grain drill and the eventual dominance of winter over spring wheat, led to the rebirth of wheat farming in all but the most marginal areas of the Big Bend and the consolidation and stabilization of wheat operations in the more favored portions.

In the larger context we see in the Big Bend yet another manifestation of the notion that the vagaries of nature rather than the actions of man are primarily responsible for changing economic fortunes. While climatic change is an indisputable fact of earth history, it is too often invoked as an explanatory mechanism to account for human misfortune. Climate was indeed an important factor in the changing fortunes of Big Bend wheat farming -- but human factors were even more compelling.

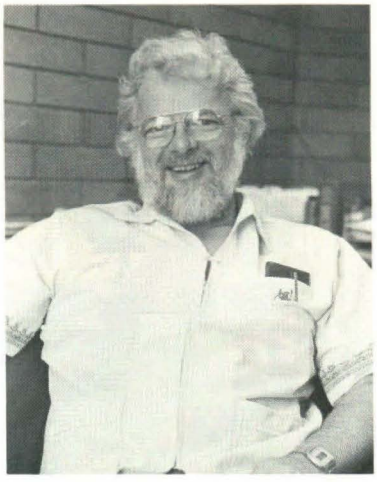
Figure 5. Abandoned Farmstead in the Quincy area.



The English Spelling System Really Is a System

The right writing of our English...is a certain reasonable course to direct the pen by such rules as are most conformable to the propriety of sound, the consideration of reason, and the smoothing of custom jointly.

--Richard Mulcaster,
The Elementarie, 1582



Don Cummings is Professor of English, Chairman of the English Department, and Director of the Academic Skills Center. Cummings' research in orthography grew out of the problems of teaching remedial spelling to college students at Central's Academic Skills Center. It extended into work with the Bellevue School District, developing the eight-book *Cummings Basic Speller,* for elementary students. During a recent sabbatical year Cummings began working seriously on a large monograph tentatively titled *American English Spelling,* which looks in detail at the patterns and rules at work in the phonological, morphological, and historical dimensions of our orthographic system. Cummings and the others at the Academic Skills Center are still wrestling with the problems of teaching spelling to college students.

Four hundred years ago in London, Richard Mulcaster, an Elizabethan language arts teacher, published his spelling text called *The Elementarie* in which he described how the English spelling system was governed in a complex way by the pressures of sound, reason, and custom. Elizabethan that he was, Mulcaster began his description with a political allegory: Originally Sound was King and held sole dominion over that realm that Mulcaster called Right Writing. But sound is much too varied and changeable a thing to be capable of complete control. In time change led to confusion, and confusion led to unhappiness in Sound's kingdom. The people -- quaking a bit at the prospect, as any Elizabethan would well understand --approached King Sound and requested that he give over part of his rule to two others, Custom and Reason. Sound was, as befits a monarch, put off at the request a bit, but in time he relented. Even he could see the confusion his reign had produced. And so English spelling came to be ruled not by sound alone, but by a more complex system that allowed for "the consideration of reason and the smoothing of custom."

Much of the work we've done in the past two decades at the Academic Skills Center at Central has been a rediscovering of the wisdom of Mulcaster's description. In many ways we've simply been filling out Mulcaster's scheme on the basis of some of the things that have been learned in the intervening 400 years.

Performance and Code

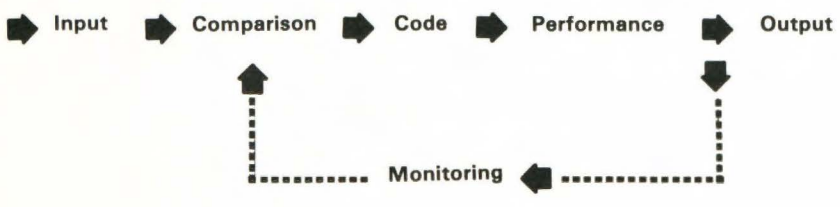
One of the distinctions we can make more carefully now than Mulcaster could 400 years ago is that between *performance* and *code.* Like any linguistic system our spelling system has, on one hand, the abstract *code,* general, constant, and conservative, which all who use the system must learn and share. On the other hand, there is the concrete, particular *performance,* varied and innovative, that is produced when a user actually puts the code to use.

The code is the conservative force in the system; the performance is the source of innovation and change. The history of our spelling system is in large part the story of the interaction of the code and its tendency to invariance with the performance and its tendency to variation.

Self-Regulation and Self-Reorganization

Our spelling system is both self-regulating and self-reorganizing. Four hundred years ago Mulcaster used a political allegory to make his point; today we are less inclined to political allegory and more inclined towards the language and imagery of such things as cybernetics and systems theory.

Today we are more inclined to say that our spelling system incorporates a feedback loop that monitors the output of the system and compares that sample with the expectations and norms of the code. This comparison determines the match between the features of the living performance and the norms within the code. It can be visualized this way:



There are three possible results as the feedback loop monitors the performance:

First, the performance may match the expected norms of the code, in which case the system remains stable, with no pressure towards change in either code or performance. A word spelled correctly raises no eyebrows.

THE
FIRST PART
OF THE ELEMENTA-
RIE VVHICH ENTREA-
TETH CHEFELIE OF THE
right writing of our Engliſh tung,
ſet furth by RICHARD
MVLCASTER.

Imprinted at London by Thomas Vautroullier dwelling in the blak-friers by Lud-gate
1582.

Second, the performance may not match the expected norms of the code, and the invariant norms of the code may be mapped into the performance so that the change detected in the performance is "brought into line." This is an example of negative feedback. It is a complex, cultural version of the mechanical negative feedback that causes a thermostat to react to an environment cooler than the expected norms by turning on the heat. The invariant norms of the "code" -- as they define the operation of the thermostat -- are mapped into the changing environment.

In negative feedback a mismatch between code and performance leads to a change in the performance. This process, called *self-regulation,* is usual in language-learning: The individual's performance doesn't match the expectations of the code -- for instance, he misspells a word on a spelling test -- and various devices are used to bring his future performances into line with the norms of the code. His spelling is "corrected." In self-regulation the changing performance gives way to the invariant demands of the code.

