# PEDS

## Pedologically Exciting Discovery Stories –

# A Reflective Journal

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*"A world without stories is fundamentally inhuman.
It is a world where nothing is imagined."*

– R. Hoffman

# INTRODUCTION

"'To see' is the root meaning of both history and story. From the same source come idea, guide, wisdom, wit, and vision. We know ourselves from the stories we tell. They are our wisdom holders, our cultural glue, giving us rein and reining us in. All images and stories that shadow them are our inspiration as we explore the subterranean influences of our past. We are memory brokers. The weight of history hangs over us all." *Author unknown.*

For some years I have wanted to write about the stories that I associate with my career as a pedologist. It is a jumble of ideas, pictures, feelings, remembrances, illusions, beliefs, maybe some good old common sense, and hopefully a sense of humor. These stories are what has happened in my mind as all the exigencies of daily life, of family, of teaching, of genetic mixtures that propelled me along, unknowingly, to places, times and events I could never have imagined. These stories are the bits and pieces, like so much flotsam, that flow around inside me. A few get out from time to time as I have tried to explain things to others but mostly they remain inside. I like them - they bring comfort to me as they send me headlong into the future but also backwards into niches of my mind where they reside waiting - yes, waiting for opportunities to sally forth and do what such thoughts are wrought to do. I've always thought of this collection as PEDS - pedologically exciting discovery stories - because they are how I have learned what I have learned - about and from pedology - a sub-discipline of the science of soils.

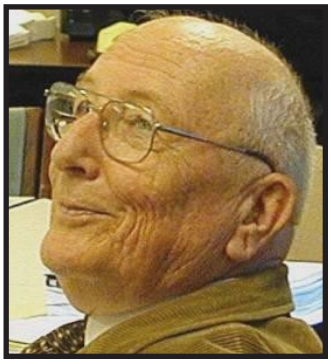
It is presumptuous of me to suppose that anyone other than myself is interested or cares about my particular journey, so I will try to be humble and jot down things as they come to me. After I scanned many of my slides I went through them rapidly looking for ones that captured my attention. Many of them had been used over and over again in slide talks because I liked them very much. They always had a meaning for me that was deeper than the concept I was letting them represent. Symbols and analogies have always been here - saying unsaid things, thinking unexplained thoughts, pushing their way into my consciousness and then diving deep down inside biding their time. Mystical, magical? - no, I think not - just normalcy of how our brains seek, search, retain, and toss away fragments of the moment.

I have enjoyed taking other people's words and phrases and using them like they were my own - a form of horrible plagiarism - but I seldom have felt guilty - instead it usually seemed that when I needed ideas to give to others - to praise them - to challenge them - to jog them a bit - here came these words and phrases - exactly when I needed them. Was it coincidence? No, for me, I was a messenger and the assistance was there to help me accomplish something - at times I wasn't sure about all of this - but usually felt good about it when done. You know I still feel that way. If I have been mulling things over - then at some point - I have to give it my full attention - to capture the essence - to paraphrase a remark - to put ideas into my speaking language - and go with the flow. This happens for me with PEDS - a set of visuals to snap me to attention - to remember, to re-live, to renew, or sometimes to extend and expand what I thought I knew already.

PEDS is in four parts.

A. Looking at nature.
B. Man's invasion of the pedosphere.
C. Into the realm of Pedology.
D. Random perceptions of a pedologist. This is the largest part.

Let me paraphrase a note I saw recently: "This is the state of 'my pedological science' in the new century; a mix of growing skill and persistent uncertainty, of intuition and algorithms, satellites, computers, and erasers." What a pleasant way to let us know just how important we are in the bigger scheme of things! Oh yes, the value of an eraser!



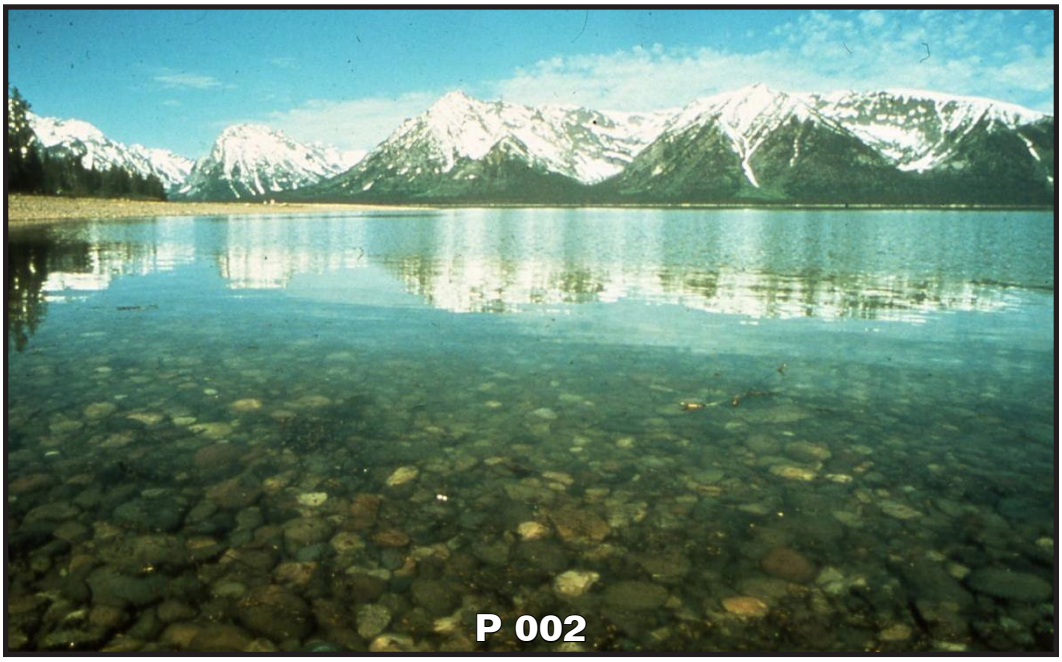

I almost get goose pimples when I gaze at this rugged part of nature. Snow drenched peaks providing a backstop from the rising tide of vision, letting you bask in the brilliance under azure sky before easing your way back to barren strata except for scattered lichens and mosses, then into the russet hues of steppe like vegetation on dissected ancient alluvial cones before entering the valley through an alluvial fan onto the floodplain of a river, its layers of gravel attesting to several stages of development.

The colors are muted colors of the season backstopping the lush greens and bright yellows at water's edge. But what, you may suggest, is the lesson I have learned here amidst this "shibui" colored landscape? I hate to move on as I am enamored, enveloped by the raw beauty of this magnificent New Zealand scene. The lesson is double - continual vast change of our earth yet dressed in harmonious beauty.

Ours is a restless planet constantly undergoing change. These hills and peaks are sculpted from rocks that formed in pre-historic ocean basins yet now they pierce passing clouds as though reaching for the stars that grace the night sky. Their rises have been rapid - so rapid, in fact, that they are above the boundary of macro-vegetation controlled by climatic conditions and here physical processes become dominant shatter the rocks, slide pieces and fragments down slope by gravity, sweep clean the steep faces even as they go beyond the angle of repose of unconsolidated sediments. Here is the raw physical manifestation of uplift of one geologic plate upon the edge of another. For me it is like being able to imagine the ancestors of the Appalachians who now are the merest roots of unimaginable splendor. Here are signs of multiple stages of uplift - some faster, others slower - of course, on a geologic time scale that easily counts in millions of years. It appears that the climate has been semi-arid for a long time as forests are not permitted a spreading domain - only shrubs and some grasses, some lichen and mosses and at lower elevations vestiges of more moist conditions. Fans have been formed from previous ones now breached and invaded by active gullies - more of the story of succession of land forms in such landscapes.

Fabulous, fantastic - the details of event after event after event. The current stream chokes with its overload of coarse sediments deposited by raging streams - now resting and waiting for seasonal renewal. The channel meanders across its floodplain giving a braided expression to its own picture. But this will change - the river will rise - the bars and shoals will be submerged - channels will cut and scour - movement will be the order of the day - and change will occur at all spatial scales and at all time scales. The enormity of a restless earth and the persistence of continuity are here to be seen, to be sensed, and to live within as a reminder of energy flow and the laws of thermodynamics.

Everything in this world has a time and a place, temporal and spatial patterns that reveal, to those who choose it to be - the marvels of science and religion, of reality and eventuality, of the seen and the unseen, of being and knowing. It is like holding a grain of sand in your hand and realizing that it is a universe. It is like a vision that you can reach out and bring up on your internal screen - seeing and feeling again emotions of thanksgiving for the power of nature's stories.




I like the serenity that exists in wildernesses. It reassures me that the retreats of our mind to such places are vital to our soul's survival. The snow covered slopes on yonder horizon are reflected subtlety in the icy ebb of a gentle flow of water fed daily by melting snow. Tranquil and serene - soothing, peaceful, powerful. These mountains in Alaska remind us of the boundless energy that forms and reforms our restless earth - but here the frozen beauty slows our thoughts and heals unknown wounds forever hidden from view. You can see into the shallow depths of crystal clear water, pure and uncontaminated like the unfathomable resources of Lake Baikal. When our soul is parched, when the drought of renewal has consumed us and our energies are drained from our vitality - we need to go into the wilderness - especially the kind of wilderness that we are comfortable in and be surrounded by the sustaining energy of the universe. Oh, yes, this environment is hostile to those unprepared for the retreat - frozen ground, bone chilling temperatures, the utter lack of amenities that have engulfed our very existence. When the Chuchi people passed this way did they rejoice at the prospects of new land, new pastures, new possibilities for life?

The rocks flooring this river channel are mostly dark colored rocks. They attest to several things - first, we see the roundness of them giving evidence of their journey. The general uniformity of size suggests a short transport of frost-riven fragments of ancient sea beds now reaching into the sky - yet look again - these rocks do not move with the quiet waters that reflect snow covered vegetation - bare mountain slopes. There is peace and tranquility here - a pause in the endless struggle of birth and death of landscape features. The implication is clear - there is a history here of upheaval, or rapid flowing torrential streams rushing toward the sea sweeping along boulders, knocking off edges, rounding and smoothing the oval shapes. Gravel and sand being smaller are swept away or nestle below the surge waiting for another time to continue their journey. And the dark color attests to the influence of dynamic forces that metamorphosed one kind of rock into another, and the formation of volcanic deposits - some lava, some as volcanoes growing big and sharing their releases with adjacent surroundings. Most dark colored rocks in the Pacific Rim-of-fire are of volcanic origin and as such most are high energy forms of rocks - so called basic and meta-basic rocks.

Like all things in nature there are stories within stories if we choose to open the pages related to different time scales or those associated with different spatial scales. Events of magnificent splendor side by side with the gentle rubbing of surfaces to polish a grain of sand - fantastic! Our world is full of opportunities everywhere all of the time - the choices are ours. For a moment return to the solitude of a wilderness - the healing that occurs is a strength that all humans require - we are creatures so young that our evolutionary roots demand contact repeatedly as our minds grow and mature in their comprehension of what will remain mostly in the chosen areas of ignorance that we all select. I do like the comfort of wilderness.


Water is a universal solvent moving in and out of the world's landscapes. It is like the life-line of blood that sustains life. Biogeochemical cycles are master inventions of man to help explain some of the complexities of the continual cycling and recycling of elements and compounds in our world - this planet of unique composition and history.

Everyone who has been to an ocean knows the saltiness of the water - so different from the so-called fresh water that sustains our bodies. We humans cannot survive by drinking ocean water - although our blood has remnants of biological evolution related to life in oceans, our evolution has removed us from such environments. After a swim in an ocean, or even just walking barefoot along the beach, we are gifted with the saltiness of evaporated water - gritty, a little sticky, and uneasiness with this preservative - this reservoir of solutions that pass from eon to eon in the cycles of biogeochemistry of earth. Where streams flow into dry basins they slowly evaporate and leave behind the treasures collected during their journey from mountain peak to sea side. Here in northern Venezuela is a salt pan - a low area in a dry climate where the water congregates and mixes its contributions with those of precious inflows. Huge salt clusters rise above - float on concentrated solutions. Often there are organic matter remains in the center of such clusters - the interactions of the living and the dead - of the animate and the inanimate components that exist side by side. We can imagine that the inanimate has many characteristics we associate with humans - yes, we give anthropomorphic names to processes and results that occur in nature - something is born and seems to age as it grows and changes in response to its own scales of time and space.

A salty solution concentrates more and more and crystals begin to form - getting larger and larger - combining with others - and the result is an entity that does not resemble the solution from whence it began. We impose these perceptions on nature because it helps us remember them and it seems to give us satisfaction at our levels of comprehension about many things that we really don't understand at all. These lessons are everywhere - they are stories waiting for our fertile imaginations to create cognitive hooks for recesses in our brains. What a fantastic set of circumstances!


Climb with me to heights in the Andes of southern Chile and we can marvel at what stretches as far as we can see. Here above the tree-line there is a sense of being in another world - one where we are intruders but as of the moment we are permitted to partake of the splendor that dominates this space. Those are volcanic peaks - cones, remnants, ash, boulders, debris of time immemorial - a place where spirits are free to come and go - to dance and sing - to be as they want to be.

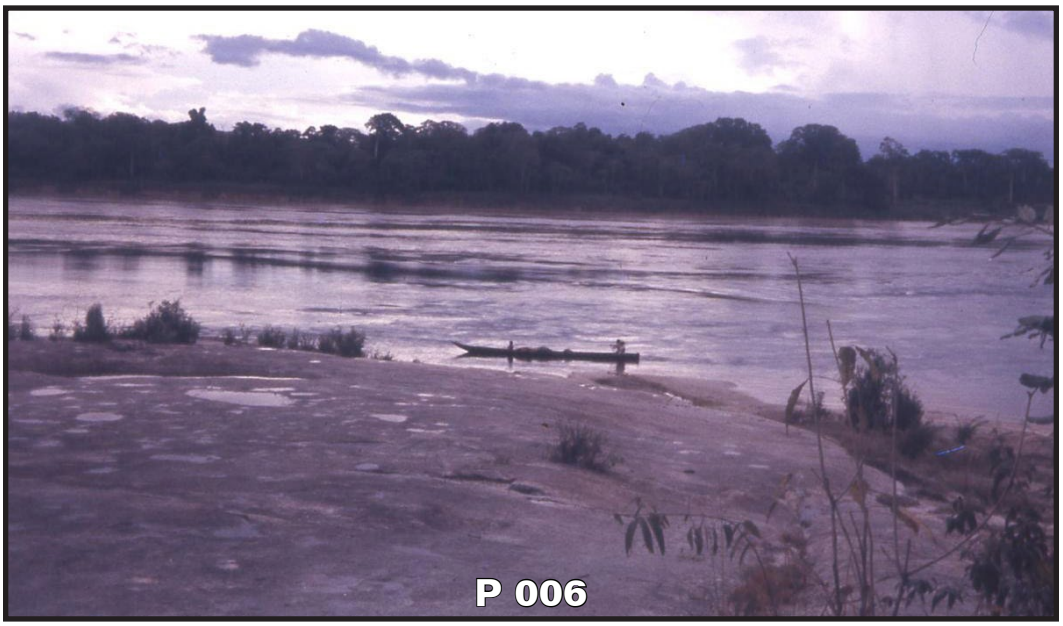
Oh no, we do not belong here but we are not forced out - we are not forbidden to be here. Mountains have a certain charm - an allure that draws us like a magnet - a temptation to come to places where no one has really been before. And in some sense that is true - physically others may have been at this location - but not at this moment. It is your moment to savor - to see what others cannot see - to sense what your soul needs you to sense - to feel the uniqueness of this event - of this place. Tomorrow you will be gone - to other places, to other sights that build different memories - but for right now stand still - take a deep breath - back in the healing atmosphere of somewhat rarified air - let your mind travel from peak to peak until it gazes on the eastern llanos, or turn and wander to the blue Pacific shores - and then return to this spot - to this refuge - to this unknown, unfamiliar sanctuary of nature. Time passes slowly here and it feels so good to be allowed to be here.

Notice the coarse rubble on the surface - it is a windswept pass where the finer particles are swept away as efficiently as any broom yielded by man. Sorting, polishing, whistling - and then at times resting from the toil of incessant change. Our restless earth - it is magical even as we think we understand parts of the physical environment and how it responds to the laws of thermodynamics. It is a flow of energy, a balance, a transformation - and from time to time we are permitted vistas.

The lesson for me is simple - the processes of transformation that occur are truly magnificent and we see vestiges of them everywhere - but some seem more special than others - and I am grateful for what happens within my cognitive domain that links sights and sounds and especially the emotions that are the joys of thanksgiving for each uniqueness that exists.


The steppe regions of our world have a fascination of their own. There is a sense of unfettered view - an opportunity to see forever. It is similar in one way to watching the ocean and wondering how far away the horizon is. When you look at the ocean and see the top mast of a sailing ship and then it gets taller and taller and the ship becomes bigger and bigger - suddenly you realize something the ancients learned eons ago - the world is not flat - you will not fall off - it is curved. And so too when you stand in the prairie grasses as they wave and nod all around you and you know the world is curved and there is continuity beyond your view. You are so small in this place - it has an enormity of its own - mysterious, at times frightening, yet soothing. The moods of seasons are played out - strong blasting winds sweep across broad open expanses with nothing to challenge them. On a gray day or in rain or snow, there is a loss of your sense of direction - you know the feeling of a pilot flying in a "white-out" where there is an unsure up and down, or left or right, or forward and backward. It is a sensation of being swallowed up like one more sand grain on the shore. But the season changes and the passage of spring rights bring forth a plethora of colors, sizes, shapes, of the niche oriented herbs, forbs and higher plants that inhabit this tightly woven ecosystem. The root mat beneath your feet is simply amazing - difficult to dig through - this teeming factory of biodiversity for centuries withstood the onslaught of human invasion. Bison and deer, wolves and rabbits, owls and mice - they found a home - their migrations marked the passage of time. But man is impatient and actually believes that he is to control.

The indigenous knew the sanctity of this environment and accepted their role in the partnership of life. I grew up at the transition of forest and prairie. Although the tall prairies had been tamed and largely disappeared - there were islands of salvation and if you lay on your back in such a pasture to watch the clouds painting and sculpting forms in the sky you could travel the world to counterpart landscapes. The dreaded Mongols, and then the Tatars thundered on horseback across the Russian steppes of yesteryear. The Sioux and Shawnee welcomed the annual harvest of bison for the winter's supply of furs and food. The sod-busters with new steel plows advanced across this region changing forever the tranquility and wilderness of nature's steppe. What did I learn - many things. The biodiversity of life is essential and absolutely marvelous in every niche of this world of ours. The constant ebb and flow of color, growth, death, renewal, release, change, seasons - each in its own microcosm that is merely a piece of a bigger piece of a greater whole. You can see about 8 miles ahead on a flat land that is actually a curve - you can check that out by sighting grain elevators. There are still prairie wildernesses and they are a source of renewal to the spirits and souls that need this kind of landscape and ecosystem for their sustenance.




In southern Venezuela there are rivers that don't seem to go anywhere - they are just there - almost motionless as though waiting for instructions. Those places are one of the strange headwaters of the mighty Amazon - but here farther north the broad channels take form and flow northward. Today some are boundaries between nations - declared but unseen by many whose existence has little to do with society so far away. Millennia of scouring has exposed granite rock on this shore while across the Atabapo river is thick rich alluvium spread and re-spread time and again by the ravages of earth's restlessness. You look again at the slowly eddying water and there is the silent motion of a dugout canoe passing by - maybe unaware of your presence - maybe not. The progeny of the ancient ones whose Y chromosomes began a journey with the Bushmen of Africa - could it be that here was a way of life - a myriad of skills and unwritten knowledge that has existed at this very spot for more than 200 or 300 generations? Why do they stay - how do they survive even as the transgressions of gold mines and greed and need to exist all are wrapped up in the events tempered and distempered by modern man?

One lesson learned is that agriculture here is not productive - the soils are so strongly weathered and reworked to leave deposits of quartz sands devoid of plant nutrients that cropping is not practical. Aha, the protein comes in the river - mainly fish and so the knowledge about kinds, habitats, habits, patterns related to seasons, and so forth have spawned skills needed to survive. You can't go far from your source of protein - never have, never could - and if you can't grow grain in the rain forest you will stay by the river where protein is available. It is the story of preagriculture where local production wasn't possible - where trade was not sufficient for survival - and thus - pockets of yesteryear exist far from the clutches of modern society.

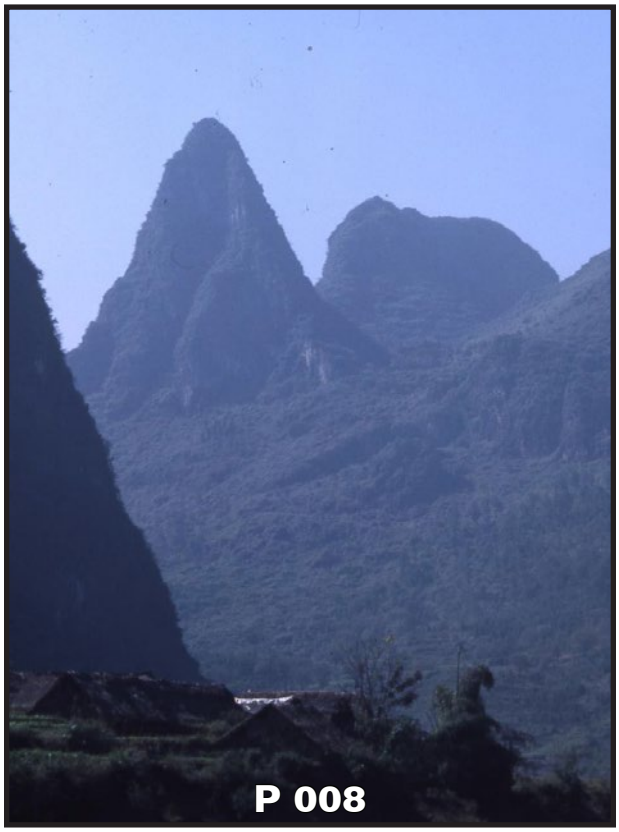
Another lesson - grasslands in hot tropical environments are not productive havens waiting to be tapped for the desires of human kind. The grasses that grow are shallow rooted, get along on short supplies of everything natural but have a marvelous illusion for the foreigner who transfers his ignorance to yet another location. Here there are grassy openings in the forest and the water table is very close to the surface - acid, very acid water - and when you scoop up a handful of quartz sand and massage it with your fingers - you soon have a handful of quartz silt - another lesson about stability, resilience and weathering conditions. The boundary with rain forest is rimmed by large mossy structured lichen and then into the darkness of the rain forest - the fantastic factory of biological recycling that enables trees to reach 100 or more feet into the air - 3 tiered or more forests, a thick organic mat - the cycle of life and death so critical to the maintenance of this ecosystem.

Another time we need to talk about "black rivers" where the water has a dark tint from the effect of organic matter and the release of aluminum into the waters - so strongly acid most biology avoids it - so clean it serves as distilled water - but beware it eats holes in aluminum cookware. What a stopping place - what a source of perceptions.


How can wind shape so elegantly little grains of sand into patterns that intersect at interesting angles - and then suddenly change the whole artistry of a dune? I think that no matter how many times you see a pattern in a pattern in a pattern that is a sand dune, you are forever mesmerized by the grandeur of the complexity of the physics. The flux of energy here is phenomenal and the sculptress exotic. To be caught in the shifting biting stinging sand is a whole other matter for then nature seems cruel, harsh, and so unjust. At times we love to walk the thin edge - the fine line left by the last puff of wind skiffing and rolling sand grains.

Around the world one can experience many kinds of sand - white, black, pinkish, gray, but mostly a mottled tan. It is related for the most part to the mineralogy - because more rocks contain quartz - either as grains in a sandstone, or in combination with feldspars in a granite - it is common to find sands dominated by quartz grains. Companion feldspars are pinkish to tan and contribute greatly to what we see. These dunes are in Oregon and there the majesty is preserved - insofar as that it possible - as a national treasure. If you wander into east central New Mexico you can visit the White Sands - tumbled gems of gypsum. Gypsum is a soft mineral and can be etched with a finger nail so sliding down a slope there is a very different experience than in harder mineral deposits. Nature is repetitive as the forces find niches everywhere - coastal dunes along oceans and lakes, desert dunes where ancient seas once held sway over a terrain now subject to the seasonal patterns of winds to shape, modify remold the forms that hold us spell bound. Dust devils that traverse the steppes seek out barren spots and quickly form small soil dunes - shapes and patterns now realized to be universal.

Sand dunes are lessons in artistry - in how a slight change can modify the external outcome quickly and irreversibly. If we think a ripple pattern to be unique, maybe even exotic, does its beauty exist if no one sees it? Although we spend a lot of time in environmental settings our time there limits what we can see or hear or feel - and maybe that is why it is so precious to us. In winter in the more polar regions snow is reshaped to granules of icy splendor and they are the grist of snow drifts - counterparts of dunes that inhabit other locations. Do sand dunes have stories to tell? Are there lessons to be learned? It really is a matter of attitude whether we learn or not - if pre-occupied by problems and events of personal relations - our eyes and ears, even our noses may be oblivious to our surroundings. Unfortunate - yet here often is a place of solutions - a retreat where the spirit can be heard above the internal clamor of conflicting thoughts and feelings. Nature has so many wondrous ways to call to our attention that change is a rule of the universe - in all places and at all times. With grace and beauty - astonishing us - helping us recognizing that we too, also can, and do change.