But sometimes the mismatch between performance and code has quite a different result: the variation in the performance is mapped into the code. The mismatch is resolved not by bringing the performance into line with the code, but rather by bringing the code into line with the performance. The code is changed. This is an instance of positive feedback -- and its effects can be seen as *self-reorganization.*

Self-reorganization occurs, usually, as older forms are replaced by newer but more ruly forms that enter the language as variants and then, invoking the power of the pattern they exemplify -- invoking, that is, their own ruliness -- they replace the older, less ruly forms.

An example is the word *millionaire.* Originally the English spelled it as it is spelled in French: 'millionnaire', with two 'n's. But in the English spelling system the second 'n' is an anomaly: The stem is clearly *million* with the suffix *-aire,* and there is no easy way to account for the second 'n'. In time it was dropped, making the word more regular and integrating it more

into the English spelling system: *million + aire = millionaire.* In the modest evolution from 'millionnaire' to *millionaire* a more ruly spelling has displaced a less ruly one. Such evolutionary changes lead to greater integration and stronger pattern within the spelling system. (We might hope that in time the same integrating will occur with similar French fossil 'n's, as in *questionnaire, legionnaire,* and, less obviously, *mayonnaise.*)

Another example of self-reorganization involves the modal auxilaries *could, would,* and *should,* a group of words whose spellings have become more similar over the centuries, thus foregrounding their functional parallelism:

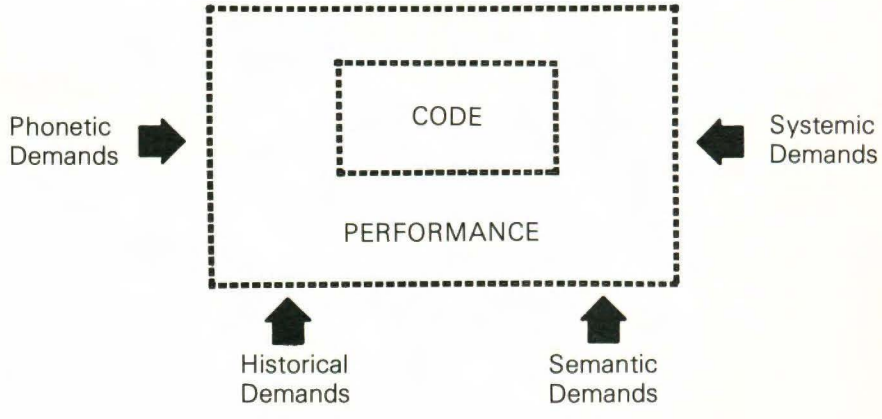
Old English	**Middle English**	**Modern English**
cuthe	couthe, coude	could
sceolde	scholde	should
wolde	wolde	would

Self-regulation and self-reorganization are essential to the viability of the code within a changing environment. On one hand, the code -- as a conservative locus of invariance and predictability -- must maintain stability; it must slow down the rate of change. This it does via negative feedback and self-regulation. On the other hand, the code must also remain resilient enough to adapt to truly relentless pressures for change from the environment. If it did not, the code would become irrelevant to the reality of the living performance. The code avoids irrelevance via positive feedback and the process of self-reorganization. Thus the spelling system evolves over the centuries, constantly changing now the performance, now the code.

But this evolution involves more than the interaction between the code and the performance. It involves an interaction between the code and its total environment. This environment contains the performance, but it contains other constituents as well --specifically, various demands.

The first of these, which can be called *systemic demands,* are common to any system: the demand for predictability, for repetition, for simplicity, for regularity and pattern. These systemic demands must be at least part of what Mulcaster called Reason. The other demands at work in our spelling system -- the *phonetic, semantic,* and *historical* -- involve other characters in his political allegory. The phonetic demand is that each sound in the language should be spelled consistently from word to word, a reminder of once-King Sound's continued role. The semantic demand is that each basic unit of meaning should be spelled consistently. And the etymological demand is that each word should be spelled so as to reveal its historical origins. The semantic and etymological demands remind us of Reason and Custom's roles in Mulcaster's allegory.

The code's environment consists of the performance plus the various demands, which are mediated to the code via the performance, rather as follows:



On Phonics: Sounds and Letters

The phonetic demand for consistent spelling of sounds from word to word is the one that has energized most spelling reformers over the centuries, who are forever concerned that English spelling is not phonetic enough and who forever assume, too simply, that the only function of a mature spelling system is to spell sounds. In any case, the phonetic demand is apparent in the necessary concern in our schools for phonics, the study of sound-and-spelling relationships.

Although these relationships are surprisingly complex at times and very seldom 100 percent predictable, they are patterned and they can be learned. We must remember, though, that there are two different sets of phonics patterns: one for spellers, another for readers. Readers start with letters for which they are trying to find the sounds. Spellers start with sounds for which they are trying to find the letters. And the two sets of relationships are quite different from one another. We must remember, too, that if these relationships are to be made comprehensible, we must grant them more complexity than our traditional textbooks have done.

The debates over phonics and look-and-say and other approaches to reading and spelling can be at least partially resolved once we recognize a developmental sequence at work:

There is a phonetic (or phonic) stage that people go through as they first begin to learn to read and write, a stage they *must* go through. But just as readers and writers *must* go through this stage, they must go *through* it. You can't spend the rest of your life worrying about sound-and-spelling correspondences. In Mulcaster's political allegory, at first Sound (or phonics) was King, which is historically true: Old and early Middle English were quite phonetic in their spelling, but in time phonetics proves inadequate. King Sound must be replaced with a more complex governing system.

Thus, after students have been "phoneticized," as it were, they must then be "de-phoneticized!" They must be freed from the one-man rule of King Sound, whom Mulcaster describes as "in authority tyrannous." They must learn of the roles of Reason and Custom. They must move from the analysis of words into sounds to their analysis into elements.

The Elements

As Mulcaster saw 400 years ago, our spelling system does more than spell sounds. It also spells meanings -- which brings us to the subject of elements. Elements -- that is, prefixes, bases, and suffixes -- are the smallest parts of a written word that contribute meaning to the word and are spelled consistently from word to word. The study of elements involves us with Mulcaster's Reason and Custom.

For example, the element 'sign' occurs in the words *signs, signal, design, designation.* In each of the four words the 'sign' element is pronounced differently: Sometimes it is all in one syllable; sometimes it straddles two syllables. Sometimes you can hear the 'g', sometimes not. Sometimes the 's' spells a /s/ sound, sometimes a /z/. Sometimes the 'i' spells a long sound, sometimes a short one. If all we worried about were the sounds, these words would be harder to spell then they need be. But if we notice, too, that they all contain the element 'sign', plus a few other short elements, then spelling the four words is fairly easy, systematic, and not at all "irregular." Life under Sound brought under the "consideration of Reason" and "smoothed" by Custom -- once we understand it -- is simpler than life under "the propriety of Sound" alone.

Tactical Patterns and Rules

Another result of Custom's "smoothing" of English spelling is the existence of tactical patterns and rules -- or just plain tactics. Tactics have to do with the customary way sounds or letters combine or follow one another. The best known tactical rules in English spelling have to do with the strings VCV (vowel-consonant-vowel) and VCC (vowel-consonant-consonant) --as in the difference we discern in the spellings 'matting' and 'mating'. But a different kind of tactical rule helps us understand, say, when to spell the sound /k/ at the end of a one-syllable word with the letter 'k' and when with the digraph 'ck': If the /k/ is preceded by a consonant or a long vowel, use 'k' (*stink, silk, week, lake*). But if it is preceded by a short vowel, use 'ck' (stick, rock).

The Processes

Reason and Custom lead to the existence of the regular processes that take place when elements combine to spell words, for these processes help us maintain pattern and predictability in our spelling while we preserve the customary shape and sound of the words. The most common and most powerful process is *simple addition:* Unless you know of some specific reason for making a change, the elements simply add together with no changes at all in their spelling. Far and away most of the time when elements combine to spell words, they do so through simple addition. The second and third most important processes are *final 'e' deletion* (as in the word deletion, which equals *delete* + *ion* with a final 'e' deleted in the process) and *twinning* (as in the word *twinning,* which equals *twin* + *n* + *ing,* with the final 'n' being doubled, or twinned, in the process).

In a fourth important process, called *assimilation,* a sound becomes more similar to a sound near it. Reflecting the change, the spelling very often will get changed as well. For instance, many, many words contain the prefix *ad-*. The 'd' in *ad-* often assimilates -- that is, the sound it spells and usually the letter 'd' itself become more similar to the sound and letter immediately following. Assimilation explains the double consonants up front in hundreds and hundreds of words -- such as *account, affect, aggrieve, allow, announce, arrange, attempt,* and *assimilate,* all with assimilated forms of the prefix *ad-*.

Recognizing elements, tactics, and processes makes it possible to do justice to the subtle and sometimes complex sound-to-spelling relationships that exist in English. For instance, if we are trying to explain how to spell the sound /n/, we can say, "Spell the sound /n/ with the letter 'n'" and be right a good part of the time. But we can be right 99 percent of the time if we add some understanding of elements, tactics, and processes, and say, "Spell /n/ with the letter 'n' unless you know of a simple addition, twinning, assimilation, or VCC string at work that would cause it to be spelled 'nn'" -- as in greenness (with simple addition and the 'nn' pronounced /n/ in quick speech), *fanned* (with twinning), *annex* (with assimilation), and *funnel* (with a VCC string). The remaining 1 percent of the spellings are the very rare 'gn', 'kn', 'pn', and 'mn' -- which can be listed, described, and explained in historical terms.

Inductive Reason, Rules, and Memory

The role -- and rule -- of Reason is extremely important to spelling instruction. Over the years at the Academic Skills Center at Central and while working with younger students, we have found that with an analytical and inductive approach, students can learn descriptions --or spelling rules -- that are detailed and thorough enough to be reliable and useful. One of the main problems with the traditional "spelling rules," with their notorious exceptions, is that they have been taught deductively and thus had to be overly simplified, in order to make them short enough to be memorized. Oversimplified rules always leak exceptions. However, when they are taught inductively, rules can be detailed enough not to be burdened with all those exceptions.

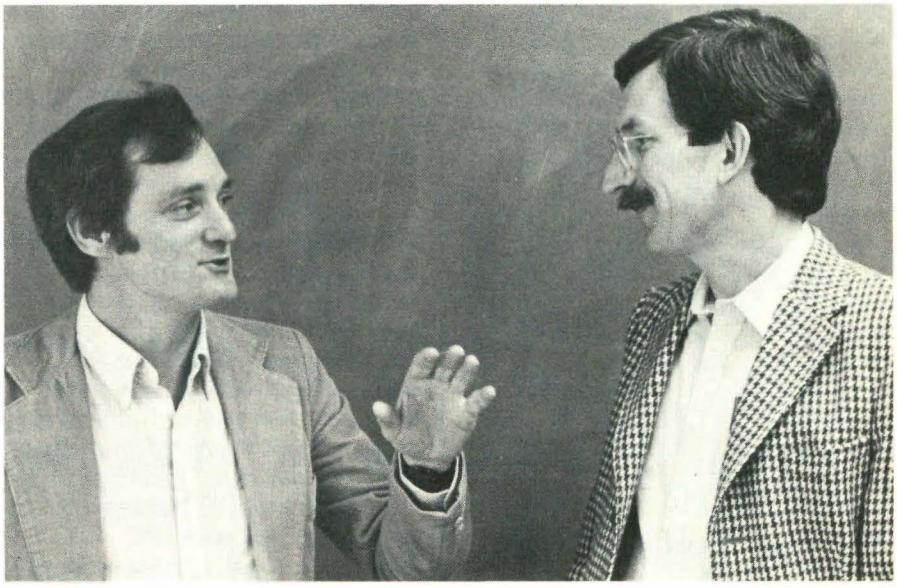
Much of the trouble students have with spelling arises from the fact that they have very little sense of the structure of words. Words exist for them as fairly undifferentiated blurs of sounds or letters, offering little for the memory to hold onto. Such students literally can't hear or see as much in the word as they might -- and thus they have trouble remembering its shape, especially when it comes time to try to spell it. The more you know about the word, especially about its structure, the more you can hear and see in the word, and the more you have to remember it by.