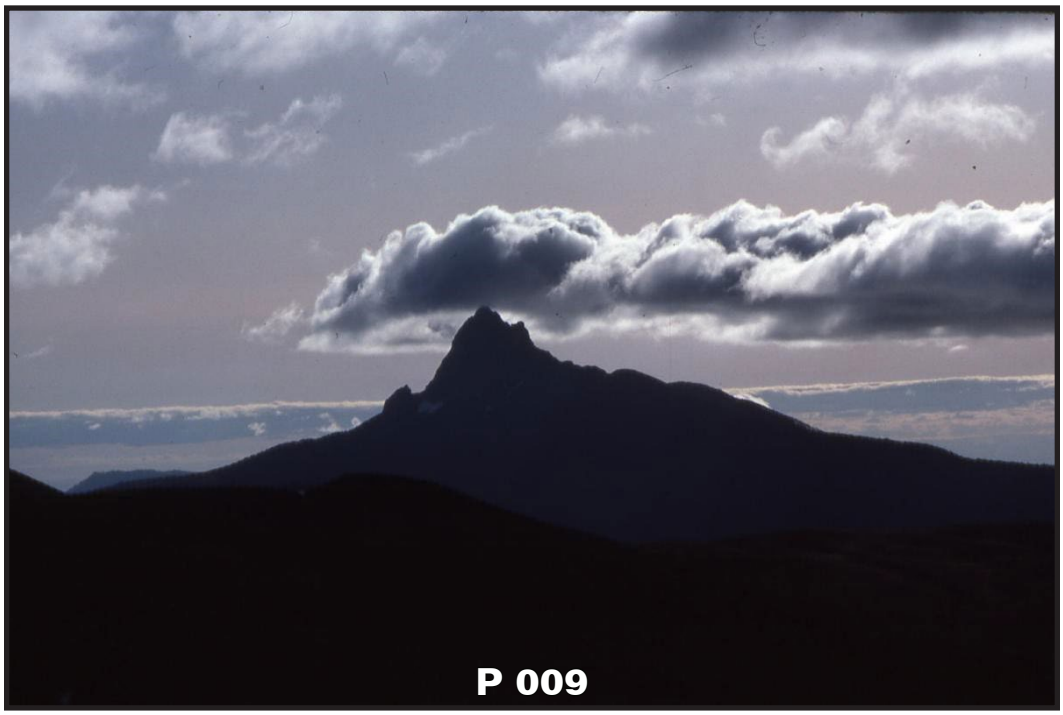



Spectacular spires rising high above the river Li have welcomed passersby for hundreds of generations. A wandering river now offers passage among a mysterious garden of limestone monuments. Poems, paintings, legends and myths all are at home here - some recorded, others passed only by word of mouth - attest to the power of suggestion arising from human imagination. Does each have a name - a special identity?

Among morning mists these erosional remnants of geologic ages past entice you to go yet further upstream, or if it must be, to rush faster downstream to the tapestry that exists beyond the bend. This Guilin landscape has so many variations it would take thousands of rolls of film but could not capture the feelings that haunt the caves, the softly swirling fog of the unspoken words, the shroud of uncertainty - it holds you spell bound. There is more - crouched on small terraces of flat land are small villages - houses that are home for thousands of people - the special places where survival continues, where dreams are dreamt - sorrows are grieved, and joys enjoyed - the cares of life everywhere so similar that being a part of the human race is faced and accepted.

Geologically these “haystack” hills are components of a karst topography with magnificent proportions. Once a seabed where limestone was deposited - now uplifted thereby permitting rains and streams to seep into cracks there to dissolve the more soluble parts. Passageways beneath the surface eventually collapse - sink holes form and the surrounding edges whose stability and position afforded protection now become the objects of attack - forces blowing, washing, dissolving, removing the rocks as the plateau is raised ever higher and gravity joins the game to reduce sharp hills to subdued hills and rolling plains. A story of change - of soil formation now removed to the ocean - and dregs of time-lapse erosion remain to startle us - to fascinate our very being.

In other landscapes in other regions remnants of erosion rise as isolated knolls and pillars - commonly called “tors” - little monuments to the struggle - to birth, growth, death, transformation, flux of forces, visual reminders of a world we can never really know - only appreciate - go with the flow - touch the fringe of an eternity that can only be imagined - and accepted with respect and awe. Again and again.



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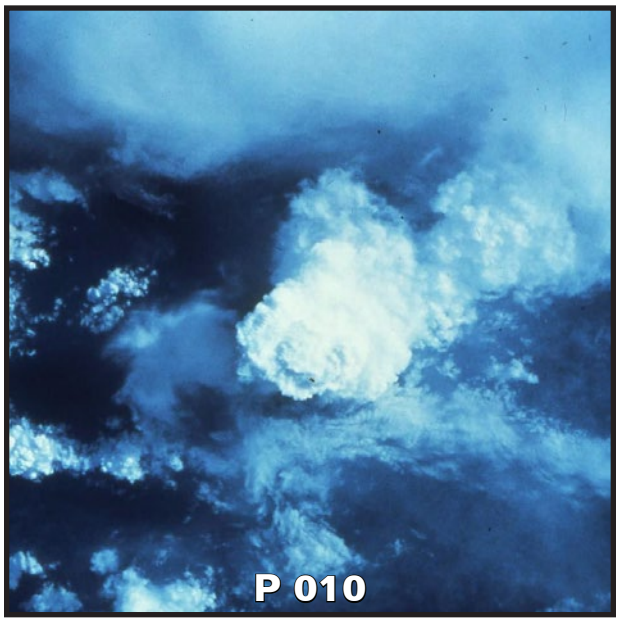
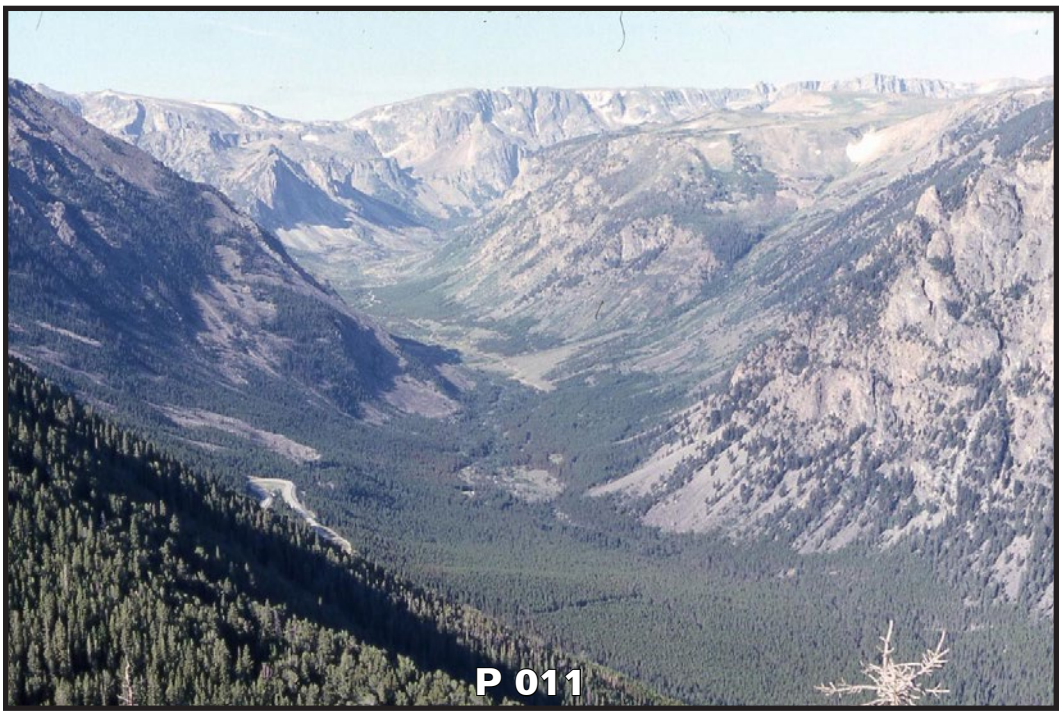
Once in a while we are privileged to see the gentle touch of the atmosphere with the heights of the geosphere. Here high in the Andes of Chile the brilliance that we sometimes associate with the afterlife seems to add its blessing to this greeting. Are we intruding on a special moment? Are we witness to the union of parts of our world that seldom are observed? It reminds me of the spheres that make up a perception of our world. The atmosphere is external to the terrestrial body called the lithosphere or geosphere - that more or less rocky shell of the earth. There is also the hydrosphere - the watery connector like blood bringing nourishment and removing wastes. The living organisms - plants and animals, microbes and elephants, amoeba and humans - comprise the biosphere. When and where they interact is usually on and in the pedosphere - the soil cover - the bridge that links the hydro, geo, atmo, and bio-spheres. Soil is the earth's geomembrane - the filter and protector of life - probably the least known of the spheres - yet so vital to survival and sustainability.

Captured here for a moment is a subliminal message - the heavens and the earth are an interacting continuum. There is a continuity that for the most part escapes our daily travails - yet when we are privy to witness same - it is as comforting as the hand clasp of a dear old friend. There is a feeling surging through our bodies and synapses in the brain do marvelous things with the visual and emotional signals. Unexpected beauty is always a marvel to behold - it does us good to pause, to reflect, to try to understand a little bit more of the mysteries that are all around us. Even as this particular view appears to be a high point in the landscape - the peak suggests that it is merely an erosional remnant left after removal of vast quantities of volcanic debris. Just as the karst hills in China are a reminder so is the volcanic throat - a core - with resistance more so than adjacent volcanic materials. The restless earth informs us over and over again - a constant reminder - to live a good life today - tomorrow is another day.

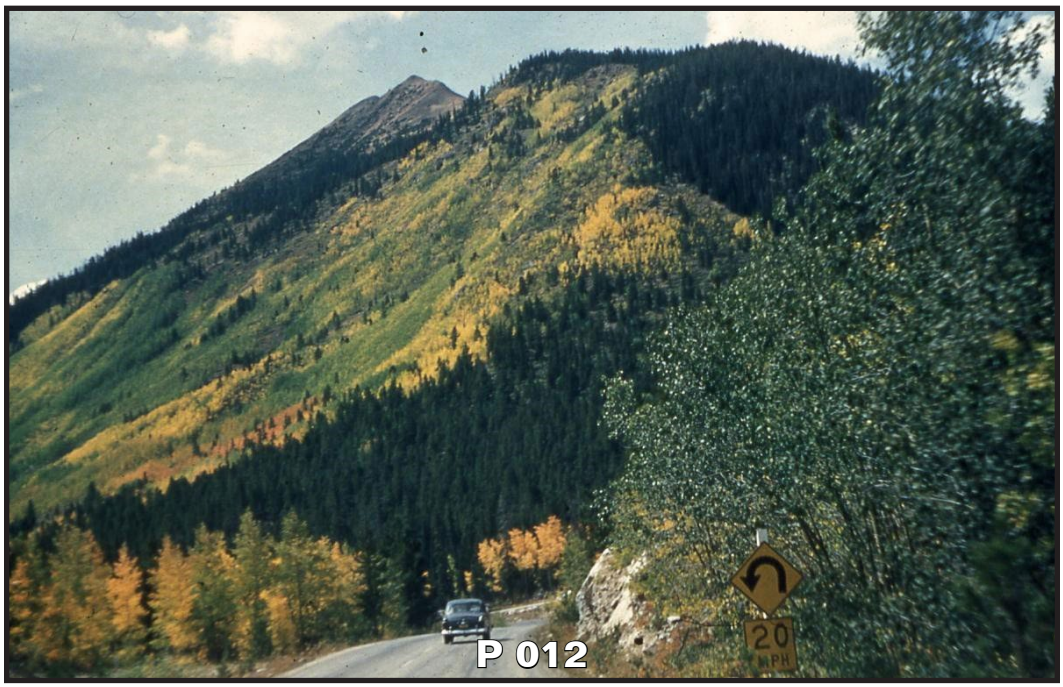



Not so many years ago this picture was not possible - this view was taken from a satellite and the whitish swirl in the middle is a massive thunderhead - those billowing clouds that often top out above thunderstorms below. We've always known the atmosphere is in constant motion - and that the spinning earth gives dimension to the paintings and sculptures rising high above its surface. As children how often we lay on the ground contented to watch the emerging animals, grotesque monsters, castles and numerous other fantasies as clouds proceeded across the stage overhead. Ah look, see that dog, oh no, it is more like a horse, now an old hunch backed man, now a thread flying away. Did you ever collect clouds? A mental catalog of some of the kinds of clouds, billowing cumulus, streaked cirrus, nimbus, stratus and kinds whose names escape me today partly because I don't open the pages of that scrapbook often enough to remain current. This picture for me is a wonder - never expected - but now such becomes common in our ever advancing technological world.




This is a classic U-shaped valley that characterizes glaciated landscapes everywhere. Glaciers moved into pre-existing valleys and filled them - eventually the relief was small (on the ice surface) and flows often cut across the uplands counter to the underlying valley structures. Imagine fog fills the lower rounded basin up to the tree line and now you visualize a barren, frost-riven macabre landscape - given over to the permafrost of that long ago age. From the fracture pattern and the slabs of tilted rocks this appears to be a plateau of metamorphosed rocks now strongly dissected by deep valleys and secondarily cut into a U -shape which has been softened by colluvium flushed from the steep side slopes. The basin fill is outwash and morainic debris covered by a fairly uniform evergreen forest. The magnitude and power of glaciation is displayed here reinforcing the persistence of forces that shape and re-shape our world. This textbook example is in Montana but its counterparts also

occur throughout New England and California and in Europe especially in Scandinavia. There are certainly patterns within patterns in such marvelous landscapes. Processes - forces - energy fluxes - in time periods unrelated to each other - the uplift, the intrusions, the transformation of rock, the buildup of snow and ice - formation of cirques and steep head walls, early "paternoster" lakes - debris avalanches - ice flows and finally the melt down - the retreat of ice - an advance of vegetation clinging precariously to crevices filled with dust and crushed rock - the story of biodiversity as only such a habitat can endure - the deeply epoch. Each has left its mark - its telltale signature - imprints as bold as fonts exploring a new printing press and scribing on pages not new but now in palimpsest format. If you stand at the top it is one story - farther down is another - and the penetrating permafrost eventually returning the rocks and soils to the following geologic stream working in the valley floor has yet another. Beauty is in the eye of the beholder and for me this is beauty in style, in format, in intricacy, complexity, and more records of a restless earth.

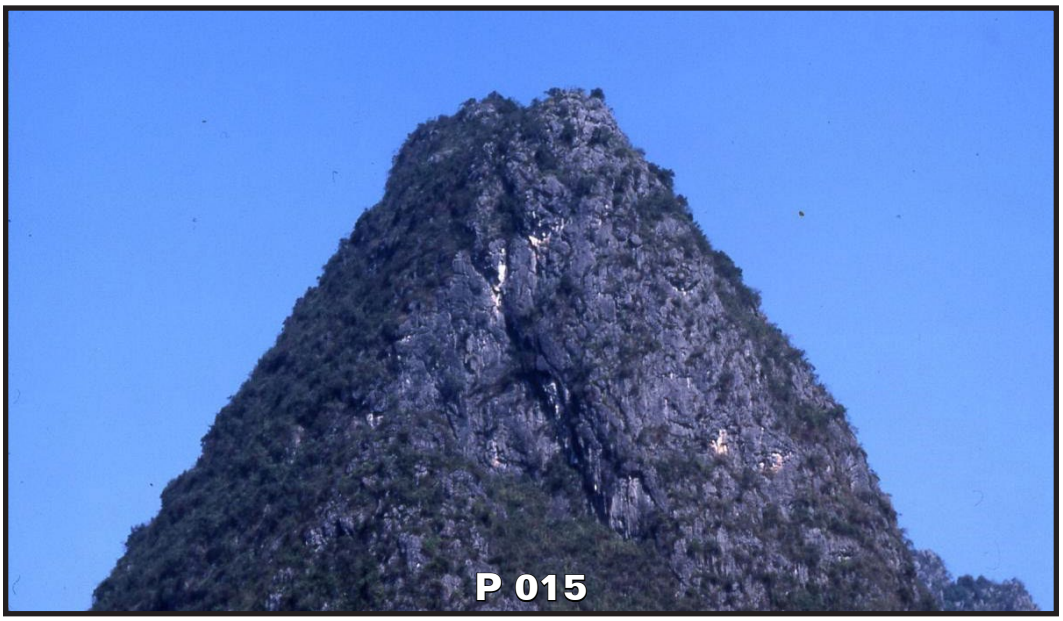



It was an early fall and I had driven from Iowa to Colorado to pick up Helen who had been working at a resort lodge for the summer before classes started again. As we came around one of the thousands of curves the view ahead was spectacular for me. A "flat-lander" here in forested mountains - everything was different - and your senses are "tuned in" to the newness - the freshness that exists for some, yet is the old familiar to others. That is why first impressions are so valuable - they encode sights, sounds, feelings that come this moment only - never to be repeated in exactly the same way ever again. The golden flow of aspen sweeps your heart like an artist's paint brush working a canvas of extraordinary charm. Here is a mosaic of color - a blend of hues but mostly the tints and shades of yellows and greens giving a magical impression. A quick stop here - and then another - and another - like a sponge soaking up the reality of this vista of nature. What a truly wonderful feeling. Sunshine, pale blue sky, a few passing clouds and here below a pageant displayed for us - now - right now. I love it - I feel good. I like the thrill of being surprised by the unique patterns in nature - contrasts, unexpected juxtaposition of textures, colors, sizes, shapes, animate and inanimate. It is as though it is one of the great opportunities that are provided to us - to jog our thoughts, to be ready to entice, to support, to renew - are we fortunate or not? And now as we look again there is another message - a lesson missed at first - a bare peak shows in the distance - so we are in the zone below the "tree line" where above forest vegetation does not readily survive the climatic conditions. Here the healthy dark green of evergreens attest to the more climax type of vegetation - its boundary marking a break in the landscape - a ridge line separates spruce from aspen. The variegated colors on the rising slope are aspen and smaller shrubs - the invasive species following a forest

fire of a previous period. Biological diversity - biological plant succession - the struggle for niches and persistence - resilience, opportunity, cohabitation, succession, survival - it is all here to be seen and to comprehend. It is really a lesson that plays out on a different time scale than our all too brief anthropic scale.


Pure, clean, crystal clear snow-melt fresh water. As the world begins to face more and more serious water shortages, unwanted contamination, shrinking groundwater, too many people in the wrong places - the sight of renewable fresh purified water takes on a whole new and special meaning. For most of us it is not a luxury - it is something we take for granted. We have grown up with plenty - we have even been wasteful - but that is a matter of location - and maybe even an accident - a legacy that is hard to comprehend against the background of global climate change that emerges now and wags its tail to remind us of all the alarm signals that have already been sent our way. Cold, refreshing, replenishing a supply, satisfying the moment - look again at white, white snow, blue sky, a peaceful little stream beginning its journey to the far away river, lakes, seas and oceans. It was a refuge in the hills near Ithaca - a reminder that the burden of excess snowfall has - in its own way - a beauty that captivates and holds our attention. Trout live in this shallow spring fed waterway and water cress is abundant farther down the way. Oh that we might learn how better to share water resources and plan ahead instead of stumbling into unreasonable solutions - even regional conflict that seldom has a satisfactory resolution. Just as the Himalayas hold dominion over the source of water that reach millions of people - so a little snow bank watches over the vital source of a very small piece of the universe - each with a purpose of renewal, of survival, of transformation - differing only in scale. An old hand pump and an enamel dipper - a memory of another time, another place - when sweat on the brow and a dusty throat were quenched with the soothing feel of water - clean, pure, wholesome, expedient. To some, water is a renewable resource, to others only a hint of security but never of certainty. And where is the world's largest reservoir of fresh water - Lake Baikal in the far east of Russia - a treasure little known but valued as a place needing its own and our protection. The lesson? Nothing is free - all things in our world are linked - and your excessive use of a resource is someone else's loss.

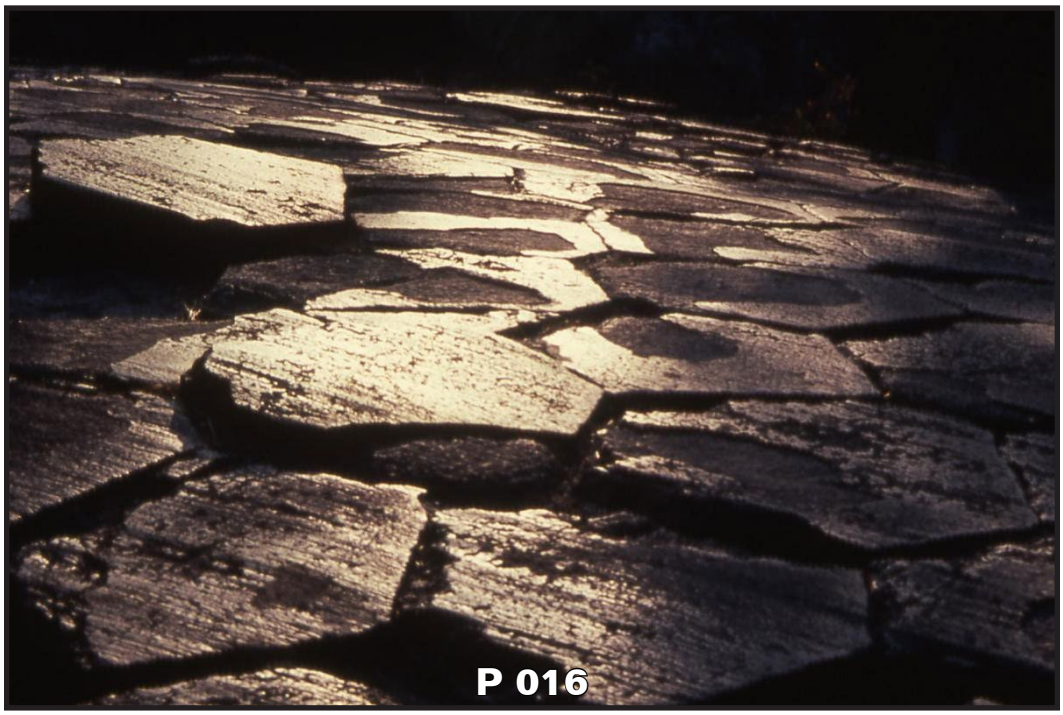

I am thrilled when I see a meandering stream or river. Meanders have very fascinating stories - each unique yet each responding to changes in the environment that set in motion sequences of events. Water flow is controlled by the base level of the outlet - it is like a thermostat - if the base level is lowered - that is sea level drops then a stream can cut deeper into the sediments on which it has been riding. Erosion of the channel walls and down cutting begin - the energy flow is increased and the channel begins to straighten itself. There is always an ebb and flow of energy to reach a balance - to come to quasi-equilibrium until the next rain fall introduces water and its energy to flow faster with more mass and as the energy dissipates, the stream drops its finer and finer particles - a sequence so cyclic that you can count on seeing the results world wide - and at all scales from the microscopic to perhaps even the flow of stars in the galaxies of the universe. This view of a river in Java suggest that soon a flush of water will spill over-bank and connect two parts of the channel - cutting off an unnecessary meander - creating an oxbow that will slowly be filled with sediment, vegetated and its evolution will be changed forever. As streams and rivers flow over bedrock, there often are differences of rock strength and resistance to erosion - and so a little gap, a discontinuity develops - growing possibly into a waterfall. At each controlling point a new base level is established. In many landscapes you can observe these “knick” points in a stream. To begin to unravel landscape evolution you need to start with the hydrologic system - the streams, the knick points, the local sediments -and eventually link this system to the slopes and patterns of the surrounding hills. Fine-tuned ecosystems integrated, whole, marvelous. But the thing I like the most is the analogy for human leadership. A stream is like a wet noodle - you can’t push it anywhere consistently - it is messy, unpredictable. But if you pull it - it surely will follow. You must provide a base level. You can lead others and they will respond. But pushing them is a senseless exercise at cross purpose with thermodynamics. I love these illustrated messages.



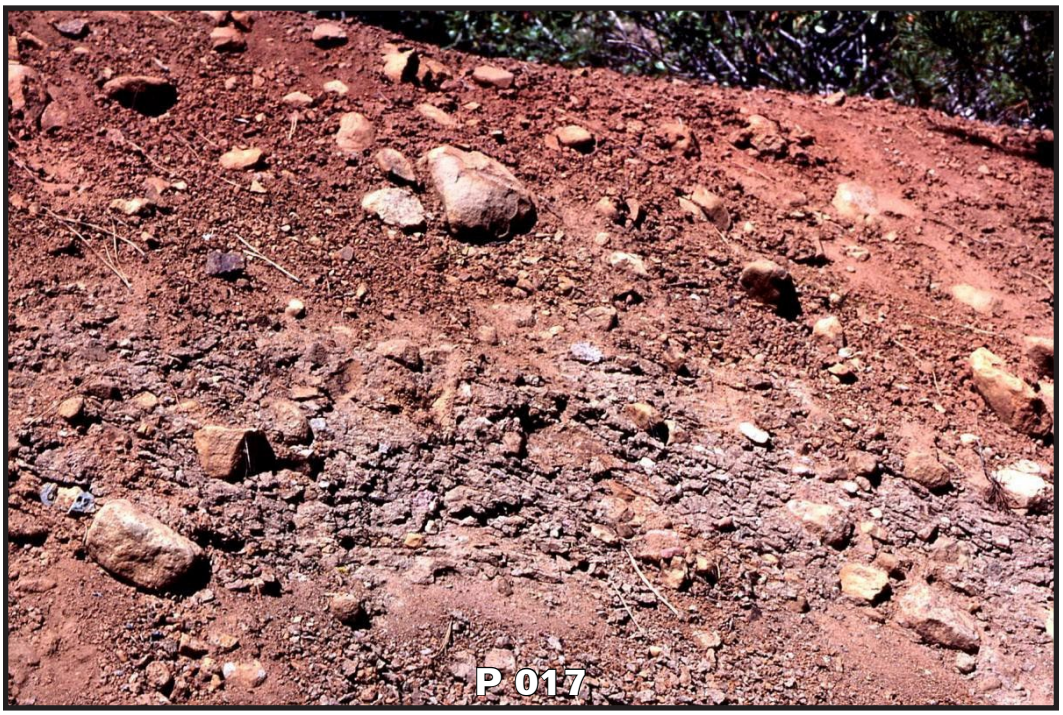

Nature is full of graphs - but you have to want to see them. This karstic “haystack” hill - this dome of limestone near Guilin, China is more than a geologic marvel. Sure, it has a story of a long involved, complicated development and if you have the inclination you may piece together another chapter about the earth’s restlessness. But in addition there are symbols and analogies that our minds can grasp and interpret to fit a need - or desire - to link nature and mankind - to realize that all things have energy - they are energy - and they are but different forms and expressions of it. Does a rock think? Well, I don’t believe it does - but it does possess energy - and my body and my mind possess energy. I have a lot of carbon atoms in my body - this limestone dome also has a lot of C atoms in its body. Are mine unique - only in that I have them at the present time - where they were before I got them I do not know - maybe in some of this rock that was eroded away a long time ago. When we study - or are introduced to statistics we learn about the theorem of central tendencies and classes that exhibit central tendencies.

There is a mean value and if the class of objects are uniformly distributed the modal value that separated the objects (or a characteristic that is being examined) into those with higher value and those with lower values - then the modal and mean (average) are the same point in the distribution. There is a normal range of values around the mean and when plotted they give a bell-shaped dome or curve like the one seen here before us. Here is a mean plus or minus about 3 standard deviations. It is a discrete entity - it is separate from other entities in some larger population. The values of a characteristic of this curve appear to be continuous and it leads us to consider that almost everything is part of a continuum of some kind.