***

Four hundred years ago Richard Mulcaster saw that the English spelling system does make sense, that it can be described, taught, and learned. He saw that English spelling has pattern and order of many different kinds, pattern and order "conformable to the propriety of sound, the consideration of reason, and the smoothing of custom." Today, with the advantage of all that has been learned in the intervening centuries, we can see that Mulcaster was right, more right than even he may have realized. Today, as we work to find our way "back to the basics," Mulcaster's parable is still valuable: The basics of spelling are more complicated than we may like, but they are also more regular and patterned than we have sometimes been led to believe -- more ruly, more sensical, more learnable, more teachable.

Locus of Control and School Age Children

This article is based on a paper presented at the annual meeting of the American Educational Research Association, New Orleans, April 1984.



Dr. David M. Shorr is Division Head of Early Childhood Education. His research interests are primarily in language acquisition and cognitive dispositions.

Dr. Timothy Young is Division Head of Curriculum and Instruction. His research interest is teacher effectiveness and student learning at the secondary level.

Mr. Daniel Organ is Administrative Assistant of Yakima School District No. 7. (not pictured)

Introduction

With an eye towards improving academic performance, educational researchers at CWU have been analyzing the relationships between students' self perceptions and success in school. It is well accepted that negative self perceptions often lead to ineffective performance in school and later life, while positive self perceptions usually result in effective behavior.

Of all the self perceptions children may bring to school, one has been shown to be consistently and significantly related to school performance. Personal control, or locus of control as it is often called, describes the degree to which individuals perceive successes and failures in life as being within or beyond their control. Individuals who believe events are largely influenced by their own behavior are said to have a strong internal locus of control. Individuals who believe events are largely influenced by factors beyond their control, factors such as luck, fate, and powerful others, are said to have an external (or weak internal) locus of control.

A substantial body of research has explored the relationship of locus of control and academic achievement and results indicate a positive and significant relationship exists between an internal locus of control and student academic success. Locus of control is correlated with both achievement test performance and grades. In most cases a positive relationship between internal locus of control and academic achievement exists even after the effects of IQ are controlled. James Coleman in his desegregation study of 1966 concluded that locus of control had a stronger relationship to achievement than all other school related factors taken together.

In addition to analyzing the relationship of locus of control to academic achievement, researches have tried to identify other variables related and antecedent to children's perception of control. To date four variables: age, sex, ethnicity, and socioeconomic status (SES) have undergone considerable study. A brief review of the results follows.

Age. A positive relationship between age and internal locus of control among school age children is well established, particularly among elementary school children. Young children tend to see relatively little relationship between the outcome of events and their own behavior. As a result, they tend to view their own experiences of success and failure as being externally controlled. As they grow older, children more clearly realize that they influence the outcome of events. Increased internality is not only a function of chronological age but of mental maturity as well. Retarded children are less internal than normal children of the same age.

Sex. It appears that among elementary age children females are more internal than males. A review of ten studies which administered locus of control scales to elementary school children indicated females were more internal than their male counterparts.

The greater internality of females among elementary children appears to hold true regardless of ethnic background. A number of studies have found Black and Mexican American female students more internal than males of the same ethnicity.

The trend of greater internality

for females continues past the elementary years but with less consistency. Two researchers found females in grades eight to eleven to be more internal than males but found the reverse to be true in the grades seven and twelve.

While it appears that among school age children females are more internal than males, there is uncertainty as to the source of these differences. Some researchers point to differential socialization of males and females by parents and teachers. The initial superiority of females in verbal and reading skills may also have an effect in that locus of control is typically measured by a written questionnaire. Another plausible explanation rests in the fact that females generally mature at a faster rate than males. Maturity, as previously noted, is positively correlated with an internal locus of control.

Ethnicity. Early studies supported the conclusion that children from disadvantaged ethnic groups such as Blacks and Mexican Americans were less internal than White children. The effects of segregation and discrimination and the denial of rewards for individual achievement were seen as facilitating a sense of powerlessness and futility. For Mexican Americans, the fatalism of their culture and a willingness to postpone action were cited as causes in the development of an external locus of control.

More recent studies, however, have reported inconclusive and, in some cases, contradictory results. While the trend remains for White children to demonstrate a greater internal locus of control than children from disadvantaged ethnic groups, it is far from being a strong and consistent one.

One possible explanation for the inconsistent results may lie in the failure to control adequately for the SES of the respondents. Closer analysis of the earlier studies reporting effects for ethnicity revealed a majority of them did not control adequately for socioeconomic status.

Socioeconomic status. Children from middle and upper SES backgrounds tend to exhibit greater internality than those from lower SES backgrounds. It is argued that children from poor and lower income families have fewer opportunities to influence their environment because of a lack of money, education, and status. This may create a sense of apathy and lack of motivation as a result of the belief that effort does not pay off. The effect of SES upon locus of control appears to be consistent regardless of ethnic backgrounds. This last finding raises an interesting question. Which of the two variables, ethnicity or SES, has the greater influence upon students' perceptions of personal control?

The Study

In an effort to answer this question and to confirm the relationship between locus of control and academic achievement a study was conducted among approximately 2,000 fourth, fifth, and seventh grade students who attended a central Washington State metropolitan area school district. The study sample was restricted to White, Black, and Mexican American children only. Table 1 lists the number of children for which data was analyzed by grade, sex, and ethnicity.

Students were administered a fifteen item locus of control scale in conjunction with district-wide fall standardized testing. The scale measures the responsibility a child assumes for marks on school related tests and assignments or the preconceived consequences for such marks when the child does not study. For example, one question is, "Do your marks seem to go up when you study?"; another question is, "Is a high mark just a matter of 'luck' for you?". A child's response to an item is scored as either indicative of internal locus of control or not indicative of internal locus of control. The summed score for the questionnaire is the overall index of internal locus of control. A greater score reflects a more internal locus of control.

Participation in the federal government's free or reduced lunch program was used to determine a child's SES. Because eligibility for the program is based on family financial need, those children participating in the

Table 1
SAMPLE DISTRIBUTION BY GRADE, SEX, AND ETHNICITY

		Ethnicity		
Grade	**Sex**	**White**	**Black**	**Mexican American**
Fourth	Male	296	14	32
	Female	265	6	38
Fifth	Male	290	6	47
	Female	258	9	39
Seventh	Male	256	7	29
	Female	274	9	24

Table 2
GROUP LOCUS OF CONTROL MEANS WITHIN EACH MAIN EFFECT

Main Effect				
		Fourth	**Fifth**	**Seventh**
Grade	MD	11.61	12.23	12.52
	SD	2.02	1.99	2.13
		Male	**Female**	
Sex	M	11.94	12.30	
	SD	2.23	1.89	
		White	**Black**	**Mex. Am.**
Ethnicity	M	12.20	11.47	11.54
	SD	2.06	2.26	2.09
		Lower	**Mid-Upper**	
SES	M	11.64	12.36	
	SD	2.20	1.97	

NOTE: Greater scores reflect greater internality.

program were classified as residing in lower SES families (lower SES), while those not receiving the free lunch were classified as residing in middle to upper SES families (mid-upper SES). Approximately 29 percent (n = 479) of the White, 59 percent (n = 30) of the Black, and 67 percent (n = 140) of the Mexican American children were classified as lower SES.

Analysis of Variance.

A 3 x 2 x 3 x 2 (Grade x Sex x Ethnicity x SES) analysis of variance was conducted on the AAA summed scores (hereafter referred to as locus of control scores). Cell sizes for the four-way interaction were extremely small (n = 1 in one instance). This interaction, therefore, was pooled into the error sum of squares. Cell sizes for the three-way interactions were n = 6 or greater. None of the two- or three-way interaction effects were statistically significant. All main effects were significant. Table 2 lists the group means associated with each main effect. These effects will be described in the order listed above.

Grade. Seventh graders were significantly more internal than fourth graders and fifth graders, and fifth graders were significantly more internal than fourth graders.

Sex. Girls were significantly more internal than boys. The lack of significant interactions of sex with grade suggests that during the grades four through seven (roughly ages 8½ to 12½ years) the degree to which girls were more internal than boys remained relatively constant.

Ethnicity. White children were more internal than both Mexican Americans and Blacks. Mexican American and Black children did not significantly differ from one another.

Socioeconomic Status. The largest effect in the analysis of variance was for SES, with mid-upper SES children being more internal than lower SES children.

As previously discussed, the relative effects of ethnicity and SES on locus of control scores has been an issue of some debate. A direct comparison of these effects was made for the White and Mexican American samples. (Sample size for the Black children was considered too small for such a comparison). The Pearson correlation between locus of control scores and ethnicity was, $r = .101$, while that between locus of control scores and SES was, $r = .165$. A t-test for the difference between dependent correlations revealed that SES was a significantly stronger correlate of locus of control scores than was ethnicity for this subsample.

Academic Achievement.

Both Pearson and partial correlations were computed between the locus of control scores and the achievement test total battery results. The partial correlations controlled for the effects of sex, socioeconomic status and ethnicity. As Table 3 reveals all Pearson correlations were of moderate size and were little affected by the partially procedure. All correlations were highly significant.

Discussion

The consistent findings that greater internality is positively associated with both academic achievement and age or grade were confirmed. Also confirmed were the less consistently reported findings of greater internality among females, Whites, and middle to upper SES children.

The finding of greater internality of females across ethnic and socioeconomic groups is interesting. It may suggest that the differential socialization of males and females is relatively consistent across culture and social class in our society. As noted, however, a consistent positive relationship exists between mental maturity and an internal locus of control. Females enter school more physically mature than males and remain so through most of the elementary

Table 3

CORRELATIONS BETWEEN LOCUS OF CONTROL SCORES AND ACHIEVEMENT TEST PERFORMANCE

Grade	n	Zero-order correlation	Partial correlation[a]
Fourth	588	.344**	.275**
Fifth	557	.395**	.368**
Seventh	517	.426**	.406**

[a]Partial correlations controlled for sex, SES, and ethnicity.
**p .01

grades. During these early school years females experience greater academic success, especially in reading, and are perceived more positively by teachers than are males. This may account for the consistently greater internality of females at the elementary grade levels.

Analysis of the differential relationship of ethnicity and SES to locus of control in the White and Mexican American children revealed that SES was a significantly greater correlate of locus of control than was ethnicity. This result calls into question the practice of attributing characteristics to children solely on the basis of membership in a particular ethnic group. It tends to support the observation by a number of researchers that poverty more than ethnicity is to blame for the lack of academic success by minority students. Early locus of control research failed to separate the effects of ethnicity and SES by not conrolling for the latter. More recent studies have addressed this weakness and found little difference among ethnic groups with similar SES backgrounds. It is not difficult to imagine ethnically different children of the same SES who are more similar in their sense of locus of control than children of the same ethnic background but of different SES.

The finding of greatest potential importance is the moderate correlation at all grades between greater internal locus of control and academic achievement even when controlling for the effects of sex, ethnicity, and SES. The strength of the correlations suggests that research addressing a casual relationship between locus of control and academic achievement may prove valuable.

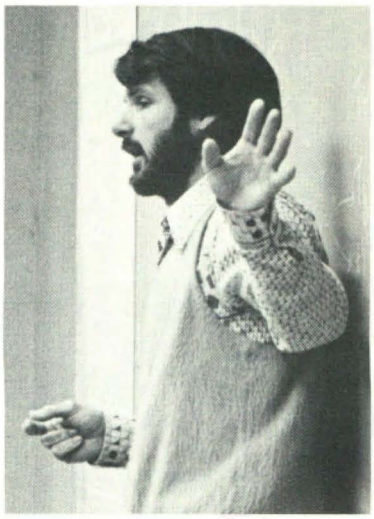
The small amount of research conducted to date is inconclusive. Support can be found indicating locus of control has a greater influence on academic achievement than vice versa, although some research suggests that achievement is the cause and not the result of locus of control. If further research confirms either finding it will have important implications for educational practices and research. These would include a more thorough attempt to identify those factors which determine a child's locus of control as well as conditions which may serve to promote an internal locus of control in the child.

As previously noted, teachers have different perceptions and expectations of female and male students in terms of academic performance. Differences in teacher perception and expectation can also be influenced by students' social class and race. One researcher found teacher behavior to influence the development of achievement skills and internal locus of control among elementary students. The relationship was particularly strong for Mexican American students. If, as this researcher suggests, teachers' classroom behavior is an antecedent rather than a consequence of students' locus of control beliefs, then efforts need to be undertaken to identify those classroom behaviors which promote an internal locus of control.