We realize that to better comprehend many things it is easier to consider the continuum as consisting of discrete individuals - this gives rise to a basic conflict in all studies of our world - the problems and uncertainties of a population of individuals versus a continuum of values. A dilemma we all learn to live with. Another of nature’s graphs!



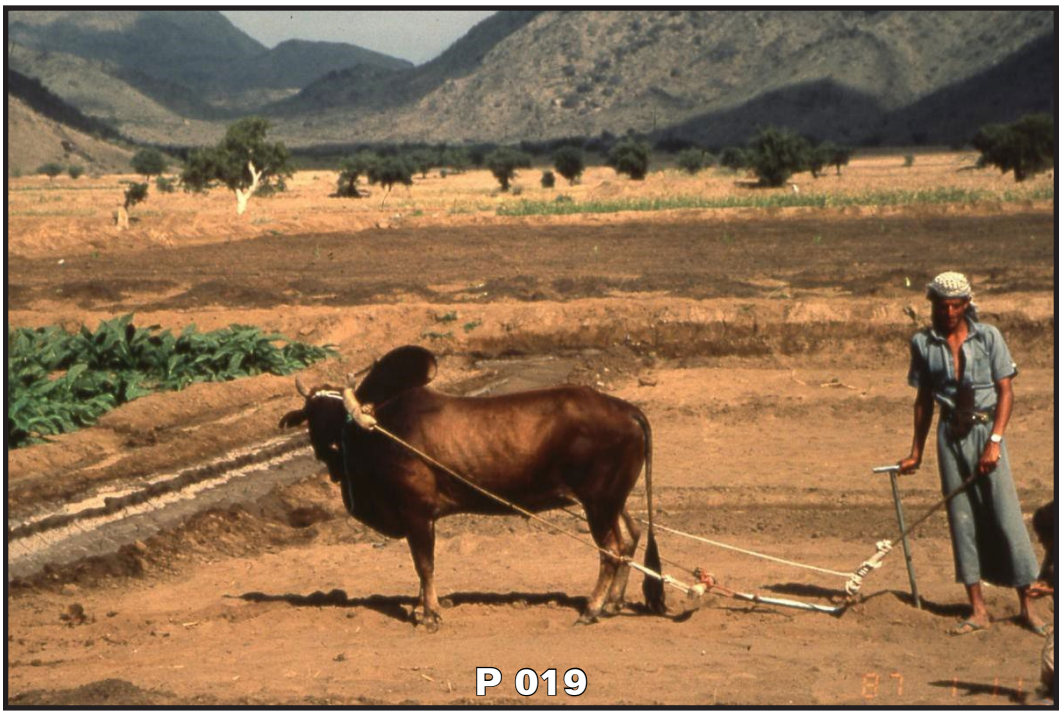

Hexagons -for me one of the more fascinating regularities that occur in nature. When basalt flows from volcanoes stop and cool, they often form hexagonal columns. Here are some, exposed and polished by former glaciation in the Sierra Nevada mountains in California. Before all the modern processing of food products it was usual to get honeycombs as a source of honey. The cells - the little tubes of the honeycomb are hexagonal columns. One is biological, the other physical - both marvels of nature. It is reported that the eyes of a fly and apparently many insects consist of a myriad of hexagonal receptors. When ice cracks on a pond often you see large polygons - not the neat ones of basalt hexagons but something similar. Watch a mud puddle dry up and crack - more polygons of course. Watch soccer? Play it? The ball is a patchwork of curved hexagons. The hexagon has many interesting properties. It is a form that permits close packing on a 2-dimensional surface - there are no gaps - all space is filled - neat like a puzzle whose pieces are all in place. Round columns leave strange space between columns - hexagonal ones fit together. A hexagon consists of 6 equilateral triangles as building blocks - so the triangles are excellent space filling shapes - the equilateral ones, that is. Okay look at a hexagon having a point at its center - there are 6 line intersections along the boundary of the shape - so if they are points of intersections plus the point of intersection in the middle - there are 6 neighbors and this would continue across such a space-filled area. Six neighbors and each is the same distance from each other - there is a unit length that provides this structure. What's more the angle to each neighbor is the same - 60 degrees. Same angles, same distances, and always 6 neighbors if the hexagon is regular. Close packing - provides strength and probably resilience. And what is so fascinating to me is that a hexagon is a form that is described mathematically by a random distribution. Oh yes, the equation isn't so simple but this apparent uniformity can be generated by a random process. Amazing. Plant ecologists have used the properties of hexagonal forms to study the relationships of plants or trees in different ecological systems. Geographers have examined locations of stores in a city. I tried it on centroids of soil map units in a glaciated landscape and found they seldom fit this, or other random patterns at common scales, so could conclude soils are not randomly distributed in space. Thank goodness!!



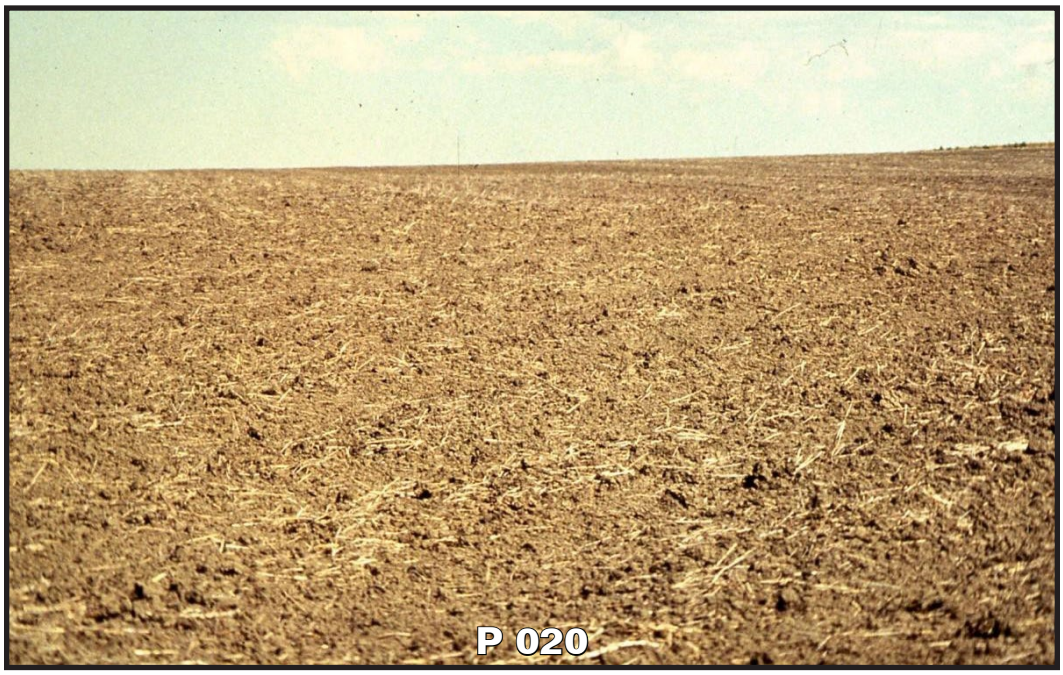

Well, it is true - most people do not get excited about a road cut - and here is a rather messy one with some stones scattered about. Pretty boring and nondescript - maybe. About 2/3 of the slope has a reddish brown color and below is a grayer layer. The gray material is weathered rock - the structure appears to be blocky in many places as though shale was breaking up and weathering to a clayey matrix. The stones on the gray material appear to have rolled down from the reddish brown material - notice that the stones are covered with a coating or skin of the reddish brown material and not much of the gray stuff. The upper material is different - it has different color, stones scattered throughout and coarser textures than the gray stuff. Aha, in this landscape near Yakima in Washington State, the upper material is thought to be colluvial material derived from the low mountain slopes farther south. Here is a lithologic discontinuity with transported soil debris resting on top of a weathering layer of in-place rock. A restless earth - absolutely - it is restless. I have not been to places where the upper mantle of the pedosphere has not been reworked as a bio-mantle such as those experiencing tree-throw, or termite tunneling, prairie dog village renovations, slopes slipping downward under the pull of gravity, and at places very rapid when too wet to maintain its equilibrium. Or here as colluvium moving slowly across a larger landscape.
Not always recognized are many areas of relict solifluction - glacial or even residual debris moved under periglacial environmental conditions. Several distinct layers occur throughout southern Germany for example. Most landscapes have been modified rather markedly throughout the Pleistocene epoch - say two million years and so very few soils exist in landscapes older than that. In many parts of the restless earth the soil mantle is mainly of Holocene age -only 1015,000 years old - an eye blink in geologic time - hundreds of generations in human scales. If the earth were more stable its history would have very different stories to tell - but we have this one - movements beyond our imagination - and it often takes us many exposures before we begin to comprehend the magnitude of what has been happening. Maybe there are too many stores to organize such information into meaningful books!


Man has seldom accepted nature as he found it. Always there has been a desire for something more, or something different - and these wants meant that the ecosystem had to be modified - altered to better supply the products or functions desired. As it turns out natural ecosystems are so tightly integrated and in harmonized balance that they cannot endure much invasive action. The balance of nutrients, of niches, is such that removal of pieces often means a major re-adjustment of the energy flow that existed. If ecosystems are maintained in a state of balanced sustainability - only a small population of humans could be supported. This, of course, has not happened. To be sure there have been disastrous consequences when humans overloaded ecosystems without attention to sustainability - climates changed, long periods of drought meant crop loss, water scarcity and emigration or loss of local society. But man has also been a major force in enhancing some environments - irrigation schemes are perhaps the best known example of wholesale change. Clear cut forests are another example of manifold change. In some places survival was the primary motive. Here on the volcanic slopes in the Banaue region of Luzon in the Philippines there are terraces several thousand years old.

These slopes are very steep and climbing them is difficult, yet here are fantastic terraces used for rice production. It is said that long ago when tribal wars were common to settle differences, a group of people retreated to these highland hills - high above their traditional food growing areas in the valleys. How were they to produce sufficient food for survival from the raiding parties that invade their lands? It is a high rainfall region with seasonal monsoons so water was plentiful. Clever minds designed a system of handling water impounded higher up, and then channeling it to the slopes and with bamboo pipes they used the hydraulic force of the water to move the volcanic materials. They learned how to form and shape and fill terraces on these steep slopes. Ingenious - practical for their survival - and today these terraces remain as reminders of the creative genius of humankind. Rene Dubois, a biologist, once talked about the "humanized landscapes" that attest to the prowess and persistence of man to tame and control nature - and now we must seek again to find our harmony with, rather than to control, nature.




The nearly level land in valley floors are easier to shape than alluvial fans emanating from the uplands and the slopes are even less manageable in most environments. The vegetation responds to topography and its effect on local water regimes. The shrubs are there when they are left alone or the land is used for grazing animals. A scatter of brushy shrubs and small trees exist where once agriculture was practiced, but now fields have been abandoned for more easily, more productive land farther out in the valley. A system of irrigation canals crisscross this area in Yemen where this man and his child permit the oxen to rest during the shaping of the soil surface before the irrigation water is permitted to flow - bringing life once again to the land - as seeds germinate and grow. It was written once that agriculture passes through 7 stages of development, but you can imagine that at first a pointed stick was used to make a hole in which to drop one or more seeds. Annually flooded land might have been a good place to start because the flooding would offer some degree of weed control and also bring in fresh sediments to help replenish plant nutrients. When hoes were invented, more land could be cleared and prepared for cropping. Somewhere a plow of some kind was built and people could pull and push the device to stir up the ground more efficiently. And eventually as animals were domesticated, a harness was designed to pull plows and land levelers. Teams of animals made the tasks easier, and horses did the work faster than oxen or water buffalo. And so the stages occurred until modern gas and diesel powered machinery arrived and the most up-to-date technologies associated with today's precision farming. So is this family at the 3rd stage? Perhaps. An interesting observation is that a society has never been able to by-pass stages of development of agriculture and survive! Shortening the time table is one thing, skipping stages is quite another. You can sense a great amount of pride as this man stands in his plot of land, with irrigation water nearby, as his work animal is well fed and healthy, as the family is fed and healthy - reproduction of replacement children is well underway. The advances in technology, the improvement of life style, the prospect of a better future - earmarks of each stage in the development of agriculture - in man's conquest, of the invasive destruction of one ecosystem for another - for the good of humankind!




Once I saw a poster of a man, a farmer, walking across a recently plowed field - and behind him was the far horizon - seemingly a long way - it was inspiring in one sense - that resources - soil resources - are plentiful - of course, but only if you live in certain areas - the richness of resources is never distributed uniformly - as we all can attest to. Is inequality a condition of life - of survival? Does it sharpen competitive skills - does it hone a desire to be something else - to have other things - to be in other places? When you stop to ponder - if our world had evolved as a uniform mass of something - kinds of minerals, similar relief, and so forth - would there ever have emerged animals from the sea - or would our thwarted DNA still be mired in the slushy covering of an unknown earth. One of the ways we learn is by visioning a future - not knowing what will be - or when - or where - and often not understanding a why. Open space - big skies - a hemisphere encloses us without constraint. Your soul can fly far, fast, and futuristic - sight is not impeded, vision is all encompassing and our mind stretches with the marvelous scenery somewhere in the Great Plains of America. Here there have been crops, now harvested, and the fields have been stubble mulched. Conservation practices designed to minimize the ravaging winds and driving rains that are so common in such environments - but history is there reminding us - if we look backwards from time to time - of the eager rush to own land free of debt - the land rush - the homesteaders of the 19th century - our pioneers whose future appeared promising if only they could own land and work hard and prosper. How seldom we listen to the wisdom of elders - of natives - or even to environmental scientists. If politicians had heard the message the laws would have, or could have, been different. The necessity to “turn sod” to prove a willingness to stay and settle - what folly. The famous “Dust Bowl” of the 1930s - the Grapes of Wrath aftermath - attest to unhearing ears connected to the right brain tissues. Fortunately nature does not hold grudges - or give praise - or even understand good intentions - nature only records and responds to energy - but what stories are recorded on these pages of hers. Ever hear the phrase “if it were not for people like you, the horizon would indeed be near” - from time to time focus carefully on the far horizon.


One of the many pleasures in life is to see, and meet, true professionals. A good professional has a certain degree of ease associated with the accumulated knowledge of their profession - they have tucked away in their cognitive domain a lifelong set of experiences - and now with self-confidence they go about their tasks with assurance and ease. Formal education - seldom - but observant learners caring about doing their very best - and all the time knowing their own limitations. Could I till a rice padi? Only as a naïve amateur with trepidation. Could I pick the "tender tea leaves" in a mountain plantation? You jest - of course I couldn't. The rice padi shown here is south of Manila - the crop attests to differences in soil and management conditions. This farmer is a true professional - on a par with professionals of any profession anywhere. All too often those of us who have opportunities to obtain formal training look down at laborers, or those who have been less fortunate and end up doing menial tasks - and we think they are uneducated and poor. Their richness of knowledge, of skills, of reasoned logic, of simple recognition and pride in what they do - likely is far greater than our skills as professionals. Open your eyes, clear your ears, open wide your minds and sense in your heart that there are professionals everywhere. We have so much to learn about life - about living - about the community of humankind - it is sad, really sad - how many areas of ignorance we have selected on our current journey - and with that we have closed doors of opportunity - of chances to understand the strength of character and values that characterize most humans. Biases and prejudices hamper us - constrain the joy that we could find in little things that are around us. Modern technology has opened thousands of windows into the creative marvels of our universe - the stories related to DNA, the plasma of physical particles roaming the infinite, the fabulous pathways of sense tingling along synapses to become thoughts - and the world seems to have no end of mysteries to dazzle us - but never forget - the evolution of humankind has not only been unbelievable - it has supplied us with responsibilities to seek a harmony that is in grave danger of being lost. Welcome the true professionals!


Man's use of soil resources has invaded all ecosystems and only a few have remained intractable to manipulation. But when a culture is closed and keeps the outside world shut out - then the limitations of resources becomes more evident. Such was the case of China during the Cultural revolution when their embrace of communism meant that all things were for the good of the people (well, except for members of the elite bureaucracy that enjoyed power as much as, or more than, their counterparts in other cultures). To feed the rapidly growing population there were drastic measures imposed on their society - food rationing, one child per family, restricted movement, jobs for everyone, and secret spying on - and so forth. When more food was required all lands had to produce more and then more again. Some soils in alluvial valleys are formed in clayey sediments whose subsoils are not favorable for crops requiring adequate aeration. If you are in the citrus belt most upland soils were expected to support orange, lime, and lemon orchards. Disposing of wastes is also a problem - human and animal wastes had long been used as "night soil" to help replenish depleted nutrients. But potassium is harvested and not easily replaced and in some soils it became more limiting than phosphorus or nitrogen for sustainable yields. Throughout the world plastic - especially as bags - are ubiquitous and they pose major disposal problems. These trenches were dug to expose relatively dense, compact subsoil - and after a while being open - the trenches will be filled with plastic and trash from surrounding villages. The soil stacked between the trenches will be mixed in - the field will now have aerated zones that hopefully will support citrus seedlings. Practical, useful, and multi-purpose - waste disposal and increased biomass production. This is accomplished by hand labor - because it doesn't need gasoline or diesel fuel - rice and vegetables will be the mainstay. Is this a view into future scenarios around the world as we reach or surpass the sustainable carrying capacity of our physical world? The earth is perhaps more responsive and resilient than the governments that ignore such limits.


Indigenous knowledge understands more about the harmony of resource use than most of the industrialized world that many of us live in. Where life is controlled by seasonal climate - monsoonal rains and blistering drought - producing food supplies requires ingenuity that has been honed and passed on from generation to generation - its success determining whether life or death shall prevail. To a person from temperate humid or subhumid regions, the nearly level fields in the tropics appear desirable for agriculture - even mechanized agriculture. Flat land becomes a sea of mud during the torrential downpour season, and seeds and bulbs and root systems drown to death - it only takes a few days being depleted of oxygen and biology responds - usually unfavorably for other life forms. A solution is observed here. Soil and biomass is mounded up by hoeing it into piles about ½ meter high. Maize can grow tall and provide support for beans and squash to climb up for their photosynthesis machinery to operate. Mixed cropping, multiple cropping practical solutions for survival before your eyes here in the Ivory Coast  real attempts to maintain high biological turnover of nutrients free from local flooding. Good!! There is sadness here that you don't hear but somehow you can sense it. This is maybe stage 2.5 in agricultural development but it is the 21st century - not the third millennium BC. Where is the energy, the power, the machinery, the animal power, the fertilizers, the irrigation systems - in short, technology has not come to this land - it is elsewhere - and so this region is kept in limbo - chained to systems of survival - not privy to the conditions of growth and economic development. How can this be? What is wrong in a global habitat that permits such extremes - such a wide devastating range of richness - of abject poverty, of hunger, of disease and other despair? The lessons here are reported in numerous places, as they have for thousands of generations - one lesson is the fantastic creative genius of the human mind linked with tradition that has guaranteed survival. Another lesson is the tragedy created and perpetuated by part of civilization on another part. The same potential of genetics exist blocked by the misuse of power, the grasp of greed, the narrow minded outlook - seeing the moment, not the future. Lessons we still do not heed!


If you can think of a way to do something easier or faster - then surely someone will make it - the world if full of experiments of tools to make life easier. Where electric power has been available irrigation pumps, hoses, rolling tracks, and high pressure nozzles have sent water spewing far away to get more land covered sooner. In some windy areas more water is lost by evaporation in the air then soaks into the soil surface. Expensive - yes! Wasteful - of course - but what to do? It wasn't a problem when water was free or very cheap, and so was electricity or gas to run the pumps.

Someone decided that maybe you could have tubes hang down from a boom and the water pressure would squish out the water closer to the ground - less waste, more efficient and also cheaper. This is one of those low pressure irrigation tubes and nozzles. It has been running long enough at this spot that the water has puddled near the nozzle. Now windy High Plains areas like this in eastern Colorado can still be irrigated, more or less economically, for the time being. But sustainable - no way! A temporary fix before the reservoir is depleted so much it is no longer feasible to farm crops!


A carpeted landscape - so well groomed, so elegant. Here is a uniformity seldom offered in natural ecosystems. The natural drainageway, an ephemeral stream - is now a path carefully trod by the workers higher up the slope. They are women - the tender tea leaf pickers - fantastic professionals in their own right - keeping the young leaves harvested after a few days of their exposure. The soils here are Tropudults - the crop - a cloned variety of low bush, high yielding tea. Another humanized landscape - preened, tailored, cared for with utmost attention in Sri Lanka. Here in the foreground is a spot of red - blossoms standing in contrast to the blanket of green - another day in the life on the other side of my world. It is unaware of me or where I come from or why I am there or where I am going. Like an intruder, one marvels at this well-cared-for

landscape. No serious erosion, good land cover respecting the need for clean water and clean air - as well as a livelihood for local artisans. The message - the lesson is rather clear - when expertise and skill is employed in a way that respects all available resources, the results can be harmonious, esthetically pleasing, ethically satisfactory, and exhibit a beauty seldom matched in its simplicity and style.

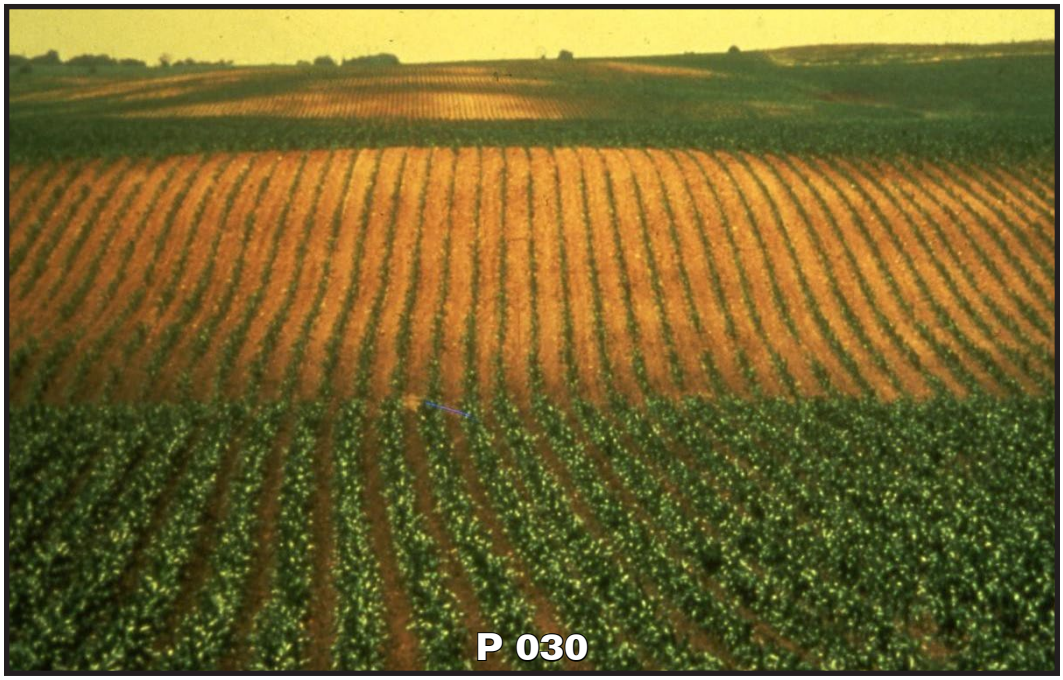

This picture of a sorghum crop on a Texas Vertisol is one of the best examples I know to illustrate the unseen variability of soils. Vertisols are clayey soils and their clay composition is such that the material expands when wet and shrinks when dry. The contractions and expansions have differing dimensions depending often on climate that dictates the number of times such events may occur. Often a slight depression exists that lets water accumulate and soak in. The wetter soil pushes outward against the moist, but drier soil, displacing it sideways and upwards. This cup shape expands and becomes bowl shaped - growing until constrained by other environmental conditions - and when two bowls reach each other the boundaries may become slight ridges pushed up by the internal forces. In areas less disturbed there may be depressions and ridges observed throughout a field - especially after a sudden rain shower leaving temporary ponds in the depressions. Agriculture, being an invasive human activity, plows up and smooths the soil surface to better enable crops to be planted, cultivated, and harvested. Many of the Vertisols in Texas are underlain by calcareous sediments and as the materials are squeezed the edges (or ridges) are dominated by the calcareous materials, with the deep, usually humus enriched clayey soils in the bowl. Most hybrid sorghum varieties cannot survive in highly calcareous materials - the salt concentrations when carbonates are dissolved are toxic to plants and the growth of cells. We see a pattern in the crop as it responds to the conditions in the rooting zone. Dramatic - of course! A vivid reminder that soils are not the same everywhere. A lesson is that soil chemistry and soil chemistry dynamics are phenomena of significance but not always heeded. Why do we study soils? For one thing they are fascinating - stories that often are not imagined - dynamics not seen on casual observation - differences over short distances that can mean life or death - for a plant, for a crop, maybe even for a subsistence farmer. Why study soils? Indeed! Did you realize that freezing and thawing have many similarities with the dynamics revealed here?


Man wants to change everything - ecosystems in their natural harmonious synergies do not produce sufficient products and services to satisfy many human needs. Cut the forest, plow the prairies, drain the swamps, and even add amendments to increase production. "Oh, some are harmful? I didn't really mean to abuse the ecosystem, I just wanted a bigger crop - it makes me more money or product to barter with. Yes, I see how the water concentrates in the natural drainageway in the field and sure, the water runs quicker, picks up soil particles, and flushes the surface layer of the landscape. You are right, the water in the foreground is muddy - but you know - it wasn't really a hard rain and pretty soon the crop will grow larger and we won't see any ill effects of this event." Why is it that folks don't like to make additive pictures in their minds? One event - stop. Another event - stop. Erosion that has modified most landscapes occurs as millimeter events - a sheet of paper or two - nothing more. But geologic time is long - and a mere 10,000 sheets of thin paper is equivalent to stripping away thousands of tons of soil - enough to change the course of history in some locations. The impatience of mankind, the patience of our earth - time scales that provide different perspectives. It is amazing how much life is like that - events seen from different perspectives - leading to conclusions and actions that influence and affect events in quite different ways. The stories of landscape modification and evolution are often as fascinating as super-sleuth novels of high adventure. Perspective - that's right - perspective is relevant to what we think we know - to what we experience - to what we do in response to our perceptions. Analogies are everywhere - usually we ignore them as we are caught up in the pressures of the moment - submerging one set of comprehension and belief - for another that seems more pragmatic at the moment. Geology - geomorphology - soil science - a small hillslope and sloshing water - analogies with human existence. It is interesting how we choose to interpret the world of our existence!