Isolating teacher behaviors and controlling for student differences present formidable research obstacles. Teacher behaviors which prove effective with one group of students may not be effective with another. Yet, it remains both an interesting and feasible hypothesis that increasing a sense of internality in the child will have beneficial consequences for academic achievement.

Minority-Type Human Mating Preferences

Dr. Thomas Thelen is a professor of biology and computer science. He has been a member of the faculty of Central Washington University since 1970. His research interest centers around behavior, particularly as it relates to genetics and evolution. Dr. Thelen has published in a variety of journals including the American Journal of Human Genetics, Mutational Research, Psychological Reports, and Social Biology.



Appropriate mate selection is critical to reproductive success, and therefore to the evolutionary success of many organisms. For some organisms choosing a mate involves nothing more than distinguishing conspecific individuals (those of the same species) from those belonging to another species. At the other end of the spectrum are organisms such as man in which considerable care is taken in the selection of a mate.

Generally, whenever parental investment in the offspring is considerable, so also is selectivity for a mate. Where there is little or no effort expended in the care of the offspring, often there is little or no choice involved in selecting a mate. In species where one sex contributes to the care and well being of the offspring, usually only that sex will exhibit selectivity. In those species in which both the male and the female contribute to the rearing of the offspring, both sexes exhibit care in choosing a mate.

I first became interested in mate selection after reading studies showing that fruit flies preferred mating with minority type mates. If, for example, solitary females were put in mating chambers with nine brown-eyed males and one red-eyed male, the latter was much more likely to be chosen as a mate than was any particular brown-eyed male. If the male ratios were reversed, the brown-eyed male enjoyed a much higher likelihood of success.

Other biologists working with beetles, wasps, and guppies have also reported evidence for preferential mating success of minority males. These studies were conducted not because the biologists were necessarily interested in these creatures, but rather because they were interested in determining how widespread such an effect was, and in determining by inference whether or not such an effect occurred in man.

I was somewhat surprised at the high degree of mate selectivity which was reported in fruit flies, and also in beetles, since neither of these creatures contribute much if anything toward the care of their offspring. If the effect was demonstrable in these species, I believed that it might also be present in a variety of other species, and particularly in those exhibiting considerable parental care.

Since no one had as yet studied the effect in a mammalian species, I decided to do so using the rat. Rats were readily available on campus and the females are known to invest extensively in the care of their offspring. A disadvantage of using rats was that the females would be expected to do the choosing, and since male rats are extremely aggressive, a female in estrus (a state of sexual receptivity) may have little opportunity for selectivity under experimental mating conditions.

To give the female the opportunity to demonstrate which of the males she preferred, I began a study in which a female in estrus was placed in the center of a circle under a bell-shaped glass. At the perimeter of the circle were seven black rats and one white rat (or one black rat and seven white rats), each enclosed within glass jars. After a short period of time the female was released. The first jar she stood up and leaned against was considered the jar which contained her preferred mate.

After spending countless hours watching female rats wandering about from jar to jar, I began to get the impression that I had no idea why a female ultimately stood up and leaned against a particular jar. The thought persisted that what I was calling a mating preference might in actuality be the female's way of getting a better look at what it thought was the most bizarre of these sad-looking captive males.

Since I have never been overly

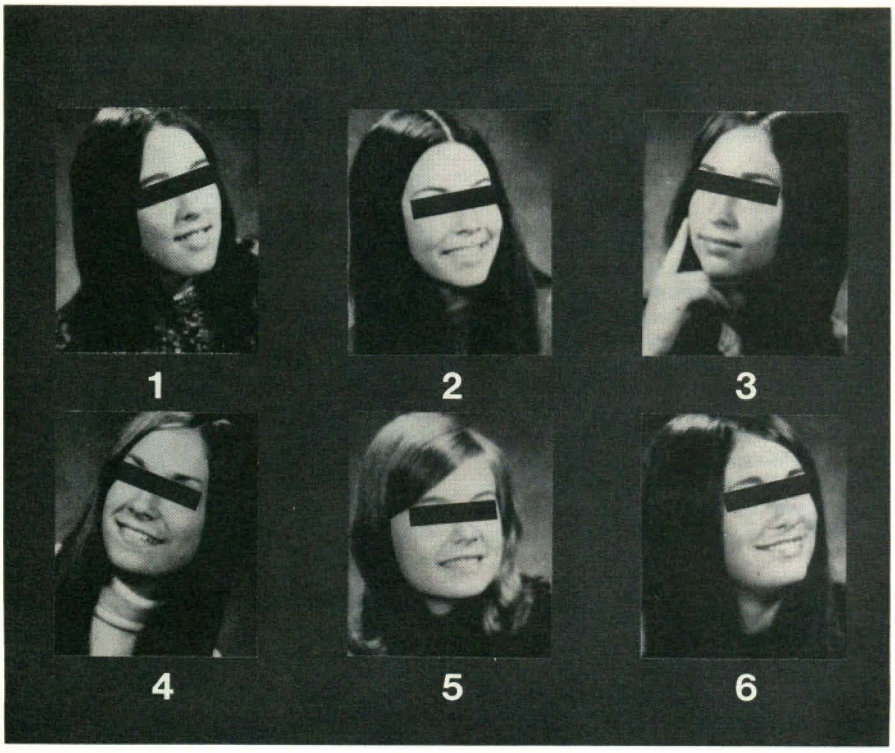


Figure 1. A facsimile of one of the slides from which male students were asked to indicate a mate preference. The minority-type individual is number 5 as she is the only one with light-colored hair. The faces are obscured on this photograph only for the purpose of confidentiality.

fond of creatures with beady eyes, I abandoned this project and designed a study to test for a minority-type mating advantage in humans. Male and female students at Central were asked to select from groups of photographs projected on slides, the individual they most preferred as a mate in a long-term husband-wife relationship. Contrasting hair color, facial expression, and profile types were varied at frequencies of one in six or one in twelve on these slides to determine whether minority-type mating preferences occurred. An example of the type of slide used to contrast hair color is shown in Figure 1.

The study showed that minority-type females were selected by male students significantly more often than expected on slides contrasting hair color and facial expression differences, and that minority-type males were selected by female students significantly more often than expected on slides contrasting facial expression. Figure 2 shows in graphic form the results of the study. This figure demonstrates that for some of the traits, as the frequency of the minority-type decreased, the extent of the minority-type advantage increased.