A gully - a deep sad gash in the soil cover - it usually starts small - hardy noticeable and then insidiously eats away at the unprotected side walls letting them become saturated and since they are not supported, they slump and slide down - waiting to be washed away to the streams, rivers, and maybe even the ocean. If you were walking across this field in North Carolina from the wooded area in the background you might not suspect what had happened there ahead of you. Field boundaries change with time, machinery must be operated carefully near these gullies, and over geologic time the whole landscape is transformed as the new lower base level of the stream urges the removal of materials. It is a timeless pattern that is a physical response to the changing flow of energy. Ecosystem functions are disrupted as erosion eats away - changing the internal hydrology - removing surface nutrient supplies, and of course - the esthetics of a harmonious dynamic equilibrium is drastically altered. Yet this can be halted, or mitigated and salvaged for the near future. Conservation is generally a matter of attitude! It matters - does attitude!


Far beyond the limits of resilience! Severe, very severe rill erosion turned into gullies eating away the slope of this landscape in semiarid central Venezuela. At one time goats grazed

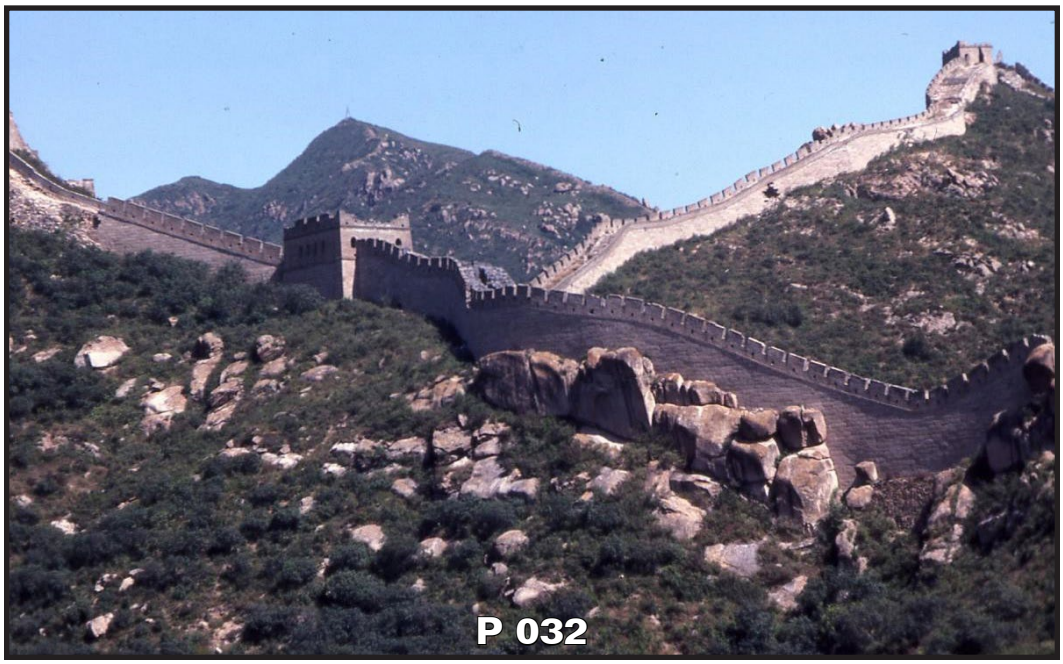
these areas stripping away the fragile protective cover - most of the goats are gone now - by Presidential (dictatorial) decree - shot by militia and others - but the damage was done - the cycle started. The level of local poverty had no incentives to control or even attempt to reverse the incessant flash of sediments that occurred during the rainy season. Often we are surprised at the lack of recovery - at the ease with which thresholds can be crossed - and abuse goes unabated. The functions of biomass support, clean water, and lack of sediment in runoff are now impaired. We watch - mesmerized by the damage to a once healthy ecosystem. Can we help? Would we help? Is it someone's fault - or is it the culmination of sequences of small things - pressures on people responses related to markets, to living - to survival? Oh, so often we realize that stewardship is not as high on agendas for either the poor - or the rich - one is survival, the other greed for more, more, more. Too many examples throughout the world!




In this soybean field in western Iowa there is considerable variability of plant size and vigor. In the foreground healthy green plants in a dark colored surface soil. In the large yellowish brown immediately upslope there is evidence that any dark surface soil has been removed by erosion. Looking more closely at the slope from bottom to top where the next green area is - you can detect a curvy S-shape - the corn reflects this also. A rise then it flattens slightly like a tilted stair step, then steeper above, and finally a small rounded off shoulder where the corn appears smallest. The green strip crossing the picture is a flatter area, then a lighter one of erosion, then a smaller green strip. In the far distance one more eroded area but the sky line appears to be green. That surface gradually rises to the right to the highest part of the landscape. This field has received the same crop management - the crop pattern consequently reflects the soils in this landscape. This is a loess mantled landscape underlain by glacial till - probably Kansan in age. The till landscape was modified by running water over a long period of time as climate changes occurred - the base level of local streams was lowered as erosion swept channels clean and deepened them - starting a new cycle of landscape pedimentation. Each cycle operates more or less independently from the younger ones. If one of these later cycles is very strong the resulting landscapes wipe out evidence of an earlier time. The records we see in landscapes is of a declining set of activities - otherwise they are not there - record expunged! Loess, mainly from the ancient floodplains of the Missouri river swept from west to east blanketing the till and colluvial landscapes. Layer by layer the silty sediments accumulated. They commonly were moderate to slightly calcareous and light gray or buff colored - the ecosystems were most likely forest. It is thought that major coverage of prairie grasses did not occur until 9-10,000 years ago and in conjunction with drier conditions and fire soon dominated upland and open areas with remnants of forest in protected ravines and some north facing slopes where moisture and cooler

temperatures remained longer in each year. Normal erosion quickly established local base levels inherited from the till landscapes. Erosion of silty loess is easier and quicker than stripping away glacial tills. The pattern of pedimentation was imprinted on the loess mantled landscapes. Man's invasive activities to replace native prairie with crops triggered more and more erosion as the protective root mats of bluestem grasses gave way to oats and corn, wheat, and later soybeans. Were the soils once similar across this landscape? Very possibly because the ages of the parent materials were the same, the vegetation was similar under the climatic conditions. The major factor difference was topography - reflecting fairly well the underlying configuration. So with time the modifications - erosional stripping, pediment transport zones and depositional areas were reflected in the changing features of the soils. Today many of the changes locally are such that the soils are recognized as differences of kind rather than differences of degree. Some areas of assumed Mollisols now are Cambisols and even a few are Entisols. With less erosion these areas have been recognized as erosion phases of Mollisols. And a whole controversy about whether we classify land use history or in situ properties rages today with no easy solutions in sight. Some believe it is a political versus scientific tradition and will die slowly. If we have to learn how to artificially make better soils that can be more sustainable - vestiges of old disagreements will have little influence - or so I think today!


But man also has another side - not all invasive actions against land are abusive, leaving scars and unhealthy environments. When society overcomes poverty and does not let greed dictate all actions, there arises the wonderful power of stewardship of resources. The land, the soil, the water, the air and plants and animals are treated with respect - it is a home for all - a sacred place - and harmony attests to unity of ecosystems. Here in Iowa are strips of crops laid out and farmed on the contour. On the ground the machinery weaves through the carefully designed maze - preparing for the gradual flow of runoff water to be absorbed - or when too much it will move through the barrier strips until it reaches the ephemeral drainageways and moves on seeking yet lower outlets. Erosion is reduced to almost nothing - crop yields are stabilized or even improved as plants and environment work in harmony creating a synergism that favors the sustainability of the ecosystem - as much as it can with added inputs and extra removal of nutrients and biomass. From the air one realizes another level of beauty - pleasing, conserving, ecstatic!




This is a miniscule segment of the Great Wall of China. Its magnetic charm today draws your view to the winding, twisting meander as it climbs ever higher before plunging into yonder valley, only to rise on another hill and continue unabated for several thousand kilometers - yes, several thousand, at least! It is not only a monument to engineering achievement; it is also a mass grave of overworked humans who perished during the construction. It is reported that many of the paving stones in this section are bricks made from special clay near the ocean and transported on the backs of sheep - hanging down on each so as not to break them. Did this fortress stop the Mongol hordes - at times, yes, at others, no - the planning, the design, the implementation, the innovation, the organization are all sheer awe-inspiring activities of human intervention. Wide enough for several horses - or a muster of warriors moving from watchtower to watchtower. Just as this landscape was harnessed to serve the ruling masters, so the Three Gorges Project in SW China staggers the mind as modern technology rivals the marvels of the past. Yet one after another society passes away in the time of nature.


Nearly half a globe away more remnants of man's exploitation of all environments. On a high overlook in the lower mountains in today's Switzerland is the ruin of a Roman outpost - a small castle perhaps - a fortress surely - a symbol of another bygone era. Conquest -

deeper exploration - more conquest - the struggle of man against man - to gain control of lands, of products, of desired things - often because the land surrounding the center of their civilization was being abused, pushed beyond the limits of resilience of the soils and climate - not sufficient any longer to support a burgeoning population and the demands of its cultural styles and modes of living. Oh, yes, there were wise men who understood the dangers, and voiced their concerns - but the ruling class believed more in brute force - in taking what others produced and bringing them to the center. Science could develop and grow if it didn't interfere with the "wisdom" of the rulers. When will humankind learn? When will cultures and religions modify their positions and actions to begin to develop a global habitat that is for all - is equitable in the distribution and use and sustenance of all resources. Maybe never!

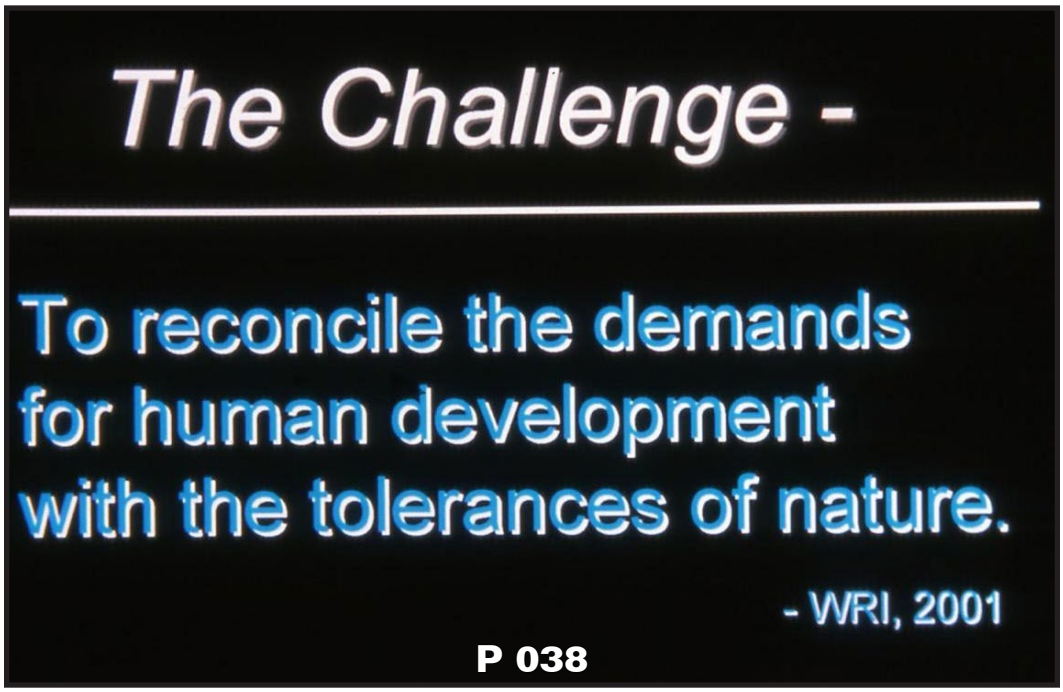

Contrast is everywhere - sometimes we do not readily recognize it. Here is rural agriculture juxtaposed with urban culture - the encroachment of one upon another - slowly but surely choking out one way of life for another as the values, goals, and desires of a more affluent segment overpowers another. The urban-rural conflict is ancient - having been repeated time after time throughout history. Sometimes the results are disastrous as attention to the capacity of the environment to support and sustain society is ignored or pushed aside to satisfy the needs of the moment. The fall of Rome was but one example in a host of tragedies. Water systems, food supplies, clean environments, all have been ignored at times. And today we are faced with a much larger conflict - a global effect of over consumption - exponential growth of greed - economies, consumption, and population exceed dramatically the sustainable use of the earth's resources. Will the images of today, like this area near Richmond, Virginia also be so grossly ignored in favor of unknown technology solutions that recovery will be lamentable and disastrous?


When we look at the far horizon it seems to fade away to nothing - over the edge of the earth - beyond the present curvature reaching to places that only our imagination can draw or recall. It is no wonder then that railroad tracks appeal to our sense of distance, or perspective drawing, and the unknown eternity that lies beyond the vanishing point of the receding railroad tracks. The scene tugs at us, entices us to follow it, to go where no one is - to dreams, to visions, to a sense of freedom no longer constrained by two tracks of steel that whisk us along - farther, farther, faster and faster. We like to imagine the future - to guess what lies ahead - giving us power to take a journey of the mind - to gain a feeling of freedom - of release from the constraints that bind us to the reality of today. It is similar to the emotional envelope that shrouds us when we look upstream - toward a beginning - toward a journey that has already happened when it passes our vantage point. Perspective is crucial to our understanding - it draws on our evolutionary legacy and is the crossing point of the future.


The Arctic Circle - an imaginary line encircling our globe at 66º 33' N - fantastic - a boundary from one world to another - both partly images passed from generation to generation. In the northern part of the Yukon Territory, the Dawson highway - gravel over permafrost - crosses the Arctic Circle. But who would ever imagine that on summer days the boundary is carefully

guarded by Ravens? “Never more” quote the raven of Edgar Alan Poe’s story. Here on a partly sunny day the ravens patiently await passing tourists who may have food scraps for them. But the symbolism is there to spark the tinder of your imagination and light the flame of stories yet to learn, of fantasies to hear about, of legends about ancient beginnings, of journeys taken, of choices made, of opportunities lost, of mysterious survivals, of migrations that sustain the environmental harmony of millennia. The Arctic circle is not like the great circles that airlines follow as the shortest routes to fly - the AC is only one - not a member of many other family of circles - it is unique - it is artificial - it is man-derived and it carries an aura all of its own.

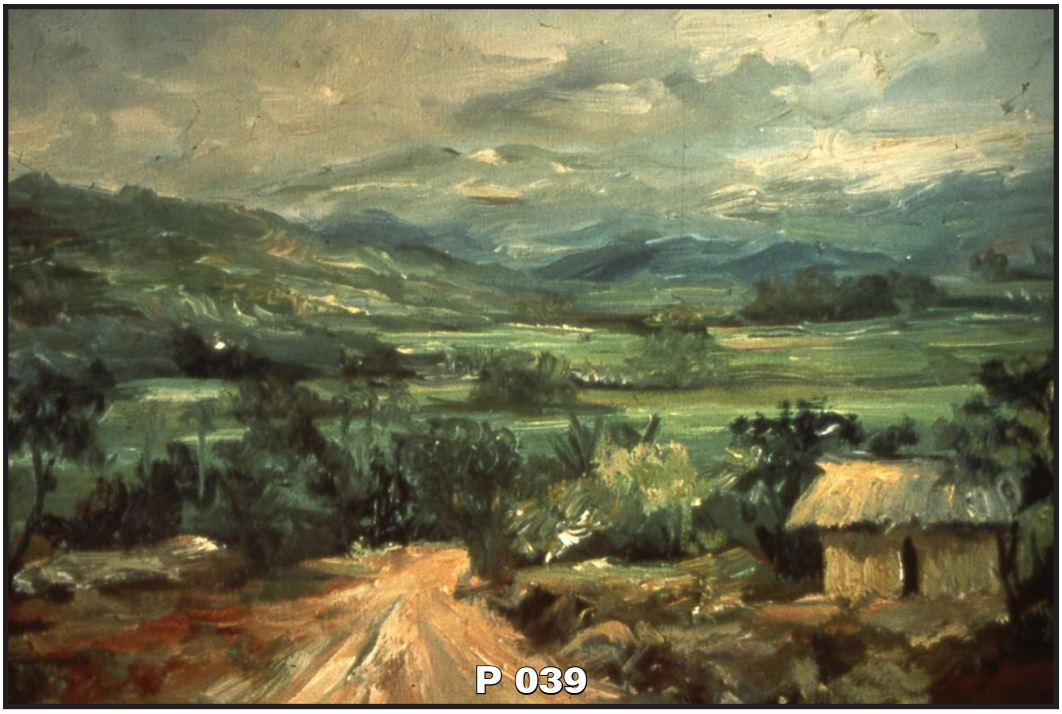

A humanized landscape in harmony with nature - oh, yes. This is the scene that flashes on my mind’s screen. Obviously there is a farmstead - house, barn, silo, contoured strip cropping, pasture, and wooded or forest land on steeper slopes behind. In the foreground are black angus livestock completing the complementarity of ecosystem harmony - the melding of nature and man’s care of the environment. I like to visualize scenes that Rene Dubois, a famous Rockefeller University biologist and philosopher called “humanized landscapes”. All over the world there are peaceful, integrated prosperous environments that do not seem to violate the local environmental regimes - whether humid, boreal, desertic, or tropical. There are those whose vision link them with a bigger universe and bring a certain tranquility to the reconciliation of man with the tolerances of nature. It is seemingly possible in all places of our world and they display the potential of achieving such harmony in all environments. The population potential varies widely but when pieced together for the world there is a set of conditions that favor a far reaching global habitat potential. There was a time when I couldn’t imagine a whole world ever being in harmony with nature. Everywhere I had an opportunity to visit - I too often saw the need or greed of humans surpassing the wisdom of ages past - of wanting instead to maximize the moment - of fulfilling instant desire - and as majestic as it looks - there was always the sad emotion that this rested on the backs of the downtrodden, the dispossessed. What makes your heart perk up is the knowledge that deep within humankind is the fire, the seed, the germ of how to live in the unique community with nature - nurtured by many millennia, hidden, pushed down, raised up, developed, and still alive within the spirit that endows humans to solve issues - to face problems - to respond - to survive. The tragedy is that so many of us will pass away without making a contribution to the spark of brilliance that will light the way of the future. Yet, we too, are part of a plan - a scheme - a design that we shall never completely comprehend - without recognizing the spirit that accompanies all of us on this journey. Hope, faith, and love are there to sustain us - the truth is there - and it shall prevail!




The challenge! Have you ever noticed how we are always at a crossroads? There are always choices - and often with uncertainty. As we begin to comprehend the overwhelming consequences of the world's patterns of consumption and wasteful use of limited resources, we are faced with a challenge. The World Resource Institute in 2001 stated it this way - to reconcile the demands for human development with the tolerances of nature. I like this idea - it recognizes that humans have a lot of development to complete - that the journey from single cells to the complexity of humans and the societies that evolved has been astounding and there is every hope and reason to believe that future changes may be as astounding as those recorded in our past - into life forms we might not recognize but more wonderful and mentally advanced than our contrast with ancestors. BUT - the crossroads is here because the world's rapid expansion of use of resources seems to outstrip their renewal or replacement. Most biological entities have a genetic capability to rebuild themselves if conditions are favorable. The nonrenewable resources, like water, minerals, oil and soil need to be used carefully and substitutes found to replace them for the sustainable futures that includes their use.

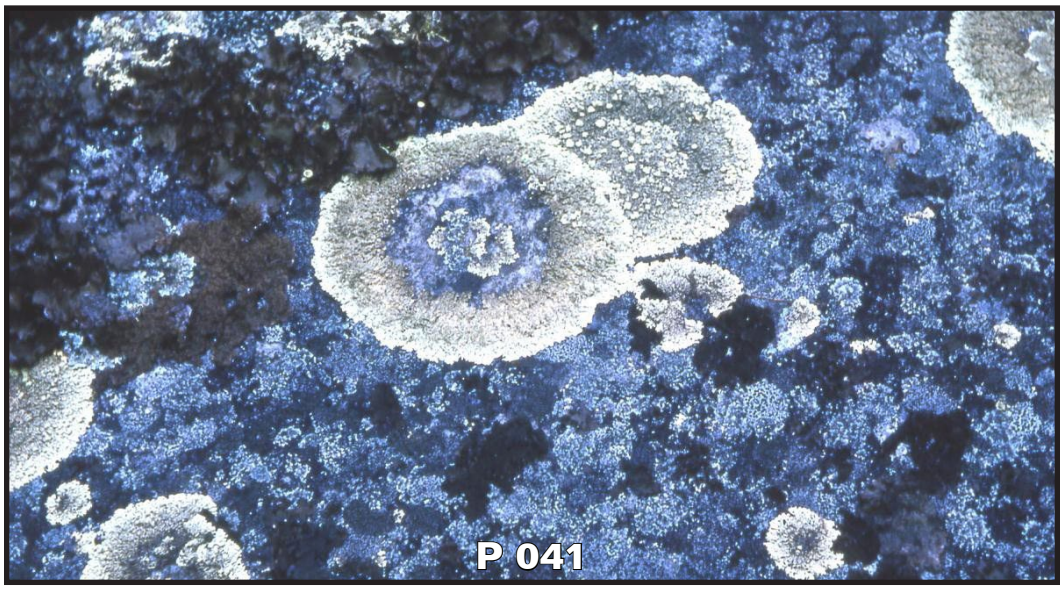
Recycling extends the time period for use of some products. Soils fit somewhere in between as the life-providing biota, mainly microbes, can help rebuild or maintain some level of fertility but the conditioning of substrata of many soils require long time spans to generate conditions favorable for plant and animal life. Natural soil fertility in natural ecosystems is a finely-tuned process that supplies the required nutrients to maintain certain levels of biodiversity. Those levels are generally far below the desired levels of society - and will not support current levels of population. Thus, there is a large demand for external inputs of fertilizers - either or both natural and artificial. The real costs of nutrients added is never reported, seldom calculated, and never heeded when suggested. The patterns of human use and consumption worldwide are out of whack with nature. Does nature really have tolerances? Tolerance is a human concept and more or less implies acceptance for something even when it doesn't quite agree with our feelings or beliefs. Does nature have tolerances? It may seem that way but in reality, nature and the earth is primarily energy and it responds to changes of energy - it is recorded in some places and in others - it is dissipated and dispersed. So, when we extract minerals the earth doesn't hurt - it doesn't blame us for the invasive actions. A severely eroded soil doesn't understand the good intentions not to harm or injure the capacity to support plant life - it is simply recorded as a stripped away layer of surface soils, or a depleted amount of soil organic matter. It is up to man to evaluate the properties of ecosystems and determine what is sustainable and what is not. When the limit is crossed - can we do things to bring us below the limit - to approach sustainability - to maintain a meaningful global habitat? How does one measure tolerance and even when we have

reasonable estimates will we have sufficient collective wisdom to do enough of the right things in the right places by enough people to truly make a difference? It is really a challenge!



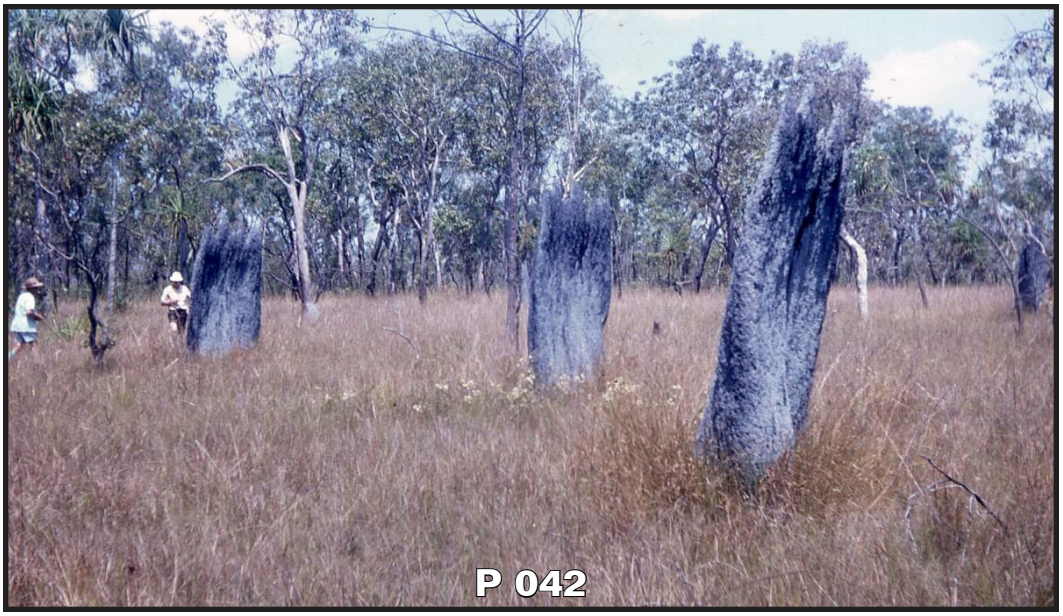

This artist's rendition of a country road is a view from the road to Terrapaima - a high hill south of Barquisimeto in west central Venezuela. The high ridge in the upper left is a terrace of Rio Turbio and is also the east edge of the urban area of the city. In the river valley are some light green corn fields. This painting was made by a friend of the Briceno family who owned a summer home on top of Mt. Terrapaima. We lived on the edge of that terrace during a sabbatic stay and could look across the river valley to that hill. Several times we were driven up that road to visit the Briceno estate. It was open, refreshing and a sharp contrast to the hustle and bustle of downtown Barquisimeto with its narrow one way streets and honking traffic. Three or four miles to the west on the terrace was the other end of the city and there the agricultural campus of the University Occidente was located in a number of barrack's style one story buildings. Interesting how a painting realistic of a familiar landscape releases a flood of memories. This painting for me lets me stand on the road and be absorbed into the environment - a picture warmer that a photo would ever be.


Stories about rainbows are legendary - the mystery of colored bands in the sky are warming to the heart. An Irish tale of "a pot of gold" at the end of the rainbow has touched the imagination of fantasy for generations. It is a sign that if we follow the rainbow we may be rewarded with something golden. I think it is marvelous how most sights have been linked by stories passed on from one generation to the next. Stars have stories linked to mythical gods and goddesses, of animals, of yesterday's stories related to various cultures. Plants, animals, colors, bodies of water, leaves - winds, clouds, sun sets - all things in our surroundings are part of the rich legacy of those who came before - and just as surely will be part of what we pass on in our own ways. Imagine a drop of moisture serving as a prism to separate white light into the middle spectrum of colors. We are fortunate to have this marvel as part of our daily experience. Looking under a microscope suddenly we see a rainbow of color. Reflected rays of light on a beveled glass or mirror send shivers of delight through us as we watch spots of the rainbow dance on the walls and ceiling. Rainbows are bridges from one level of consciousness to another - maybe leading us to some degree of unconscious understanding. The pot of gold is a treasure of the mind - to be enjoyed and shared.




Most pedologists believe the phrase "factors → processes → properties" which means that the 5 soil forming factors have, and do, interact in space and time in such ways that soil forming

processes transform a parent material into recognizable soil properties. Originally the concept was that factors as they occur have influenced reactions that result in properties that are not strictly geologic or biologic, rather the properties are pedologic. The major emphasis was provided by Do0kuchaev and his students and colleagues in Russia in the 1880s. In the U.S. we became familiar mostly with Hans Jenny's presentation of the soil as a function of the 5 factors - a factorial equation, S= f(cl,o,r,p,t, …). As an exposed rock (one of the factors - parent rock or material) begins to respond to climate, a biota settles in and through biogeochemical processes manages to colonize part of the surface and it supports an evolving biota that keeps weathering the minerals of the rock producing smaller particles by physical and chemical decomposition and may through time - a lot of it in fact - produce a layer of "fine earth"; that supports higher life forms and a soil - at some point -is recognized. Spores of lichen and mosses are carried by wind and water. To the naked eye it is more likely that lichen are the early invaders - the pioneers - that are visible in the early stages of colonization and transformation. Concentric patterns, like growth rings, seem to often characterize many lichen. Here we see color patterns in the growth patterns. Like bacteria growing on an agar jell in a Petri dish. Some patterns appear as ripples on a pond of water and uniformly expand until constrained by a neighbor, a change of substrate, or other conditions in the environment. What if soils, as we think we recognize them, are the result of a migration from points across a geomorphic surface that has been exposed to the other soil forming factors? Can we build a model that might simulate the growth of patterns associated with processes and produce visual images that look similar to detailed soil maps? We have learned to expect repeatable patterns of soils in specific landscapes - how do such patterns develop in response to cause-and-effect processes and interactions of the factors? How much is really deterministic versus random? Ah, how we are intrigued by the interesting shapes, sizes, and colors of lichen on exposed rock surfaces -they prod our imagination and generate creative possibilities.

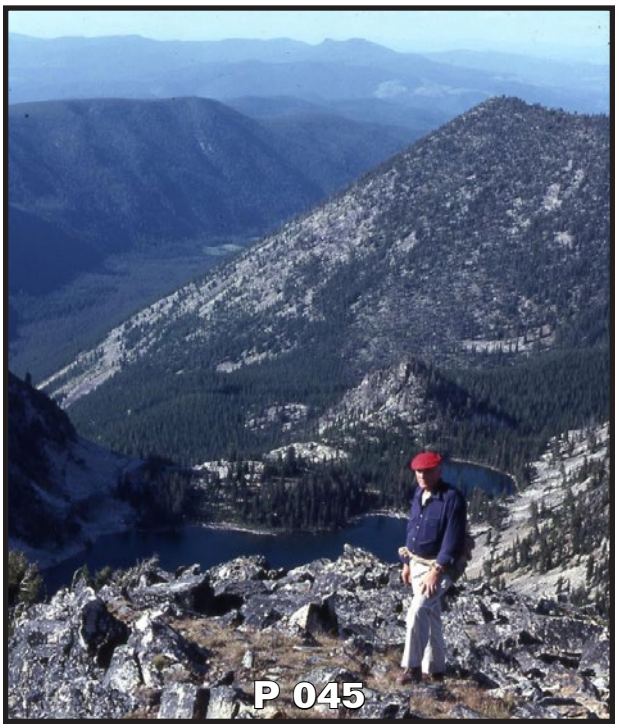



Often we are surprised at new sights. Walking in a grassy clearing among small eucalyptus trees near Darwin, Australia there were tall dark spires rising to heights above our heads. They are broad but narrow and resemble a closed hand rising from the earth. The top edges are jagged and usually darker colored than the basal portion. And throughout the area the broad flattened sides are lined up - they are not in random juxtaposition with each other. The explanation of these interesting spires is that a certain species of termite build their colonies here a Vertisol soil (dark, sticky, clayey soil) - the nests are built up above the water table that is seasonal in this area of Australia. These termite mounds are in line with magnetic forces of the area - why and how - is not for us to readily know but here is a biological form that responds to an energy stimulus and has its own survival instincts passed on for millennia. Wonders of

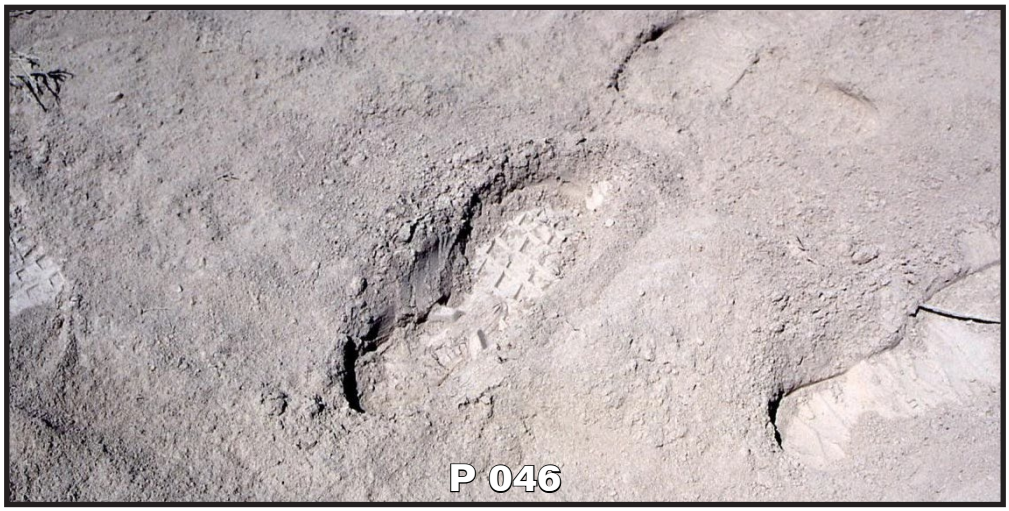
nature unsurpassed! Adventures of the mind can be found almost everywhere. Mysteries are the unexplained - forces of nature - seemingly answering to powers beyond our realm.


Nature's plow at work in the north humid temperate regions of the world. Tree throw - look at the amounts of soil and stones that are uprooted when a tree loses its footing and topples over. Walter Lyford, a soil scientist at the Harvard Forest in Petersham, MA along with Canadian colleagues determined that the eastern forests were pocked with tree-throw debris. Going back over weather records they found that about once every 200-300 years a strong hurricane had moved inland and accelerated the blow down of vulnerable forest areas. With some C14 dating to confirm the possibilities they eventually could recognize and map at least 3 generations of tree throw pits and mounds. What a story carried by the affected landscapes. With time the earthy debris and soil residue will be washed off the root system filling in the lower portion of the "cradle" while the "knoll" will become a low mound resting on the buried surface - notice the lack of any major tap root for this tree. Most leaves are of deciduous maple, oak and other species. The flat rock slabs attest also to relatively shallow depths to underlying bedrock. So in a thousand years this field of forest will be plowed by the dynamic plow of nature. Is the soil cover then a "biomantle"? Call it what you will, this disruptive force alters drastically the formation and evolution of soil horizons. The former horizons are mixed - almost willy-nilly - organic debris - leaves and old A1 soil horizon materials get buried in the pit - water stagnates and iron reduction is facilitated on a micro scale within a moderately well drained landscape position. Some older forests or those inhabited by evergreens - mostly pine and hemlock - develop micro podzol profiles - time after time - but the grim forest reaper resets the pedologic clock and the weathering of some iron plus the efficient staining by organic solutions color the subsoil a yellowish brown - time and again. Clay migration within this upper ½ -1 meter is seldom detected - and soils are kept in a youthful stage of development even as the soil materials get older and older. Rejuvenation, successions of vegetation occur and the mature forest is ready again for the forces of nature. Always then - the pedologist interested in genesis and evolution of soils - must be alert, keep an open mind and be impressed by the majesty that accompanies this seemingly wanton alteration.


Isn't life just full of stories - or at least imagined stories? Would you like to add your story to this picture? Emotions, events, players, time lines, and whatever else comes to mind. When we associate features with anthropomorphic traits we envision a tree has imprisoned a boulder and now stands guard over its prisoner. Why is the cage so high - more than needed because the stone won't stretch. In the background is a tree trunk of a fallen tree and here and there are uprooted trunks with root mats standing vertically when once they were horizontal. A storm can upset many things - human and non-human. Depending on conditions at the time of upheaval, stones embedded in soil and roots can be displaced and covered with the soil washing from an upturned root mat. A new habitat is formed on this mound of disturbed soil, a tree sprouts from seed and plant succession continues. The root system reaches out and down to find solid ground - unknowingly enclosing a boulder. Now at stage three of evolution, the mound is eroded away. Time - rain - ice and snow - freezing and thawing - so many events of the passing years slowly take their toll - eroding away the loosened earth - exposing a root system that developed on a tree throw mound about 18 inches or so higher than what is present now. A plucked boulder now finds rest again on the near horizontal surface. Cycles of events each with a story - each with clues that we may or may not see - or even choose to see. Soil science is like this - a way of deciphering from the colors, structures, textures, patterns and general environmental setting - stories of the past - unseen passage of time - unknown happenings - without human intervention and usually without human knowledge or experience of what has gone on before. What is a useful clue to one person is insignificant to another. What is fascinating and tantalizing - teasing a fantasy of thought for one - is a simple random non-entity to another. So experience - curiosity - imagination - intrigue - desire - all attributes of the mind that lead us along the pathways - assumed and uncertain - of pedogenesis - to the stories within stories within stories. Fantastic world!




Relevant? Significant? Purposeful? Why me - why now - why where? There are places that reach deep into our psyche and assure us that even though the world is big - and uncertain - and continuously changing - there is an intelligence that permeates all - the marvels exist at all scales that we know or even imagine. Is cause-and-effect a human desire to ask the intelligence - why? Is this desire to know - to understand - to comprehend the legacy of the tree of knowledge some mythical explanation of wanting to know more - to see relationships - to recognize patterns - to think outside the box from time to time? This is not a high mountain peak that invigorates that burning desire to achieve goals that are often dangerous to reach. A modestly high point in what appears to be a plateau surface - a pediment of far ancient times - a beveled surface that truncated tilted rocks from long gone sea beds. And as uplift continued the steams cut deeper and deeper forming new levels of the landscape before plunging farther into the rising platform. How many climates, how many thrusts of tectonic continental plates took place? What is the story behind this landscape in northern Idaho? Here there are more recent mementos of glaciation - U-shaped valleys - cirque basins - paternoster lakes - frost-riven boulders and angular scree on steep slopes far below. The haze in the distance -is it the pheromes from evergreen forest that add a sense of mystery - that gives rise to descriptors like Smoky or Blue Ridge? Is this a lonely place? Oh, no - it is comforting - it is enlightening - it is with good feelings - for nature, for God, for being alive, for being in the presence of wonderful grandeur. I am grateful for the opportunity to have been to a few such places in my lifetime - they have given a strange sense of belonging in a world I will never understand - to be at peace - to look into the future - to see into the past - to be in the present. If heart strings sing and resound - then I have been there - it is good. Is one person really important? To whom - for what reason - why? I like to believe it is so - and if so - that it is a blessing that fits with the eternity of a universe in which we are a piece of flotsam.



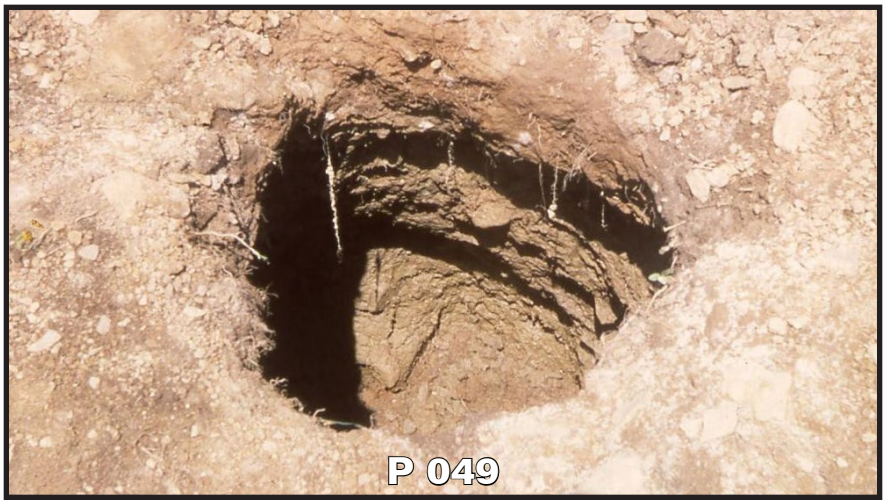

Not often enough do we look to see where we have been and the impact that we have had on others - the footprints in the dust of time. Sometimes we sink deep into the soft fluffy conditions of the moment - looking like a lasting imprint on the world around us - but soon gentle breezes whisk grains across the surface filling in the depressions - the hollows -and evening

out the irregularities. What we thought was astounding - impressionable - great stuff - is soon obliterated never to be seen or heard again. How fragile our sensitivities - how short the walk across the stage of our life. One is reminded of the difficulty of walking in another person's moccasins before passing judgment on that person. Our experiences, our training, our beliefs and culture have tempered our personalities and molded us such that our reactions and behavior are close to reflexes of survival. So how could others walk in our shoes - follow in our footsteps? Impossible - yet we hope that empathy becomes understanding, a kind of forgiveness - a balm of salvation as we take footsteps in a new direction. Foot prints on hard exposed rock surfaces are unseen by others - but the path may have significance to our being - a journey of aloneness - of solitude - of a new way to reach yonder horizon. Symbols - of course - useful - I hope so - reminders that we ask forgiveness and learn to forgive as part of the process. Foot prints in the sand are like messages of kindness and caring that are slowly swept up by the eternal washing of the waves - carrying ideas across the ocean across the chasms that separate us - one from another as we struggle to be heard - to share a commonality that resides in our heart - that lets us be sojourners during this brief interlude of the souls - wonderful - exciting - consoling. And where are footprints remembered - the greatness of our ancestors - the wisdom of ages long gone - some are etched in our minds - more are left in the written world - others wrapped in the musical notes of emotional outpouring. Maybe a flower planted in a new place - a whistle of mating birds - the passing amoebic forms of clouds - the voice inside helping us know what is right and wrong - the smile of a child - the cry of a kitten - the touch of a friend. All are footprints of value - treasured mementos of the past.


This is a pipeline trench in western Ontario in soils that are dominantly Gray Wooded soils (Boralfs). Today they would be cold-area Luvisols in the World Reference Base of IUSS. The classification is not why this picture is so special. The relevance is in the way you can follow the merging of horizons down the slope and the replacement of one kind of horizon by another - follow the banded layers of light and dark that exist in the foreground. In the sag, the low spot, the soils are dark and there is water standing in the bottom of the ditch. This lateral blending reflects the increasing wetness going from an upper slope to a saddle, or low area. If one takes the two extreme positions in the landscape the soil differences are quite easy to recognize - but as you move toward the other extreme it is uncertain where boundaries occur. Wherever one decides to place a limit there is uncertainty and separating this continuum into segments appears arbitrary and self-imposed by the viewer. Here is a classic example of the debate about whether biology is a collection of continua or is, in fact, a large number of independent individuals. Modern soil surveys in the latter half of the 20th century would apply arbitrary limits, here associated with horizon arrangements that relate, more or less, to the existing shapes and slopes of the landscape. By so doing, a continuum has been segregated into compartments and with judicious care a central concept of each class (segment) can be described to represent this

member. Its boundaries become secondary but are based on the best judgment of the surveyor and his/her knowledge of the relationship of horizon sequences to landscape position. It is this process that creates the mental models of soils in landscapes. Within a limited spatial range such models are feasible and practical but as the area of concern increases the boundary limits shift and perhaps even the central concept, the modal profile, the characterizing pedon also reflects the influence of interactions among the soil forming factors as they impact processes that form soil horizons. A physical analogy of this dilemma is the visible electromagnetic spectrum - more on this later. Road cuts, quarry faces, pipeline trenches - vistas of the complexity that exists beneath our feet - and it is a humbling experience to realize that science has yet to find satisfactory techniques to define, decently sample and characterize these phenomena.


Some days the complexity of the world around us seems too large, too mysterious and we need help to solve the riddles of nature. To the experienced who have stumbled but eventually learn how to solve the “Cat’s cradle” string puzzle the repetition of a particular pathway to achieve success slowly becomes fixed mentally and not easy to change. So much of life is this way - biases drilled into our mental visions, our untried experiences, accepted on faith because we have been trained what to think and say rather than how to think and talk. Change is resisted with a stubbornness that easily transcends rational thought - such beliefs are fundamental to how we operate and behave - yet as we begin to realize that life is all about change and that we really know very little about our world and the inhabitants that occur throughout its space, it is a threat to our peace and contentment. The seasons come and go, vegetation has rapid cycles of evolution, time does not stand still, the sun and moon appear to move and the greatest mystery of all - the human mind -struggling to cope with the need to adapt, to try, to fail, to learn, to move ahead - uncertainty is the spice of adventure into all the tomorrows.




There is something almost mystical about a hole in the ground. Small ones may be made by earth worms or ants, larger ones by cicadas, and much larger ones by many burrowing animals - chipmunks, voles, moles, wood chucks, prairie dogs. One day Milt French, SCS soil scientist in

Bath, NY called my office - “Dick, can you come over - we have quite a striking phenomenon uncovered by the farmer’s wife who was disking a field after it had been plowed.” This was way up on the Appalachian Plateau - my beloved Lordstown Country. The nearly level silt stones had been scoured by early glaciers and in some places a thin blanket of basal till was deposited by later glaciation. In most instances a firm, often brittle substratum - maybe dense till or often a fragipan - was overlain by a thin - up to several feet of ablation drift. The dense material commonly perched spring snow melt waters - saturating the upper mantle. Okay, away I went to see Milt and go to the farmer’s field high on the plateau. Walking out in the field to a place indicated by a few boards lying on the surface - we came upon this “hole in the ground”. None of us had an answer - only questions and speculations. But beyond that I was struck by the notion that soil scientists were often accused of having their “heads in the sand” - looking at profiles lying beneath the surface. Living in a dream world is often what others thought. And here was an honest-to-goodness example - way up in the hills - isolated from most folks - yet a neat rounded opening into the mysteries of another world. I love it! You could see some natural layering around the edges. Why would such a hole be out in this field - perhaps a hundred feet from the field’s boundary with a steeper non-farmed slope facing the NW? Why indeed! Not an intelligent location for a burrower’s home - no mounds of dirt piled around the edges or scraped back into the hole by passing farm machinery. Looked awfully big for a larger animal - fox, coyote or what have you. We certainly thanked the land owners for notifying us about this “hole” - this window into the unknown - this challenge to our concepts and theories of how landscapes formed and how soils evolved under changing climate and geomorphic circumstances. Thank goodness for the curiosity - the questioning mind of humans - asking for answers that to us were not known. Wonderful how the world keeps bringing on surprises - but when and why and where - planned, ordained, chaotic, random - or just something to help us think!


When we went inside this hole in the ground it was like nothing we had ever seen in this area. I was waist deep in this hole, my shoe is in the middle, and there are soil stalactites hanging from the upper edges. Shades of a soil cave here in the middle of a farm field on the Appalachian Plateau. These tongues were in the dense basal glacial till. We went to the edge of the tilled field, got a long branch about 10-12 feet long - we could shove it down at a slant in this channel carved into the soil - it pointed to the edge of the field where a drainageway existed. We never found an opening where soil had been washed into the drainageway but we weren’t experienced with such things. I remembered Alfred Zinck, a soil scientist in Venezuela, explaining “suffusion”, a near edge effect whereby surface waters filtered through cracks, or possibly outlining edges of prisms and slowly moving out the material. In Venezuela little ponds dotted the plateau edges and small springs occurred in the adjacent drainageways. Could that be the situation here? Why not? We had no prior experience relevant to this fascinating upland soil phenomenon.


To a person who grew up in a prairie region - a grass savannah stretching beyond sight - or even in the anthroposized remnants of such venues - there is a strong tug on the heart when the majesty of unseen Earth suddenly appears in view. The darkening of upper portions is endued now with life giving humus where vitality slowly builds over the centuries - through periods of drought, of floods, of wildfires, or tales of mankind's quest to become a part of this ecosystem - or perhaps more so to control the restlessness of waving prairie grasses. The root systems of many generations of grasses, herbs, and the interacting animals and microbes are memories held within the profile of today's Mollisols. Here the forest, it if ever existed, has not been a major contributor to this fascinating set of characteristics - the darkness extends into the granules so when crushed only a lighter tint of uniformity is observed. Like a sponge the rains are absorbed o slowly wet a path downward. - the uniformity attesting to processes of homogenization of texture and pedality - endearing such an envision to plants who find niches and companionship to bestow seasonal flushes of color, fragrance, and intricacy of using the available resources. Deeper in the profile are browner colors and larger aggregates - clumps, subangular blocks, crumbs, and then an enclosing columnar or prismatic structure that gradually merges to a less modified substratum. The classic Chernozems of Russia are similar but highly calcareous in the subsoil. This soil has less secondary carbonates attesting to more leaching over time at this site. The ever searching rootlets capture and return nutrients closer to the surface than a systems of trees - such a cycling has endowed these soils with a high inherent fertility that has endured with minimal outside inputs for a century or more. But like all resources, if pushed beyond resilience limits, the fertility declines and eventually the productive capacity is disabled and outside help is needed to maintain reasonable outputs. Most remarkable are the activities of the ongoing evolution - natural and anthropogenic - that have donated features to these fantastic soil profiles. This is an ideal soil for many types of agriculture - and of a rich cultural history.


Water tables relatively close to the surface occur in many locations in the world's savannah regions. In older landscapes the process of dissolution and removal of compounds is called

suffusion and often gives rise to isolated ponds and intermittently flooded areas. In younger landscapes such as this one in a glaciated region the lower positions, either along drainageways or in kettle holes that cumulate sediments, develop soil features associated with hydromorphic conditions. The lower exposed portion in this profile has the grayish bluish color attributed to gleying where oxygen is depleted by microbial activity and iron compounds are reduced (ferric reduced to ferrous). Where the processes are still active alphaalpha-dipyridyl solutions turn red on cut faces. Above this gleyed layer there are brownish yellow colors associated with better oxidized conditions. Some folks interpret this as an eluvial (E) layer whose iron compounds were translocated and possibly some clays also. For others it is a zone of some iron oxidation and/or staining by organic matter - thus it may be a cambic horizon which may relate to the intermittent wetting and drying throughout this part of the soil. It appears to be a relict A horizon where surface biota lived and died. It is a marker between a developed soil and infilling sediments washed into this low lying landscape position. Now the new parent material takes on the nature and properties of an A horizon. In terms of landscape and soil evolution, a former prairie pothole has slowly received sediments from the surrounding surfaces, burying one stage of soil development with partially altered surface soil materials which now are stabilized and mixed by agricultural practices - plowing mainly. Classification recognizes the wetness expressed in this profile but has no facility to indicate the changing environmental conditions - a story still waiting to be told.


A classic podzol soil. Podzo was an old Russian term for “burned ashes” - light whitish gray colors - so common to the remains of smoldering embers of wood fires. Under acidic solutions derived from the forest litter, iron and organic matter are mobilized and translocated to greater depths in the profile. In soils that were thought to have a zone of removal - usually of clay and some iron oxides, the soils were called “podzolized” because of a lighter colored zone of eluviation. Eventually emphasis was given to the underlying zone of accumulation rather than the impoverished overlying one. Why? How do you know something has been removed - that is a comparison that cannot really be measured -only assumed. On the other hand, how do you know something has been gained? Loss or gain in this sense is relative, thus to afford a decision some depth distributions of properties can be interpreted. Speculation but no proof! This profile has a bright yellowish brown horizon beneath the light colored overlying one. It is possible to measure iron, organic matter, clay, color, and some other properties. One may assume they accumulated there. One can measure the same features in the whitish layer and then compare the two horizons for relative differences - usually more of something than the underlying horizon. The sesquioxide “enriched” zone is now referred to as a spodic B or podzolic B horizon if it contains sufficient amounts of designated properties. Such is the basis of “diagnostic horizons and features” commonly employed in most current soil classification schemes. Soil profiles can be associated with vegetation and climatic and geologic conditions - which gives rise to support for the concepts of soil genesis and evolution. Voila! The basic precepts of pedogenesis. However, one may simply observe the layering of this exposure - be enamored with the beauty of such an arrangement without wondering why or how or when. Ah - the mystery of nature as observed by humankind. Fascinating!


This soil was observed in eastern Thailand. The bottom of the tape disappears into standing water which attests to, at least, periodic water logging of the substratum. The red blotches and streaks are associated with iron oxides in various stages of crystallization - thus some is plinthite and some is not. The transition to the horizon is sharp - in fact, so sharp that one suspects it is not a natural developed zone of transition.