This study was the first to demonstrate that mating preferences of both males and females could be influenced by the frequency of certain traits. It was also the first to demonstrate a minority-type mating advantage in any mammalian species.

The findings of my study suggest that frequency-dependent mating may be a relatively common phenomenon among animals exhibiting mate selectivity. If so, minority-type mating may have important evolutionary consequences in that it does provide a means of maintaining high levels of genetic variability within populations of a wide variety of animals.

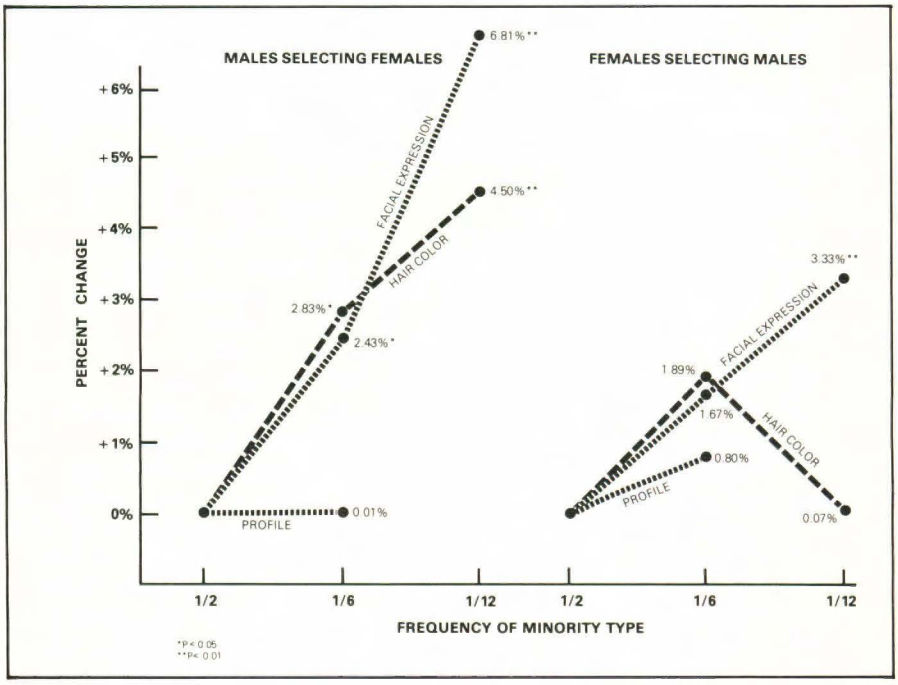


Figure 2. The difference in frequency of selection of the minority-type (1 in 6 or 1 in 12) from the frequency of selection occurring when contrasting types were equally frequent (1 in 2). Data on the left indicates males selecting from photographs of females, and on the right females selecting from photographs of males.

A well-known evolutionary force called genetic drift tends to eliminate alleles (forms of a particular gene) from populations when their frequency is low. The frequency of an allele may be low within a population because it has just been introduced into the population by new mutation or as a result of migration. Genetic drift would tend to further reduce the frequency of such alleles. However, if an infrequent allele produces an obvious physical or behavioral effect, and that effect confers a minority-type mating advantage, the allele would tend to resist the effects of genetic drift and would tend to persist within the population.

Even an allele having a slightly undesirable effect, which by itself might be expected to cause its elimination from the population (because of natural selection), could persist in the population if the allele would confer a minority-type mating advantage. It could be argued, for example, that the allele causing red hair and the associated light-colored skin might not be expected to exist in the human population because of the disadvantage associated with increased susceptibility to the sun's cancer-causing rays. It can also be argued, however, that the disadvantage associated with an increased risk of skin cancer is compensated for by the increased mating advantage (and therefore fitness advantage) these relatively infrequent red-heads enjoy.

Since the minority advantage tends to retain infrequent alleles within the population, the population can enjoy high levels of genetic variability. High levels of genetic variability are critical to the population because this variability gives the population the means by which it can respond over time to environmental change. Without reasonable amounts of such variability, populations would be doomed to extinction.

Research News Briefs

Robert Bentley, Geology, has geologically mapped more than 3,000 square miles between the Cascade Mountains and the Columbia River.

William C. Smith, Anthropology and the Central Washington Archaeological Survey, has given workshops on use of the Masscomp computer system and its application to geographic information systems. He and colleague James Chatters are presently under contract with U.S. Army Construction Engineering Laboratory to apply the system to the Yakima Firing Range.

Harold Smith, Leisure Services, and **James Peterson,** Ethnic Studies, are studying long distance running as a possible effective alternative addiction for alcoholics.

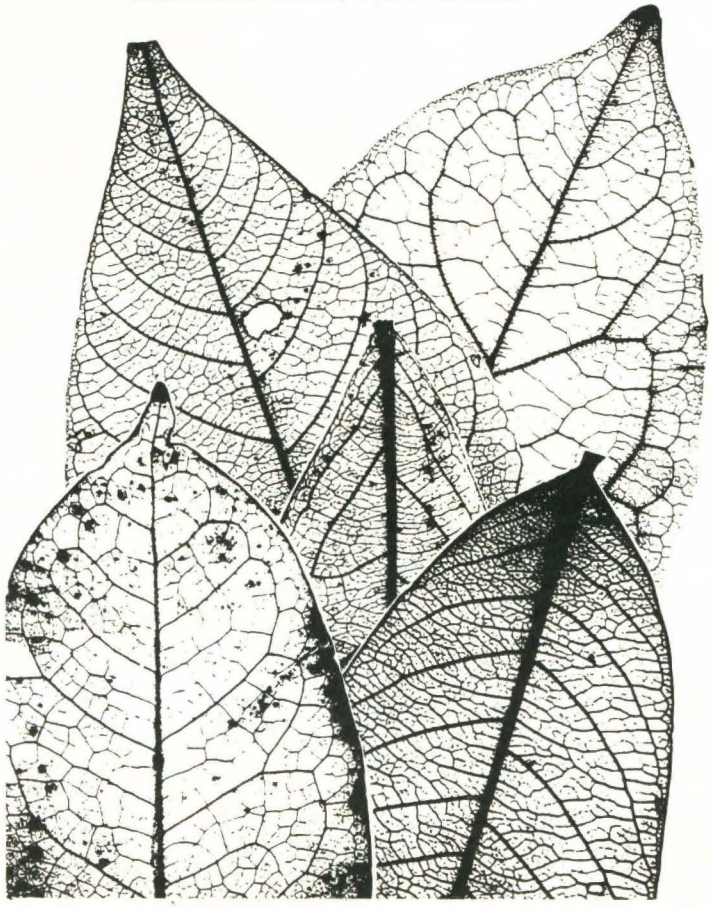
Burton J. Williams, History, is completing work on a history of the state of Kansas.