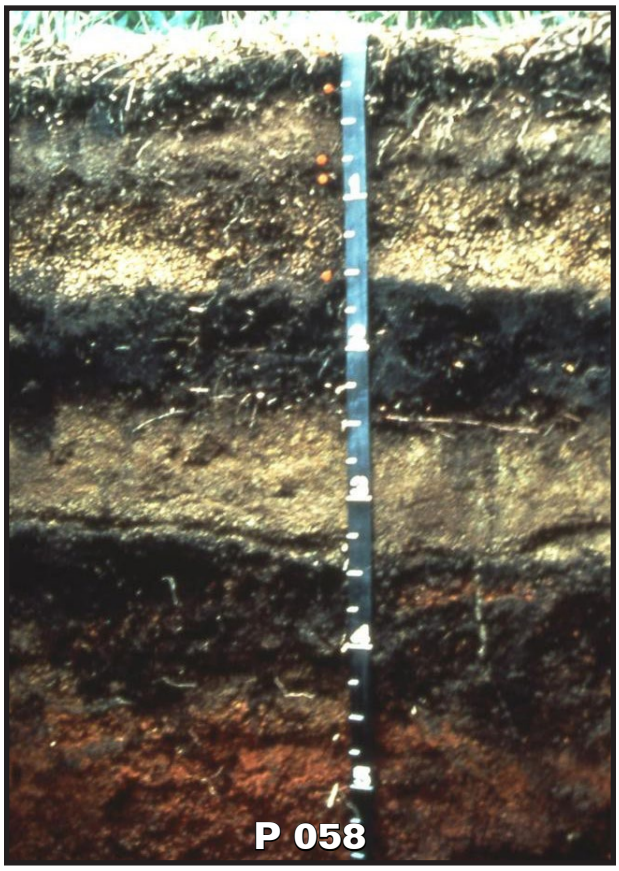
It looks like a discontinuity of materials and horizons. The landscape position today is an upper toeslope or a lower footslope. The light brown layer is reasonably well aerated and does not reflect gleying or other features associated with periodic water logging - either by capillary rise or by surface wetness. The darker surface layer is associated with cultivation and grazing of similar land nearby. The contact can be traced higher in the landscape into redder soil materials that are also mantled with material similar to the yellow-brown of this profile. Landscape evolution reasoning suggests that this area has been uplifted with the result that a lower lying swampy area, a more recent toeslope lies farther west. An old erosion cycle has truncated the previous landscape and as the upland slopes retreated (eroded) into the higher lying materials the sediments so removed were transported downslope and many were deposited on the lower footslope and into the toeslope basin or shallowly flooded lowlands. The upper sediment body is too thick to have been deposited as one uniform body - consequently it represents a period of landscape instability with active erosion and deposition (pedimentation at its best). In many parts of Thailand one observes benched or terraced (stepped) landforms coming from steep slopes shallow to bedrock, across terrace remnants of old soils, then at lower levels remnants of ironstone (hardened plinthite) and below that more recent sediments and landforms before dipping into the floodplains of gently meandering modern stream channels. What a marvelous storehouse of landscape history and some of its variations - even some landscape inversions. Wonderful to behold!


A sense of correctness. What does that mean to us? Professionals take pride in their work and some of it is art - and showmanship - to display objects at their best. Dr. Marcel Camargo, leader of the Brazilian soil survey, was one those professionals. His associates had opened a large soil pit for an international group of visiting soil scientists. But no one was permitted entrance until the pit face had been appropriately shaved and cleaned. The eye of the master examined, touched up, and finally his blessing was given. No sloppiness here - loose crumbs were removed, a light spray of moisture to enhance the drying surface - a picture of museum quality before our eyes prepared with the utmost skill equivalent to any artist. And what a portrait is being presented - a pseudo plinthite evolving into plinthite in an Oxisol in central Brazil not far from the new capital. The mixture of Ultisols and Oxisols in the cerrado expanses of this area were wonderfully hidden by the gently undulating landscape. Such professionalism is a lesson for all who are privy to it!


A simple worm or screw auger. The space is just right to accommodate a thumb and a forefinger held lightly so that a ribbon of soil extrudes into the hand - held in the palm awaiting the kneading to estimate texture - to check on colors, detect inclusions of coarser particles or

nodules. After some years the process is almost automatic - like a condition al reflex as the mind pieces together the input from the senses. Visually the position in a landscape is duly noted, the vegetation and variations indicative of patterns, evidence of disturbance by animals and/or plants, or man - the season and the effects of recent weather - a feeling about the geomorphic components. Drainage conditions, texture, relation with a profile - a mental image of a soil and the story its clues try to convey. Augers - screw or bucket, probes, sharp shooter spades - tools to open samples from an unseen world - the mystery, the beauty, the charm of field pedology at its best.


This is an ice wedge in an organic soil in the Canadian Arctic. This is a valley floor area nearly level to slightly sloping away from the steep bedrock walled hills. Most of the subsoils here are permanently frozen - but because the summer thaws and thunderstorms add moisture to the site it is enriched with water forming a continuous thick layer of ice. As freezing occurs in the fall the organic layers are heaved upward and there is a hummocky micro-relief that you can see here with the surficial fibrous matt of mossy vegetation. Some years ago a road was extended across this valley resulting in more thawing than normal. Near the road the ice began to melt and the soil collapsed into its own puddle of water. The water moved through conduits under the road. Slowly a meandering pattern developed in response to the lowered base level and the classic example of upward migration of a small stream channel was initiated. Now, at more than a quarter of a mile from the road there are deep channels, usually flooded in summertime, as the melting occurs along the channel faces which are not protected from the warm temperatures and bright sunshine of summer days. A man induced alteration of the landscape in sensitive permafrost regions. The soil as we observe it in this exposure has a fibrous root mat, an Oi layer over a moderately decomposed organic debris layer, an O e horizon resting on the “glacic” ice layer which in turn overlies layers of alternating lenses of ice and partially decomposed organic materials. Further away in the valley are ice centered pingos contributing their unique forms to this landscape. You can no longer walk across this “eroding” melting landscape - the channels are too deep and ice water sloshes in the bottom. Nature has many ways to unveil her secrets to us - begging us to listen to the stories that have remained hidden for such a long time. It is good to experience such phenomena because it is a humbling one - seeing the forces of nature responding - without judgment, no blame or praise, only the fascinating exchange of energy. I am grateful for such an opportunity. Will I understand?

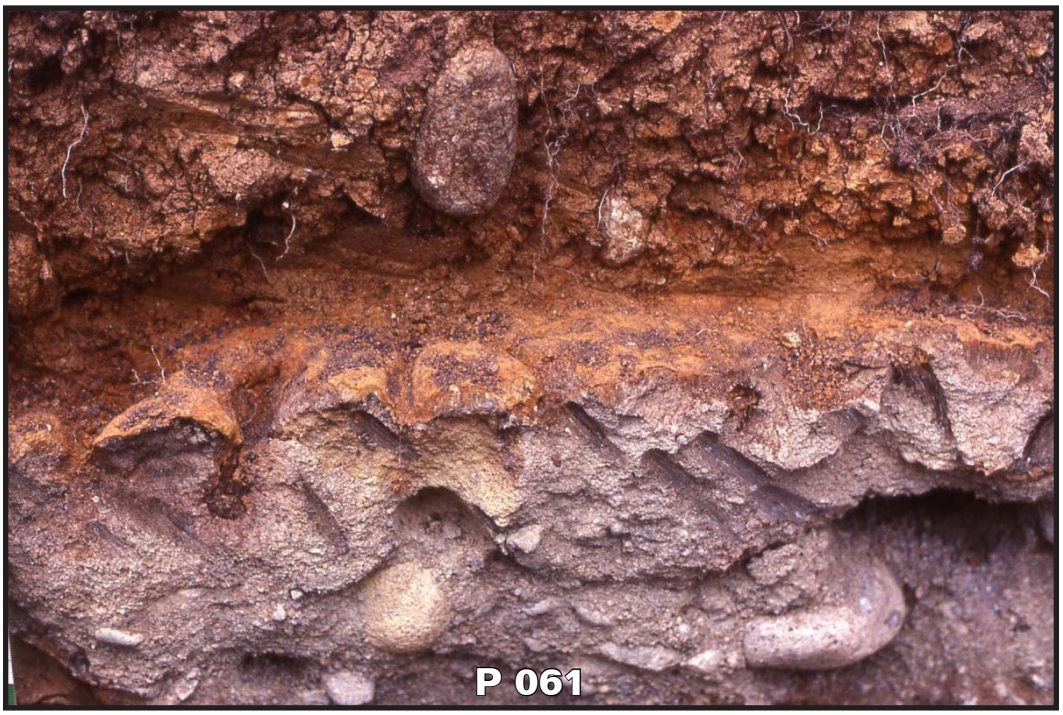



The novice and all but the nearly blind observe strongly contrasting color bands in this exposure. In the earlier days of genetic interpretation here were invoked the marvelous processes of mobilization and translocation of numerous organic compounds - repeated several times during the evolution of this site. He who lives in a volcanic part of the world experiences the ebb and flow of volcanic cycles - periods of violent eruptions and the spewing forth of ash far and wide - unique in mineralogy, color, and duration. And slowly comes a realization that these forces of nature are also makers of markers and they leave traces of times and events long past. How many hundred - nay, how many thousands of years have left their stories at this site? White pumaceous ash and tuff deposits are soon colonized and the organic stains and admixtures soon develop a black, very black surficial layer protected and exaggerated by the properties of rapidly altering ashes. How much of any story is a myth built upon the imagination of the interpreter? The truth is but a fleeting glimpse into the uncertain knowledge of the moment. Be still, be humble, be grateful, be amazed, be blessed!


This roadcut in southern Ontario shows once again subsoil variability that is not predictable from the surface. The light tan is a calcareous sand deposit associated with the last glaciation and possible shorelines of Lake Erie predecessors. The tongues of brown are mainly organic matter stains but also some iron oxidation. It is hypothesized that a pine forest existed here for some time and its organic acids moving along root channels removed the solubilized carbonates as the brown tongues are not calcareous. But a forest does not commonly produce a thick, uniformly dark surface horizon. Deep plowing was undertaken to prepare land for tobacco thus major shifts of land use and management are a part of the story recorded

here. Only with exposures such as this is it likely that working models of soil genesis and evolution in this region are appropriate and reasonably correct. It is a lesson to help us constantly test, revise, and improve our mental models of the landscapes we traverse!


When we moved to Guelph, Ontario in 1963 I was introduced to Guelph loam - a soil dominating the gently undulating ground moraine of the area. An interesting profile - the white spots are limestone rocks in the darker colored and clayier glacial till. Above is an organic enriched surface layer and beneath it is a brownish horizon. Often you can detect a darker portion directly under the surface layer and lighter portion above the gravelly loam glacial till. The "powers that be" - that is, the older, more experienced soil scientists including Pete Stobbe, Alf Leahy, Reuben Wicklund and others explained how the intense weathering and leaching associated with initial forests had dissolved the carbonate rocks in the upper layers and leached the carbonates from the soil system. I wondered why and how the leaching could be so uniform as to remove all limestone fragments from the upper layers and also have a rather uniform boundary rather than a wavy or tonguing boundary often associated with prior forest vegetation. I had grown up in southern Iowa where old Kansan glacial deposits were covered by loess of several generations. It was common to find a line of pebbles at the contact of the loess with the till. Robert Ruhe was initiating soil geomorphic studies in Iowa at that time and he introduced us to pediments cut into glacial till, pedisediments - the erosional debris from higher lying slopes transported across pediments and deposited as a lag. Pebble bands, stone lines, processes of pedimentation and often stepped landscapes as hallmarks of landscape evolution were fresh in my mind. Also I had studied a layered loess soil with evidence of past stages of deposition followed by stability and soil formation, followed by yet later deposits and soil formation - mainly in response to changing climatic and environmental conditions. So I was skeptical of the Guelph explanation. I just couldn't believe it and my attempts to provide an alternative model were not very well received. My first graduate student, Mr. Chang Wang, kindly agreed to sample and determine many properties of a Guelph loam soil profile. We used that data to demonstrate the feasibility of considering discontinuities of soil materials - a pedisediment overlying a pediment cut into glacial till and marked by a concentration of coarse fragments as a lag gravel on the erosional pediment. Intense weathering and leaching were not necessary to produce the observed features, rather erosion-deposition cycles did quite well. Some years later I presented this model at the World Soil Congress in Adelaide. Guelph loam became the major starting point of my pedological career of describing and interpreting discontinuities in soil landscapes and their significance to an understanding of how geomorphology and pedology fit together so nicely. And 30 years after the Adelaide Congress I presented a sequel at the Monpellier Congress - mentioning how our methods and data interpretations had improved over a 3 decade time period. There are still quite a few soil scientists who do not embrace such a model for explaining how soil features and properties have developed. The youthful nature and age of late glaciations have provided us with windows of opportunity to explore the possibility of multiple working hypotheses and enable us to keep from having "sacred cow theories" that may be slaughtered on the butcher block of information and facts.

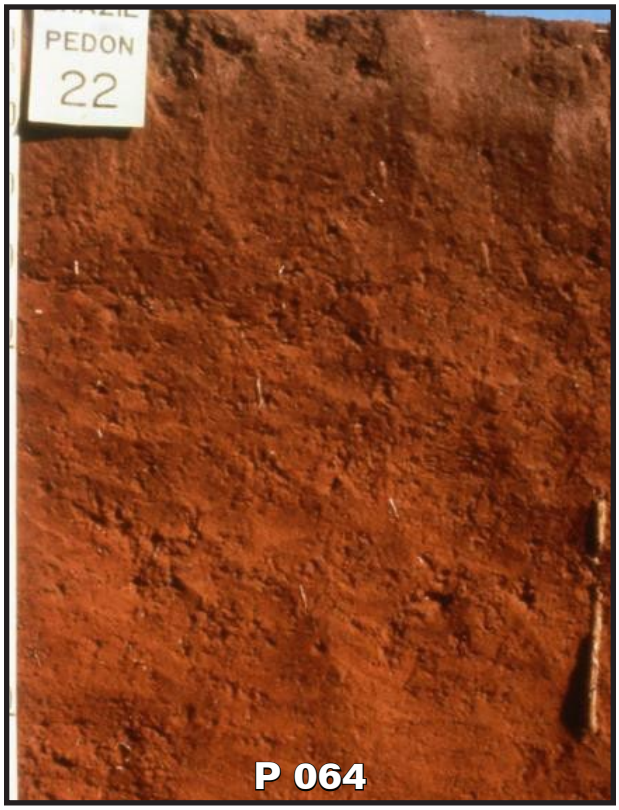



In areas where volcanic ash is common the ash often weathers rapidly because many of the compounds are poorly crystallized and organic acids cause them to dissociate and move within the material - usually downward with percolating water. When the water stops due to absorption or a restricting barrier - contact with denser underlying materials - the soluble silica coats particles or surfaces of pebbles and rocks and as it crystallizes it forms bridges among the particles cementing them together as “duric” materials. As more silica accumulates a “duripan” is formed. All of this is believed to take place where moisture is periodic - that is, both a dry season and a wet season are present. This favors times of solution or transformation and times of crystallization, Xeric and Ustic soil moisture regimes have such periodicity. Solubilized iron oxides and organic matter commonly exist in perhumid conditions giving rise to “placic” horizons - thin layers, almost membranes that move from near surface layers of soils - often highly organic (peaty or mossy materials) and move downward with percolating waters. Such soil conditions are generally acid to strongly acid. The Fruitilar soil in southern Chile (Valdivia region) has more recent ash over a mixture of glacial debris and volcanic debris of former times. And for the first time experience for a number of visiting scientists on a soils field trip here was a placic horizon overlying a duripan - an anomaly of genetic contradictions. The cemented duripan is weakly calcareous. The overlying acid ash marks a major change of sedimentation, vegetation, and chemistry - landscape evolution that holds the key to pedogenesis of this multi-layered soil where climate change - at least the internal pedolclimate -has experienced drastic changes. This Fruitilar soil has been, for me, a reminder that adherence to old concepts is somewhat analogous to having sacred cows that eventually are slaughtered. Here new facts become information that destroys old models - yet permits the adaptation and acceptance of other realities. An open mind about soil genesis is a good thing.


Geology has always seemed like an excellent complement to pedology because geology is more advanced, has many more scientists, better funding and so forth - such that they have observations and relationships among facts that are not always known to us. In the fossil record of rocks there are instances of rounded masses that are fine grained but the boundary is outlined by coarse fragments of various sizes. Sometimes those phenomena have been called “rollers” or “storm roller” suggesting that balls or lumps of fine textured material were coherent enough to survive rolling down streams during storms. Were they periglacial features - frozen balls of mud rolled along a melt water channel? The rolling surfaces presses on pebbles in the stream bed and are embedded in the softer outer layer of the rolling mudball. Geologists have long talked about the tenet that the present is a key to the past - meaning that the many physical events and features have changed very little over thousands and thousands of years. Erosion often uncovers such things for us to observe and contemplate.

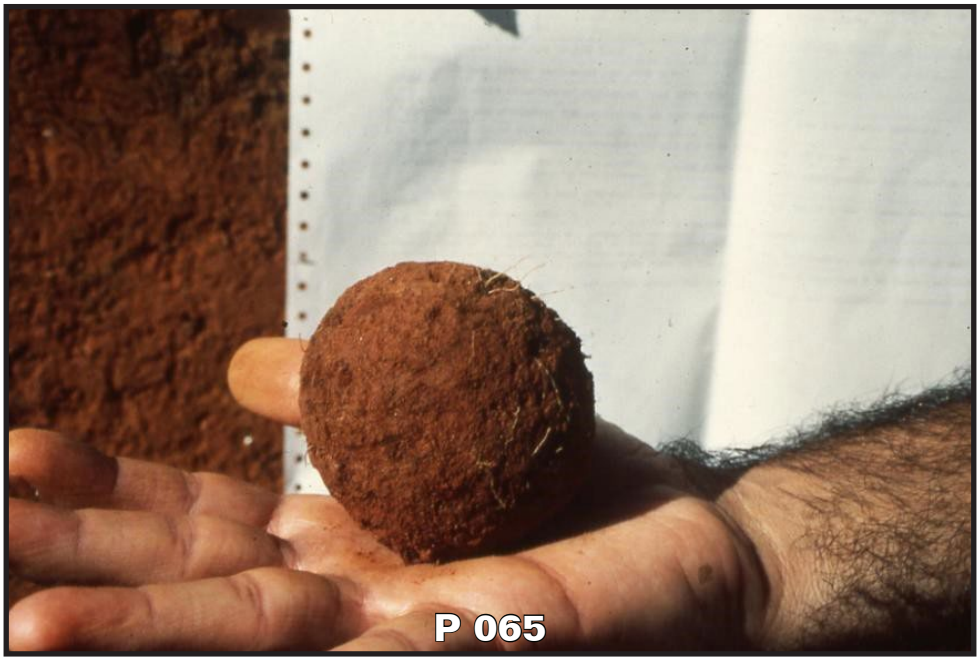

In the mid-1950s I was a soil survey party leader setting up map units for Montgomery and Fulton counties in upstate New York. I was working along the southern edges of the Mohawk Valley. They had been glaciated and then covered by a series of glacial lakes which finally drained eastward through the Hudson River valley. During my investigations on these gently undulating surfaces I had observed profiles with a clayier B subsoil (Udalfs) and others without a finer textured B (a cambic horizon) that were Udepts or Ochrepts at that time. I

had not been able to detect a pattern that gave me any predictability for mapping purposes. They seemed to occur in the same landscapes without any rhyme or reason. One week during a field review with Prof. Marlin Cline, Ray Marshall (state soil scientist) and Mike Work (previous party leader) we had an opportunity to examine a relatively fresh roadcut on a road perpendicular to the river. The landscape sloped from south to north - maybe 3-5% with many areas of lesser slope. The profiles had a dark organic enriched surface layer most likely the result of former cultivation and pasturing. Originally it was assumed to have been forested after deglaciation. One sees some rather large coarse fragments under the dark surface; they are thought to be derived from glacial till and are common to the siltstone bedrock in the area. The zone below and enclosing the stones is a loam to silt loam depending on the amount of sand content. Below that is a clayier, strongly structured horizon or material. We outlined a body of this material - you see it as a light colored mark outlining the area exposed in the road cut. This material is stone-free and has a texture of silty clay loam. Below this material is sediment that we assumed was glacial till - possibly a ground moraine overlying a scoured bedrock surface at some depth - 3-5 meters or more. After describing these features and discussing possibilities we concluded that the clayey material was a remnant of glacial lacustrine sediments deposited during one of the quiet periods of a glacial lake in the area. Although we didn't know the lateral extent or shape it was easy to imagine a meandering stream crossing the lake bed and eroding away channels of clays. Erosion reached through the lake bed into underlying glacial debris or ground moraine. Mass movement on steeper bedrock controlled slopes south of this area could be a source of coarser debris that moved across the general area as a pedisediment leaving a thin veneer of glacially derived loamy sediment with coarse fragments as lag deposits overlying remnants of the lake bed. Because the slopes are gentle it is not known what the configuration was of the meandering belts or streams flowing intermittently across the higher (sparsely) vegetated surfaces as they were exposed by the lowering lake waters. Some rock fragments could have been ice-rafted - held on the bottom of ice blocks in the lakes that moved during spring thaw periods. We felt it probably was not feasible to spend sufficient time and augering to determine the spatial pattern of argillic and cambic horizon distributions - consequently an undifferentiated soil map unit could be proposed for testing. Voila! The magic of imagination involving glaciation.




Surprises, like the dissected lacustrine lake bed sediments, are real eye openers. They are cautions to keep an open mind and observe what has been going on in nature. But from experience we know that mainly we see what we have been trained to see. For example, color changes are commonly associated with different horizons - it may be chemistry, or structure and pedality of the soil aggregates, or changes of texture. Some changes reflect the usual depth of water penetration - that is, more commonly moisture in the warm or hot season does not go through the soil to great depth (3-5 meters) rather it gets absorbed and adsorbed in the upper meter. The implications for biological activity are great - plant roots and microbes are more active where sufficient moisture is available. The color changes in this profile are not very obvious below a foot or so. Slight waviness in the subsoil may be associated with structural variations or rooting patterns. This is a Red Latosolic soil in south central Brazil. It is weathered enough to be a near relative of a Latosol or Oxisol in Soil Taxonomy. The moisture comes in the warm

season and drier periods occur in the cooler season. It would be an Ustult. See the root on the right side? Near the bottom of the exposed root look to the left and there is a slight wavy color and probably structural difference - but these variations are relatively small compared to many we see in other soils. The reddish colors are quite uniform throughout this profile. There are no coarse fragments or pebbles that suggest depositional differences in the parent materials. In fact it is assumed that this soil is old and has formed in strongly weathered bedrock or in transported materials derived from weathered saprolite. Did pedimentation occur in those old geologic landscapes in Brazil? Discordant ridge tops could be weathering phenomena where more resistant beds now stand higher in the eroding landscape. A hint of stepped erosional surfaces suggest that pedimentation has been at work here. Are there any surprises in this soil? Of course!

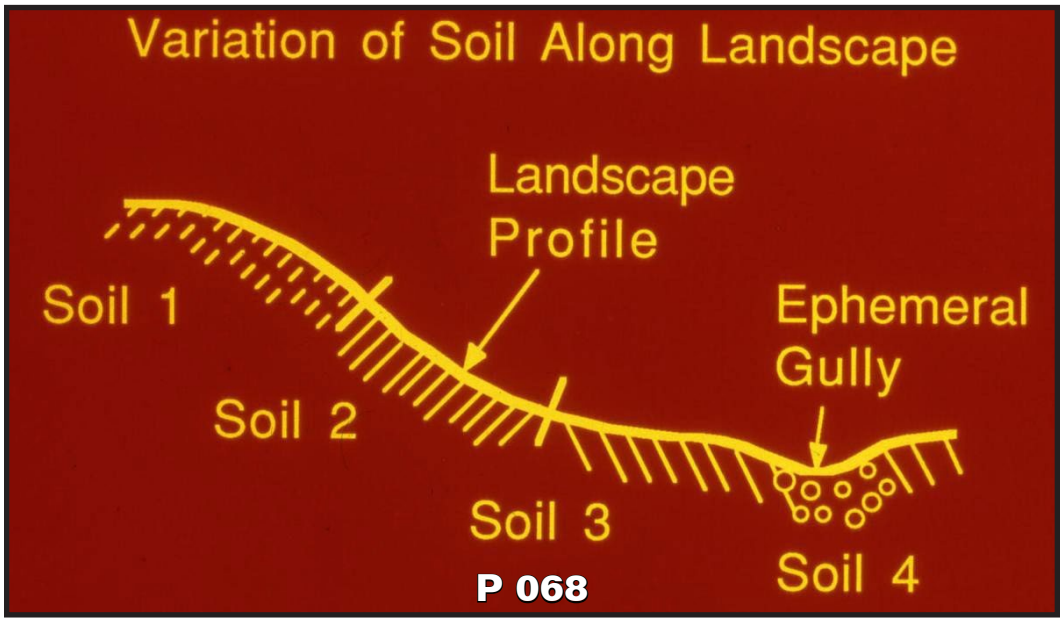



When you gently remove soil from the zone mentioned at about 1 meter depth you tease out a "biological ball". I referred to it as one of nature's baseballs. Obviously it is quite well rounded - the shape with the least surface for the volume enclosed - sounds like conservation of energy doesn't it? Small rootlets can be seen on the sphere's surface. We didn't know whether it was the action of beetles or of a small rodent. It was not in an area disturbed by termites, at least not now. Earthworms are often found in rounded chambers that have been filled in with fecal pellets. We were so interested in the shape and size of the ball that we didn't dissect it. I'm sure many of them have been examined in enough detail to provide better evidence about the makers and the purpose. Several of us concluded that the biological agents descend to these depths to have a dormant stage where some moisture is still present. If so the presence of these balls is one to broaden our perspective; it indicates the long term depth of moisture penetration before the dry season begins. A surprise? Yes indeed - it is!


Many discussions and a lot of debate have focused on the concept of a soil individual. A profile is mainly two dimensional even though we take samples from a small trapezoid or "thin box" of soil associated with the horizons in the profile. Others claim an arbitrary volume represents a soil individual even though the starting and ending point are not necessarily known in advance. One would hope for a small volume that adequately represents the major observed horizon variability. Normal statistics have been used to describe the acceptable range of observable variations but such descriptions are rare except for special research projects. Where horizons are quite uniform in depth and width then a surface area of 1 square meter seems adequate for many properties. A lower boundary isn't defined but presumably includes most pedogenic features or at least those that are still detectable and active to depths of 1½ to 3 or 4 meters depending on the circumstances and the purpose that an individual satisfies. Genesis is one concept, soil management is quite another, and seldom is their overlap satisfactory for both purposes. Soil Taxonomy struggled with this dilemma and eventually defined a pedon "as a small 3-D body exhibiting a major portion of spatial variability observed in the field". The lower limit is generally 1 meter or 2 meters if continuous bedrock is not encountered within those depths. Concepts of soils in the tropics such as illustrated in #64 permits a 2-m depth, but in many temperate regions a 1-meter depth is readily accepted. In the Dokuchaev Soil Museum in St Petersburg, Russia a column of soil from a classic Chernozem (Black soil) of European Russia stands as a symbol of a soil body - a soil individual appropriate for many soil investigations and units used for mapping detailed areas. This 3-D monolith of a pedon is one that closely resembles the image in the minds of numerous pedologists. If we considered various chemical properties the volume would be a contorted, non-uniform entity but such a representation has seldom been presented except on theoretical grounds. This pedon works for me; it works for classifying most soils of the world but does not work for some soils with periodic but chaotic depth distributions of horizons. The logic of matching purpose and definition is obvious.

P 067

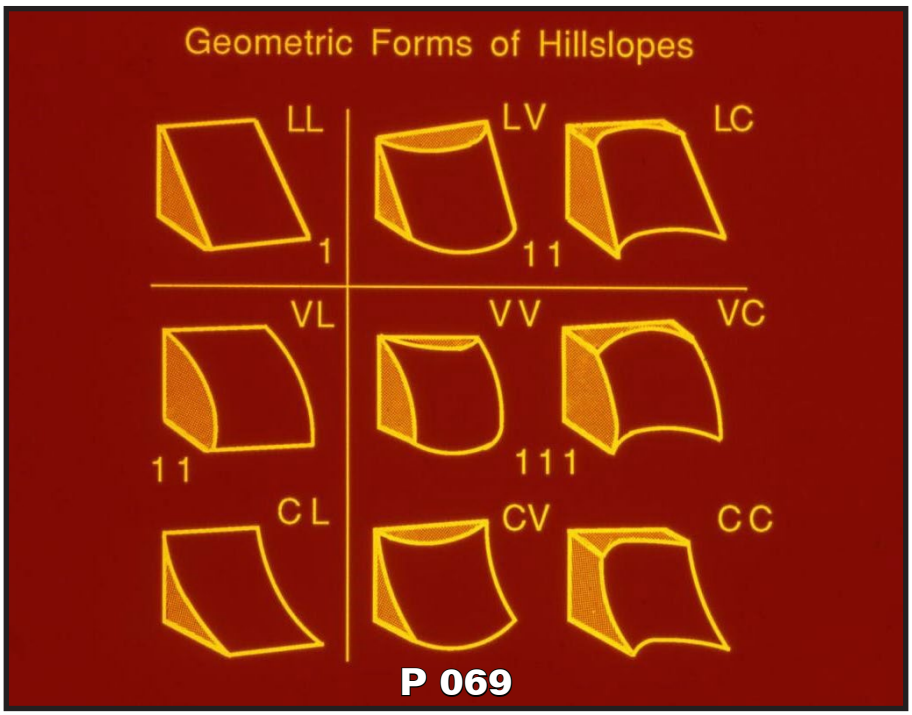
Is there such a thing as a perfect soil pit in which to examine a soil? Perfection is likely in the eye of the beholder - yet this one in southern Chile comes awfully close I'm sure. There is no clutter or mess around the pit - no hurriedly dumped piles of loose earth - no distractions when taking a picture of the profile - neat set of stair steps leading to the open pit face and the sun's angle exactly right for the scheduled stop. You have the sense of standing at the center of a polypedon and you can observe the fitting together of several of its adjacent pedons. Ah - this is an international study tour and the local hosts have gone to extra pains to have things just right. This is a volcanic ash derived soil, the Puento Fonck series - and in the hushed silence of an introduction we pay tribute to the dedication and skill of our colleagues. Do you know why this site is so well presented? It was with the kind but strict permission of the golf course that permitted such an excavation. The sod is neatly stacked nearby to complete the restoration to its original anthropic state as possible.



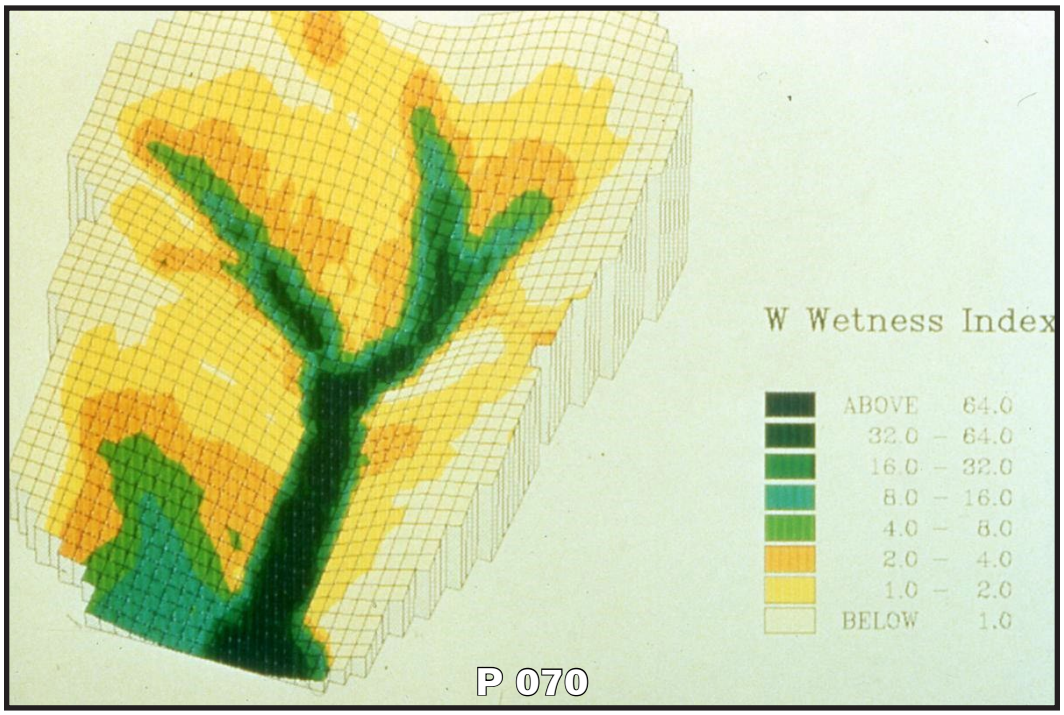

P 068

How do we present our ideas to others? Usually we have a mental model that we want others to see and hear about - and hopefully to accept. Language is one way of symbolism - words and phrases are symbols for what we see, hear and feel. We show slides as symbols representing

segments of reality, like landscapes or soil profiles, or they may be schematic drawings of the essential features of our mental models. This is such a model about variations of soils on a slope that merges into an ephemeral gully or waterway. This was prepared by an agricultural engineer studying soil erosion - the processes of particle detachment, transport, and deposition in small watersheds. To those familiar with pedimentation and pedisediments in landscapes this is a nice depiction. The down cutting and back wearing of an upland area in response to a lowered base level can be discussed with this illustration and used to explain why soil variability in many landscapes is predictable and can be modeled.




A hypothetical model of landscape elements formed by considering surficial lines parallel and perpendicular to landscape contours. L=linear, V=convex, and C=concave. Their combinations provide 9 points of a continuum - here representing pure geometric forms - obviously abstractions of reality. Geomorphology and pedology benefit from having such idealized components - they may be combined to help describe a "cove" at the head of a waterway, a "nose" at the end of an interfluve where hillslopes join - their common boundary is a watershed divide. In slowly permeable materials the use of these elements permit one to anticipate (guess) the flow of runoff water - thus their use in hydrology and the modeling of water erosion. Imagine a 30-m grid superposed on a landscape - each one given one of the 9 form symbols, or names, and looking for consistent trends in the patterns of these forms in a landscape. Powerful - useful - and a basis for field and lab research. U.S. pedologists use the model portrayed by R.V. Ruhe, a geomorphologist-soil scientist of the 1950's and 60's. A most useful model to channel our thoughts.




Models are wonderful constructs of the human mind. In fact they are essential to our being human. Models are abstractions of reality and "show off" what we want them to show off - to capture the essence of a concept - to distill complexity into a simplicity that we can and do remember - that enables us to explain to others what is going on in our minds. Imagine a small watershed and a soaking rain fall - entering into the soil cover and eventually working its way to the stream channels where its accumulated flow is emptied beyond the boundary of this small watershed and becomes a part of a larger one. It is a system - it is comprised of many subunits that interact and respond to energy changes yet become integrated for the observer at another scale. Consider the processes of water movement as a continuum in space and time - and this picture is one frame out of the continuum. Small landscape elements hypothetically are linked together thereby facilitating the flow of energy (water mainly) through the system. Ho do you use such a model? Is it useful to grasp the overall concept of this system? Does it relate to your real life experience in the field? Does it deviate from experience - in what way - do you know why? Could you design an experiment to test your concepts? As far as I know this model represents a common situation in slowly permeable earthy materials (soils that is!). It is qualitative as represented here but with measurable relationships over time it can become more and more quantified - a working model needed to satisfy some minds. Is this not also an analogy of the universe in that we believe the universe is a system of systems - operating at all scales, at all times, and so we can pause and wonder where humans fit into a larger scheme of things. Are we as cells in an organism that is mostly unimaginable? Why not? Do I not but represent energy - a dot, a spot, a moment between transitions within a system I don't understand but want to - to recognize it, to comprehend a little, to be content to call it God?

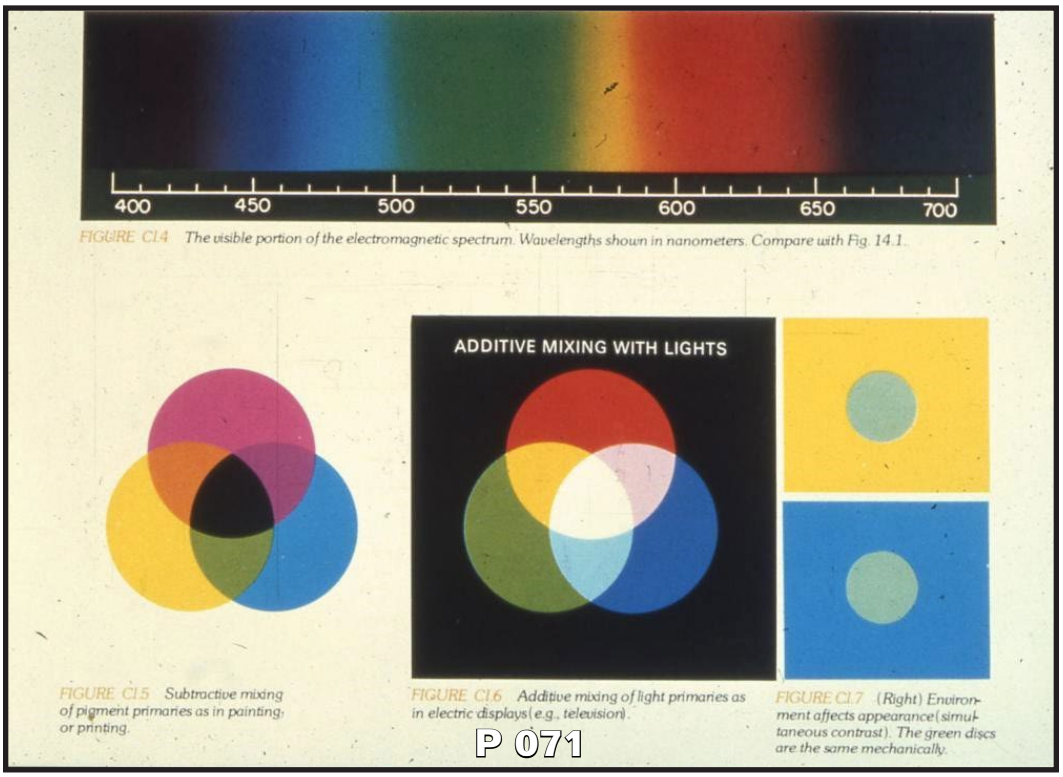


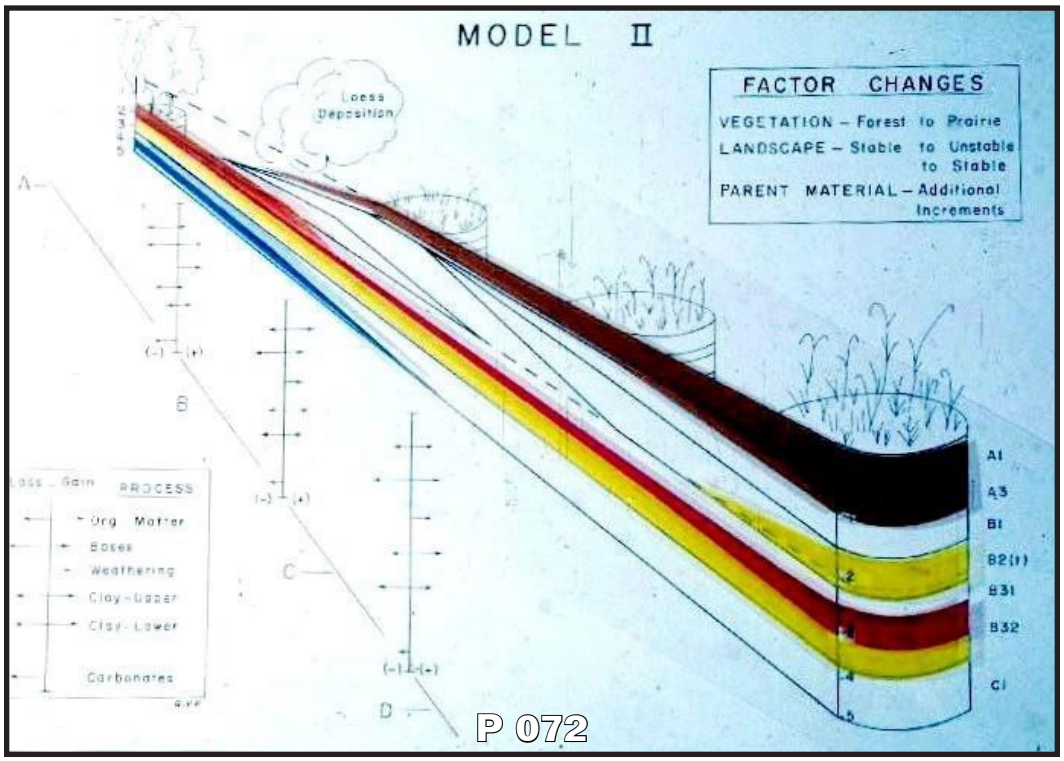

FIGURE C1.4 The visible portion of the electromagnetic spectrum. Wavelengths shown in nanometers. Compare with Fig. 14.1.

FIGURE C1.5 Subtractive mixing of pigment primaries as in painting or printing.

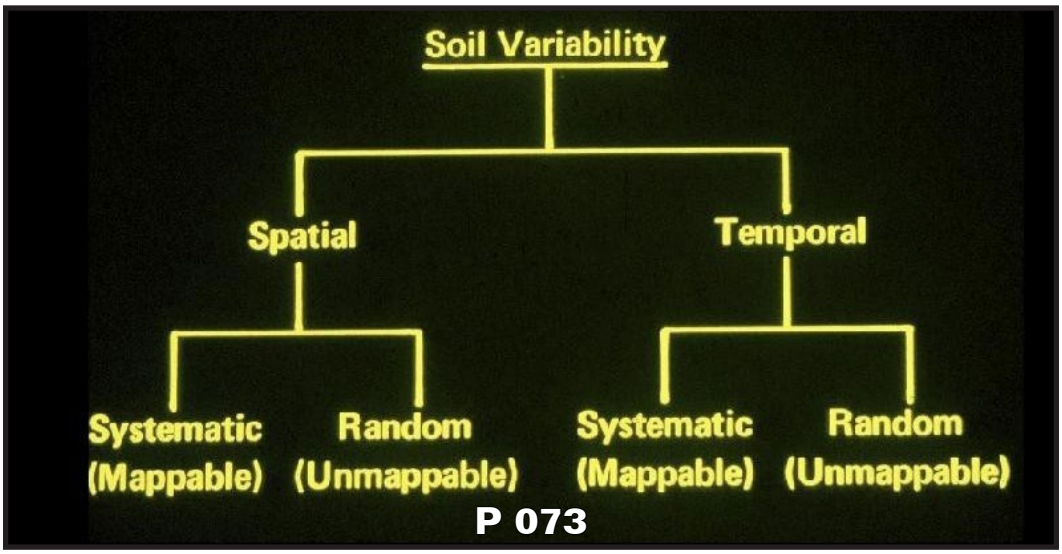
FIGURE C1.6 Additive mixing of light primaries as in electric displays (e.g., television).

FIGURE C1.7 (Right) Environment affects appearance (simultaneous contrast). The green discs are the same mechanically.

This illustration of the electromagnetic spectrum in the visible range is a favorite of mine. For me, it represents many things - an important one is the problem, the dilemma of continuous versus discrete entities. The rainbow spectrum of reflected or refracted light has easily observed central tendencies of color - red, yellow, blue and the intergrades between them. Change the frequency change the color - see a fuzzy boundary - lose the individuality and appreciate the gradations of a continuum. Soils embrace both of these concepts - a continuous cover of the Earth's terrestrial surface yet differences sufficient to recognize as kinds and not just as degrees. Maybe it's just a delusion of the human mind that wants some semblance of discreteness - recognition of self - of me versus thee. The bottom left square with circles represents taking away part of the color spectrum. White is all the energy - and if we take away all but the wavelengths except those for red - we see a red circle. Similarly we can take away all but the blue wavelengths and also for the yellow. Eventually if you remove all the wavelengths in the visible spectrum you have black - total absence of visible light - but not the absence of energy. Astronomers and cosmologists speak of "black holes" in space where the forces of energy are truly spectacular and difficult for us to comprehend. The middle black square with colored circles represents the addition of energy wavelengths to the absence of visible radiation -that is, blackness. Add the wavelengths of red, blue, yellow - the primary colors - and their overlap produces the whiteness of total light in the visible portion of the energy spectrum. Fantastic - this system of energy of which, we too, are a part. In the lower right portion there is a yellow and blue square - the small circle in their centers appear to be different - one is darker than its surrounding wavelengths, the other is lighter than its surrounding - yet both circles are the same. Illusions of contrast - illusions of similarity. Is it easier to recognize 3 primary and 3 complementary colors rather than a continuum? Of course! The analogies with soil forming processes and their interactions to produce recognizable soil features are remarkable stories!

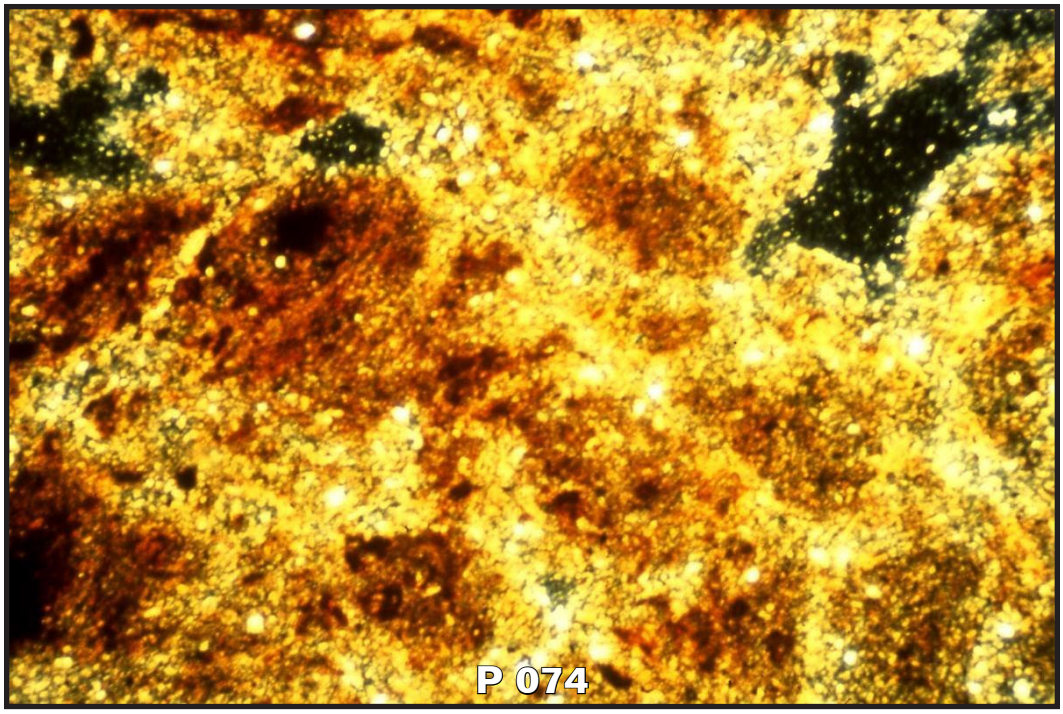



Models - models. The world is a collection of models because we cannot readily handle the myriad of details that fit together in such systems as we know exist. Perhaps it is a perception that systems are always parts of other systems and it goes down to the smallest scale up to the largest - neither of which we fathom properly in our minds. I examined a soil profile on Sunbury Flat in eastern Iowa for part of my PhD work. It was a Tama-like soil developed under the major influence of subhumid native prairie - but in the lower subsoil was a little zone where subangular blocks were coated with whitish silty coatings - I called them silans - silica coatings of quartz dust. I assumed they resulted from processes acting under a forest vegetation on an earlier deposit of loess. This diagram was one of four courses of development that I suggested - each a working hypothesis and the basis for a 1964 SSSAJ paper on multiple working hypotheses in soil genesis. I thought the data was most supportive of this model - a change of parent material and vegetation related to climate change thus two major periods of genesis of soil properties separated by erosion in some places and deposition in others. I think models fascinate us so much because they abstract frameworks from the countless ways we receive information and synthesize bits and pieces into coherent patterns for us. They are stories, if you will, that enable us to cope with the complexities that exist in everything. And we do love stories - we can talk more freely about them - embellish them from time to time (maybe to soothe our enormous egos). In geology classes we heard about Chamberlain's theory, or concept, of multiple working hypotheses and then read J.R. Platt's discussion about trying to disprove our hypotheses as a scientific way to support ideas. Proof of truth is an uncertainty and so finding things or relationships that we cannot destroy, or negate, strengthens the working model components or elements - and whether true of not - explanations are closer to our understanding. And this kind of thinking helps us as teachers - as mentors - as folks wanting to help others think in better ways - with openness and reasoning. Systems thinking - new facts, refreshing relationships, discarding the unlikely - standing by what we have learned until new data makes it suspect. Ah, yes, models, wonderful models!




When I first saw this slide of Goro Uehara's I was thrilled. Here was a concise explanation of our soil survey field work and classification. When we examine landscapes we are searching for patterns of soil profiles - ones that repeat in a fairly consistent way with changes or elements of the landscape. Insofar as we ascertain such a pattern and its relationship to landscape, we can map it. And we can explain it to others, and teach them how to recognize the systematic changes that occur. At some spots we have anomalies that don't fit our working model - the site may have been disturbed - like a tree-throw in a forest, or a prairie-dog mound in a prairie, or a site of an old fence or a building long gone and filled in. It is like searching for clues the way an archeologist might and deciding if the occurrences have a pattern or seem to be hit and miss - randomly distributed in space. We can describe these latter variations but they are not recognizable in a consistent enough pattern to be mapped with any degree of certainty. It is relevant to remember that most randomness can be described mathematically, usually with the mean and standard deviation of a sampled population. Names like Gaussian, Binomial, Negative Binomial and many others apply to random sequences - they even apply to patterns on surfaces when using cell counts - so many empty, so many with one entity, so many with two entities, and so on. Thus the systematics of randomness generally can be described but not mapped. Most spatial patterns that we recognize are scale dependent - that is, the soil patterns. Not too surprising as we create boundaries for soil profiles and these are scale dependent (not well documented but scale dependent never the less). And what about temporal variability in soils? Soil temperatures have a regular systematic depth pattern measured over the seasons - a time sequence that differs from place to place regularly enough to be measured and mapped. Usually we make large extrapolations and so the boundaries between temperature regimes are not very accurate. Moisture also has changes that can be grouped and combined to form patterns we call moisture regimes. In the better drained soils the patterns extend over rather large areas - tens to hundreds of square kilometers, and yet within a local landscape wet soils and drier associates occur side by side and their patterns are also imprinted in the physical and chemical properties of those soils. Again there are anomalies - things or measurements that lay outside the acceptable boundaries of our models - and for our purpose they exist as random events, either in time or space or both. The mind enjoys being able to pigeon-hole information - to tuck it away in a box where other similar bits of information are collected - then we can forget for a moment the exact piece or range of the data - and use a generic or common name for the things in that box. In a sense we can map out patterns of information by abstracting qualities that objects have in common - and we can organize boxes of information in ways to help us recall those features that characterized the things we put in those boxes. Aha, classification. Each class has defining characteristics - they are features that entities therein must have - and those features often have some commonly associated features but they weren't used to define the box. They are accessory information and apply for describing more details insofar as they are correlated with the defined ones. And there are often important features not consistently related to characterizing nor accessory ones - they are

random and can only be mentioned but not used to characterize the entity in the box.




Because we classify to simplify - to organize and recall - to make sense out of the morass of information that inundates us - we create cells, we make boxes and most of them have rigidly defined boundaries. Well at first they seem to be rigid, but in application they are more difficult - they often are hazy, or convoluted, and we see the central tendency and wish we knew about the blending, the merging, the intricacies of variations that are not well defined in our minds. Oh, sure, mathematics and computers can help refine space into smaller and smaller pixels and assign values within a continuum. Our minds do this constantly and generally we are unaware of the activity.