William Owen, Mathematics, is continuing research on improving statistical procedures for radioactivity detection.

Bonnie Brooks, Education, is conducting a study on re-entry women with particular emphasis on cross cultural comparisons.

Edward P. Klucking, Biology, is nearing completion of a long-term study of leaf venation patterns.

ANNONACEAE: Custard Apple family tropical trees, most in S.E. Asia, Central, South America.



Recent Academic Grants & Contracts

Sponsored by Outside Agencies

Jimmie Applegate, Education
Teacher Preparation Program
$2,400, Supt. of Public Instruction

Luther Baker, Home Economics
SPI-CWU Home and Family Life Education
$27,400, Supt. of Public Instruction

Paul Bechtel, Business Affairs
Technical Assistance Study
$10,000, Washington State Energy Office

James Chatters, CWAS
Chief Joseph Dam - Additional Units Project
$95,767, U.S. Department of the Army

James Chatters, CWAS
Oroville-Tonasket Project
$3,246, Idaho Bureau of Reclamation

James Chatters, CWAS
Wells Reservoir Archaeological Project 1984-85
$383,037, Douglas County PUD

Glen Clark & Bob Pacha, Biological Science
Animals as Reservoirs of Giardia and Campylobacter Fetus
$159,913, U.S. Environmental Protection Agency

Dale Comstock, Graduate Studies
Graduate & Professional Fellowships-G*POP
$16,800, U.S. Department of Education

Dale Comstock, Graduate Studies
Intergovernmental Personnel Act (IPA) Appointments
$20,411, U.S. Army Const. Engineering Res Lab

Clint Duncan, Chemistry
Acidity and Lake Susceptibility in the Washington Cascades
$13,000, Washington Water Research Center

Clint Duncan, Chemistry
Acid Rain and Lake Susceptibility in Washington
$5,000, Environmental Protection Agency

Clint Duncan, Chemistry
Summer, 1984 Lake Survey (22 lakes)
$12,013, State Department of Ecology

Wayne Fairburn, Business Administration
Management Counseling to Small Business Concerns
$3,600, U.S. Small Business Administration

James Hinthorne, Geology
NORCUS Faculty Appointment
$14,500, University of Washington

Karen Jenison, Leisure Services
Tourism Data Collection
$15,000, Dept. of Commerce & Econ Devel-WA

Karen Jenison, Leisure Services
Yakima Valley Vintners
$500, Quail Run Vintners

Maggie Johnson, Education
You Are the Expert VII (Title VI-B)
$2,511, SPI Office of Special Services

Maggie Johnson, Education
You Are the Expert VII (Title VI-D)
$1,485, SPI Office of Special Services

Maggie Johnson, Education
You Are the Expert VII - Supplemental
$2,050, Supt. of Public Instruction

Eugene Kosy, Business Education & Administrative Management
Marketing and Distributive Education Assistance
$7,000, Supt. of Public Instruction

Eugene Kosy, Business Education & Administrative Management
Support to SPI Business and Office Section
$6,500, Supt. of Public Instruction

Dale LeFevre, Education
Training of Professional Personnel in the Education of the Handicapped
$34,817, U.S. Dept. of Education

Dale LeFevre, Education
Training Workshops for Teachers Serving Children with Handicapping Conditions
$13,392, Supt. of Public Instruction

Minerva Lopez-Caples, Education
Bilingual Education Teacher Training Program
$101,645, U.S. Dept. of Education

Dale Otto, International Programs
English As A Second Language
$9,000, Dept. of Social & Health Services

Dale Otto, Education
Conference on ESL Teaching Methods
$500, Supt. of Public Instruction

Duane Patton, Occupational Education
Professional Improvement Courses
$11,760, St. Bd. for Community College Education

Dorothy Purser, Physical Education
Paramedic Training Program
$5,425, So. Central Regional EMT Cnl.

Gerald Reed, Cooperative Education
Supplemental Funds to Initiate, Improve, or Expand a Program of Cooperative Education
$5,445, U.S. Dept. of Education

Gerald Reed, Cooperative Education
Off-Campus Job Location
$1,328, Council for Postsecondary Ed.

Gerald Reed, Cooperative Education
DSHS-WIC Cooperative Education Agreement
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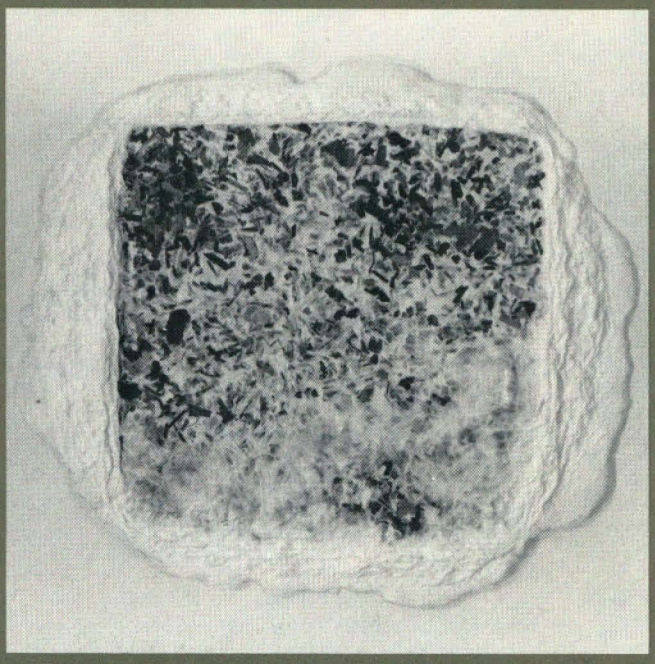

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