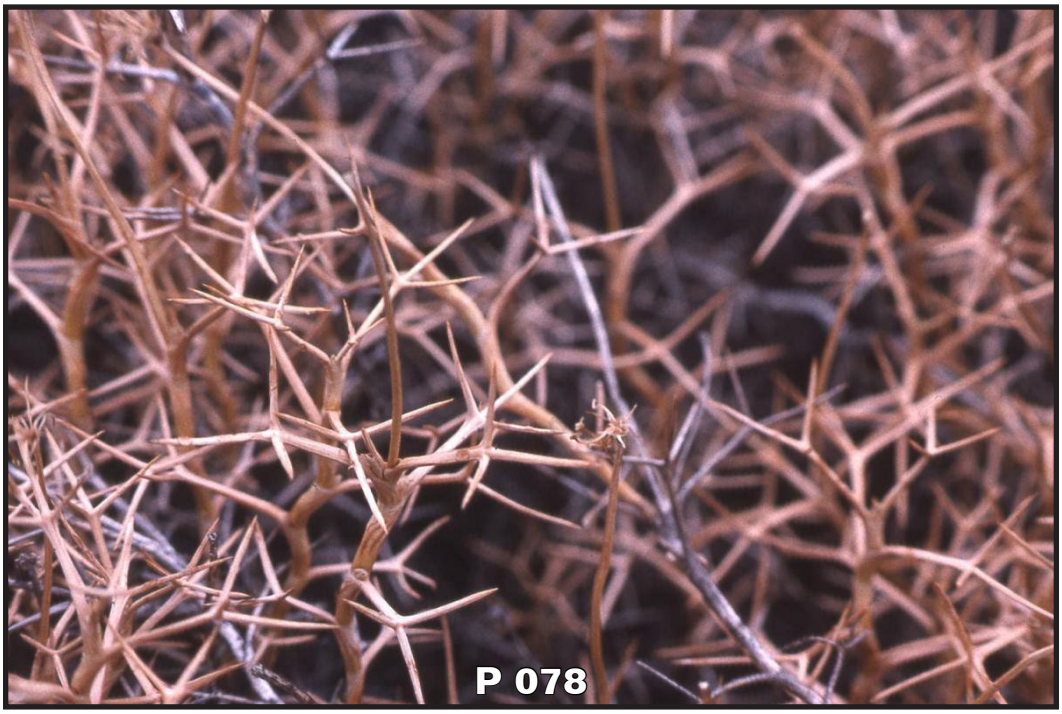
Here is a picture with shades of brown from dark spots through lighter brown and into shades of tan or yellowish brown. Also several black areas occur. In one sense it is a tan matrix with black and brown blotches. You assume the darker tones are major entities and the shades of brown are some kind of mixture or dilution or whatever. And your mind says - delineate this scene into recognizable patterns. Color patterns? Size and shape patterns? Sharpness of boundaries? When is one pattern so intricate that we must accept inclusions of one thing within another? But how much is enough, or too little? Do we want accuracy or generalization? What is the most useful? What is easier to comprehend? Assume it is a satellite view and the black is water and the browns are vegetation - darker is more dense. Assume now it is a vertical section in a soil pit and the brown areas are iron-enriched areas - like concretionary concentrations - mottling if you will. Describing proportions may be a key to consistent recognition and identification. Assume once again that this is a soil thin section - a horizontal slice that is a few millimeters across. The black are pore space voids and the browns are concentrations of organic staining and iron oxides, or so we may assume. In each case there are boundaries to consider and we sense that scale influences some of our decisions. What you have observed is the dilemma faced by cartographers - the decisions of “lumpers and splitters” - the making of meaningful maps in the minds of the map makers. Now you understand the importance of writing down information about the decisions that are made in pedology. You know - for the record!


Artistry of mythology - an ancient rite of Maori's in what is now New Zealand. The Earth is sacred - the seeds that give rise to re-birth of biology are surely carriers of the desires and promises of the Great One. "Oh, shaman, diviner of powers, hear us as beseech thee for a bountiful harvest from Mother Earth." When are actions louder than words - almost all of the time. Beliefs and values enclose a culture with comfort, fear, quilt, but also love and forgiveness. This wall mural was at the main building of the Soils Bureau in Lower Hutt.

How many times did I make a point with this illustration - I cannot count. Listen to the wisdom of the centuries - feel the spell of mystery as it invades the surrendering environment - tingle with a realization that all things are connected - that man is but a piece of the fantastic tapestry of evolution. Indigenous thoughts are never far from "distant time" as well as the uncertainty of the future. Symbolism embodied in the rituals of thanksgiving and of asking for help - once again - during a cycle so precious!


Rene Tavernier and Guy Smith - July 1977 in Brazil. This was perhaps Guy's last major field trip and they honored him with a mammoth cigar which he smoked on their behalf. Guy had had the huge benefit of support for Soil Taxonomy from Prof. Tavernier who had, at that time, the largest global network of pedologists who had trained or studied at the University of Gent. I called them the "Gent mafia" in an endearing way - they were unique and were immensely valuable in the testing of concepts proposed for Soil Taxonomy. Guy had retired, was living in Belgium and had married a widow who graciously catered to his needs. These two men were truly giants in Pedology - they made things happen - their logic was outstanding - their respect for each other was of the highest - and their friendship was real as each accepted the other as they were - and who among us does not have faults. At that time I was a full professor at Cornell yet had never been in the field with these 2 scientists. What a privilege it was. For Guy life was now measured by - a good cigar, a good whisky, a good friend, and discussion about soils. Their legacy will remain for a long time. Legends in their own time! Wow!


Patterns are also symbols and analogies if we choose to let them be. Do you live where there are termites? At the time in the early 1970s I lived in New York State - glaciated and without termites. Puerto Rico was my first out-ofcountry (more or less) experience with the subtropics. An old barn board etched and weathering - but biologically enhanced by termites - the softer tissues removed and the more resistant portions like veins in a flat leaf. Durability - resilience - resistance - persistence - concepts of nature whether applied to a wooden door or a soil in its unique environment and ecological development of features with the passage of time. The joys of instant gratification are not enduring - they are limited and transitory. The waste - the remains - have a resonance - a beauty of their own - but only if we choose to observe, to examine, to see something else. The cyclicity of the universe has many scales in both time and space - and we miss most of them as we trample through the morass of daily cares. Take time to capture a few glimpses of other worlds.

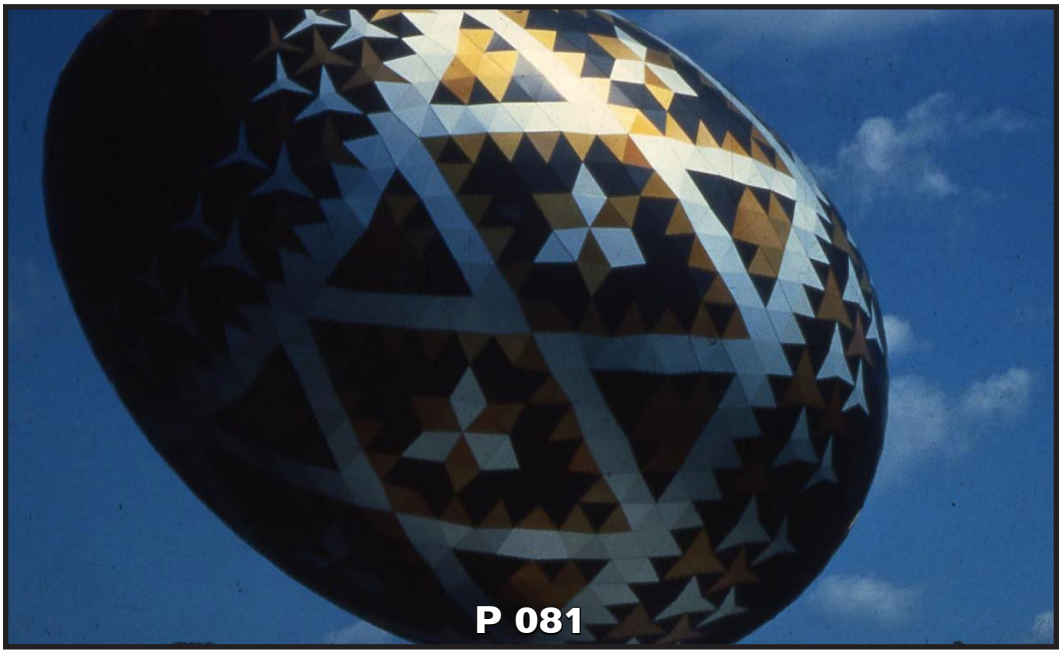



A 3-D network of thorny spines - on pasture land in northern Patagonia this shrub warns livestock - including goats - to back off and find feed elsewhere. Nature's way of protecting - maintaining an environmental niche that I wasn't aware of the need. But what attracts your attention - why is this so fascinating? The intricacy - the complexity -the artistic maze is

there for us to behold. Have you ever watched on TV the animated blow-up of lung tissue, or blood flowing in arteries, or other adventures from the seen to the unseen for human eyes alone? Maybe this is such a view into structures that are vital for specific functions - networks that maintain open space - maybe a picture for one's virtual mentality. The unique branching of stems and the final spiky needles - is this chaos, is it randomness, or is it a precision of fractals not yet studied? Is it a subtle reminder that the crown-of-thorns that Jesus wore carried symbolism beyond any immediate recognition - that suffering is a burden carried by others for us. Messages if only we can see and hear.


Oh, glorious rhododendron bloom. Colorful, expansive, sensitive, beautiful - brief in its transition yet infinite in its messages. When do we comprehend the purpose of humankind? What is the role of a teacher? And are we not all teachers - in so many subjects at so many times to so many people? It seems that Nature is mostly about survival and perpetuation of a species. We most readily see the cycles of biology because most occur within our own life spans - daily, weekly, monthly, annually. Also many longer term cycles are described and we partake of segments. A flower must attract other species to help it complete the fertilization essential for a living future. Colors, shapes, sizes, timing, location, adaptations, subtle mutations - and millennia later the message is still clear. A teacher wants another person to learn something - how to think, how to see connections, what are relationships, reasons, choices, acceptance. Reaching out to others in life is important to human progress, to learning, to adapting, to sustainability, to values, to compassion, to the future. Look closely and see these messages in the rhododendron blossom. Reminders of living a life!


Big foot! This foot rising from the Earth as part of a delightful statue on Haynes Point in Washington, DC is a dramatic reminder that we should strive to "not put our foot in our mouth". It means that when we say things that are hurtful to others, or are not true, or are arrogant - then we have not spoken the right words and we are in the awkward position of "putting our foot in our mouth". The overall sculpture is the "The Awakening" with body parts coming up out of the ground. It is one of my favorite statues. I like symbolism - it abounds everywhere - it is like having sign posts along our journey - gentle reminders to guide us - to help us stay on the right path and to enjoy the travel of each day. If a journey begins with the first step, then surely a foot is of that part of living. This sculpture is big enough for kids to climb on or slide on the ankle. I like the artistic reality of this foot - the right foot - for all to see. Like an outreached hand to indicate there is not concealed weapon. A bare foot - open to the atmosphere - and not in someone's mouth.




More about models - this computer designed ornamental Ukrainian egg is colorful and a reminder of the old traditions in some folks' Motherland. Triangular pieces of metal were carefully fitted together and this large shape was created. It is about 8-10 feet long and is mounted on a pole - held high for all to see in Vegreville, Alberta, Canada. What makes it so special? In addition to its historical roots and associated festivities - there is also a symbolism of another kind - a reminder about what models are - and what models are not. The shape rather faithfully reproduced that of an ideal egg - its form is easily recognized by most, the artistic painting is rendered authenticity. The shell is then like that of an egg but it is not made to be cracked open and a chick appears to peck and search for its mother. Functionality is

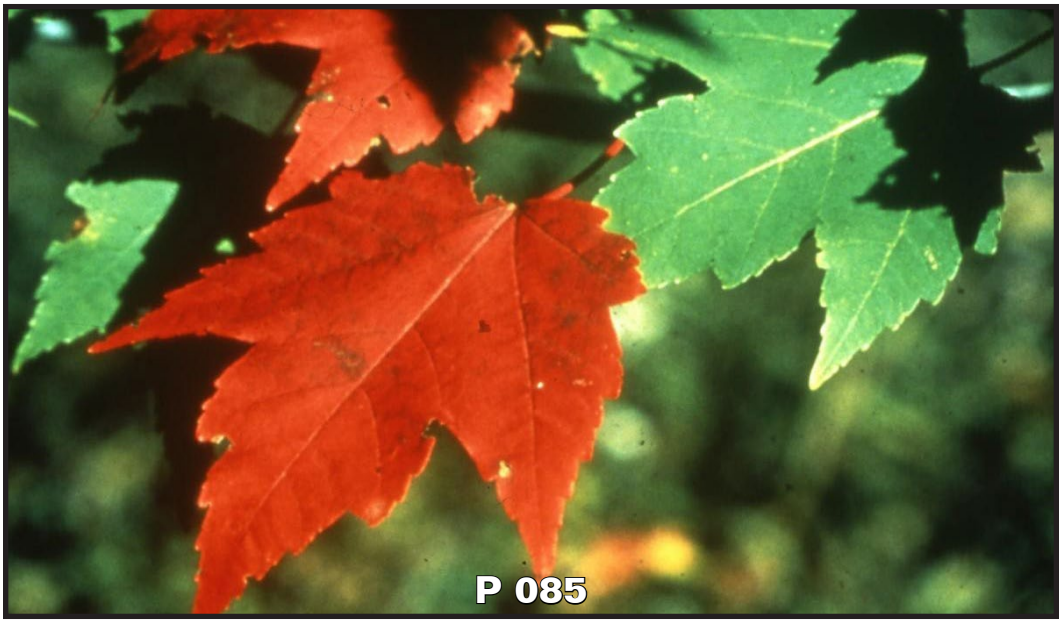
missing from this particular model. Models are abstractions of reality and some things are to be emphasized at the expense of others. All models, consequently, include degrees of uncertainty - of elements or components that were not part of the clever design of the model. A lesson we sometimes have to learn again and again.


I love it when you look into the sky and suddenly there is the deep azure of clean air and it gracefully holds the whiteness of slowly drifting clouds. It happens almost everywhere in the world, I suppose, but it is a joy to the spirit when you happen to be in its midst. When you believe that you are alone experiencing what no one else has experienced, even if a million million have had such an opportunity, you feel that God has reached out to you - just you at this particular moment. Why? I am not smart enough to answer that correctly I am sure, but I am honored and grateful for this moment. It soon will pass into the ordinary of daily life - but the lingering mood is so comforting to one's soul - a brief encounter with millennia long gone - an air of excitement - the magic of a dream - unimagined and surely not believable. There is peace in our world when we are exposed to dusk - that haunting tantalizing period of transition. Yes God is here, everywhere and we are given, provided with numerous opportunities to pause and be welcomes into this celestial glory from above.


It is only one pail full of night soil in a Chinese village. Destined for the nurtured garden of vegetables for market and remains for the family dinner. Why is this important to me? There before you is a tradition passed from one generation to another - survival and a better life

within the constraints of cultural reality. Such gardens appear to be rich and fertile - close at hand - waiting to assist in the evolution and growth of humankind. The reality is that little would prosper from those overworked bits of soil. Yes these soils now are in the Anthrosols - man modified entities designed to sustain one generation at a time - needing help to replenish nutrients long gone in the history of their use and abuse. The recycling of the ultimate recyclable - the essence of life giving nutrients essential for a healthier life - a freedom from the ravages associated with a haunted destiny. I appreciate being reminded of the thin line between survival and non-survival - it sharpens our perceptions, strengthens our determination, and supports our thankfulness.


An infrared sky view of Washington DC - the highly urbanized areas are bluish and the red areas are vegetation. The Potomac River is the larger black area coming from mid-left to lower right - the dark branch is the Anacostia river and the other one circles most of Haynes Point. Although this was a work environment for twenty years seldom did I stop and think about the area depicted here. Haynes point is mostly vegetated with a golf course, park, picnic areas, and so forth. The big red area in center left is the area west and south of the Pentagon - it covers Ft. McNair, the National Cemetery, and some heavily treed residential borders. The Potomac separates Virginia (SW of river) from the District of Columbia. The rounded black cross area in the middle of view is the Tidal Basin. This satellite image is another way to envision one's surroundings - a reminder that soil survey also used infrared photos to assist mapping in some areas. We tend to change as technology changes - hopefully for the better.

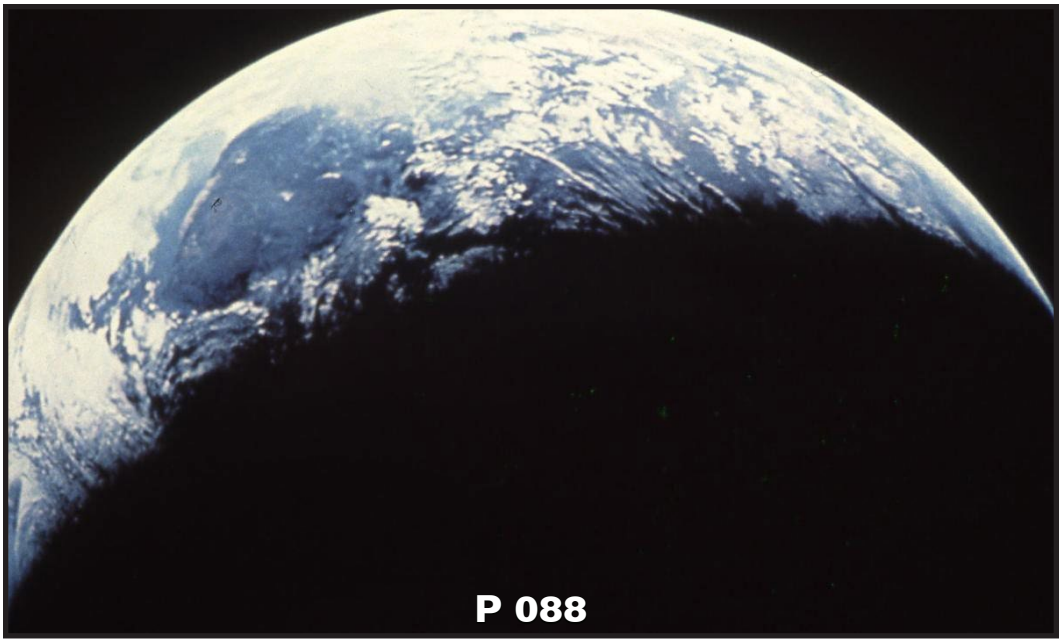



Red and green leaves of maple on the same branch! I had taken my children for a ride in the Appalachian Plateau area east of Mt. Pleasant near Ithaca, New York. I wanted to try out a new Olympus OM-1 camera - something I never expected to have. We were walking down an old abandoned road that was grown over - it was sunny and warm - a gorgeous fall afternoon.

We paused for a moment and there it was - this striking sharp contrast - no transition - just bright red and bright green. Really eye catching! This picture eventually became my signature and hundreds of people saw it over the years. Some folks even waited to see how I would use this scene - one they had seen time and again. I also wore a red cap in the field - a thing that started when I was working out of Gloversville, NY - I bought one at a street sale and now almost 50 years later I still have red caps that I wear. These leaves had special meaning because Canada had just created their new national flag with a stylized red maple leaf. But most often I used this to remind folks that all of life was about change - beautiful often predictable change - it was and is naturally normal, expected, anticipated, and enjoyed. Yet all of us from to time resist change strenuously. When I became a bureaucrat I found resistance to change a common activity. New methods, new demands, new forms to fill out, new directions, another set of strategic plans, then fleshed out goals with inputs and outputs. Almost weekly there was something to disturb the status quo. Even I fell into the hopeless feeling of we've been here before and it looks and feels the same - don't we learn from the past? Do we go through similar exercises and not gain any benefit? But then I'd be looking at slides and here was an old favorite - it was like a friend - comfortable, accepting, brilliantly beautiful - ah, yes, here was the lesson over again - change is what the universe experiences - energy changes - transfers, transformations, gains here, losses there. A mental model of what the pedosphere undergoes constantly. Cycles are well known and their periodicity is part of our myths and stories of our "ancient ones" who are in touch with the "distant past" of our ancestors. We are grateful for change because it also means renewal, rebirth, growth, development, and eventual death.


He who has walked the moist sands of a shoreline or in the powdery dust of volcanic ash, or even on highly weathered Mn-rich materials - knows the exhilaration, the excitement, that the passing of a moment from the past into the present has for the human psyche. A footprint is a marker - it is evidence of presence at location - it is a record for others - or maybe no one. If we are close to the water and a tide is rising, the footprints will disappear like so much sugar dissolved in water. The mood of the person making footprints may be proud, be fearful of what lies ahead, be joyful at the perceptions surrounding good news - all through the gamut - the range of emotions that are part of being human. Now as we face environmental degradation we conceive of, and speak of, an "ecological footprint" - the impact of human activity on the supply and use of resources. The nonrenewable resources, when consumed at exponentially increasing rates, have led man to leave a big footprint - much larger at present than the one associated with conservation and the stewardship of our limited global resources. Yes, a footprint of possible disaster if we do not change directions.

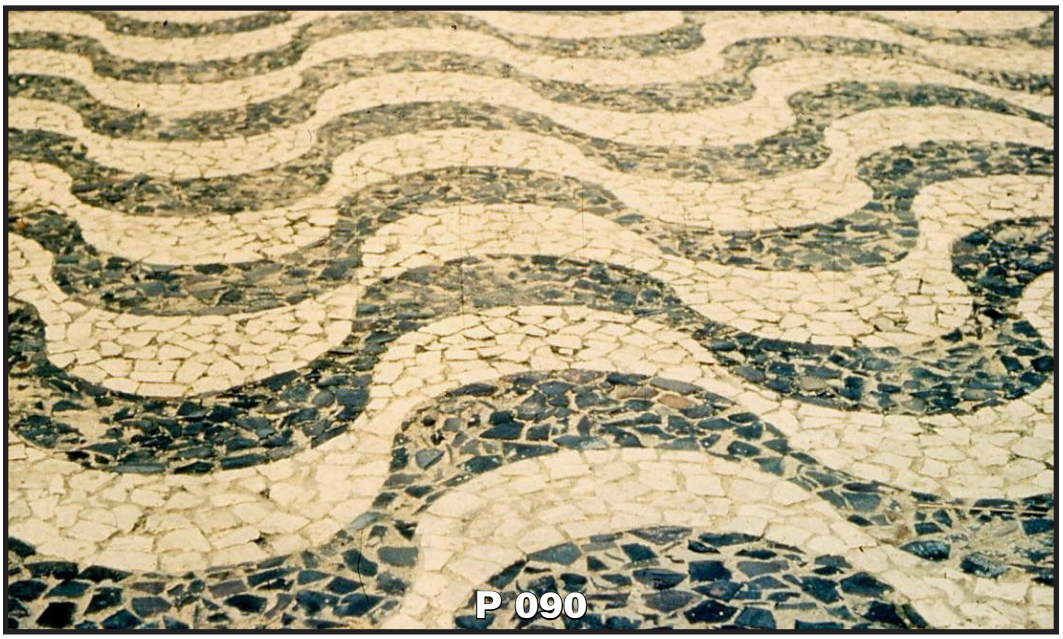

Walk on a beach on the Eastern coast and most waves are gentle, easing their way to shore - letting the ebb tide come and go. But every so often the sand bars are shaped just so - and the winds bring the waves at such an angle that a good spray splash develops. You see it coming, it builds up, and then it crashes forward sending a fragmented display of silvery water spewing forth upon the beach. Sometimes the light is just right, the timing impeccable, the moment ready - for capture. And you happen to be the fortunate one along a solitary portion of beach on Nantucket Island. But isn't there more? Is not the sensation and the sight brought together at this instant to impart a message - an emotion to fill your heart and let your soul sing out in glee - is this not the utmost instance of release - of freedom from an ocean of forever? A freedom of water molecules to become something more than ebb and flow -an escape, a striving, and perfection of flight in the sunlight. Marvelous!




There are so many stores and myths about the moon throughout recorded history and long before when places like Stonehenge were erected for worship. Lovers have sung many a song or vowed their commitment under the view of moonlight. Imagined faces pieced together from the intersecting craters on the moon's surface still intrigue us - the man in the moon,

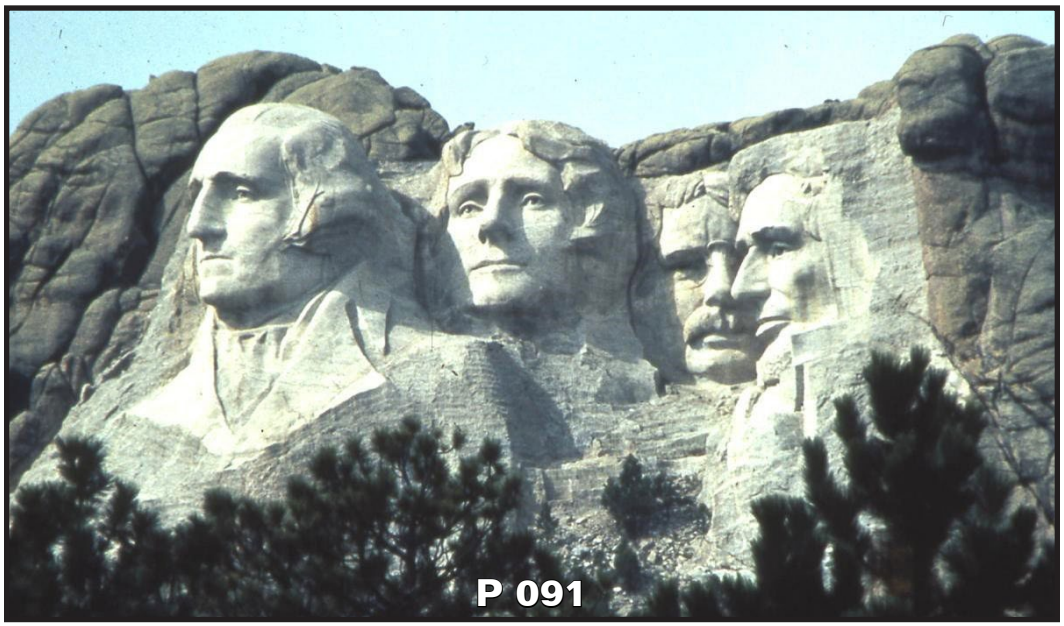
the lady in the moon, and I'm sure there are numerous other illusions in the cultures of the world. As the Earth's shadow steadily crosses the path of sunlight, the moon passes through its phases - it wanes and waxes, it pulls the tides on Earth out from the shore and then back again. One can attach their own symbolism to the Earth's moon and yet today after some decades of the "big step forward for mankind" it still seems unreal that man has been on the surface of the moon - and thoughts of colonization or tourist way-stations or whatever may yet lie ahead. I like the friendly glow and the welcome shadows on a night's walk outside!


First impressions are invariably strong ones - they are ones that capture the essence of a moment - they stay fixed in our memory apparently forever. A noisy gathering of local folks on a market day in Nigeria in the early 1970s captured my attention. So many people - crowded together but not crowded, noisy but not noisy - just the hustle and bustle of another day in a culture I'll never comprehend. From the stalls of the marketplace I gaze at a "mob" that reminds me of what was meant by population growth. Unbridled expansion of human beings - more and more - as the technologies of a modern age intersect and interact with the traditions and mores of another time, another place. And there in the right foreground - a Basenji dog - common companion in this part of Africa. Over and over I've used this picture to remind others of the consequences of population growth and the unwelcome specter of poverty and health issues, of illiteracy and break down of civil law - a fascination with the faceless masses that are our brothers and sisters - relatives from the past - linked to the future.

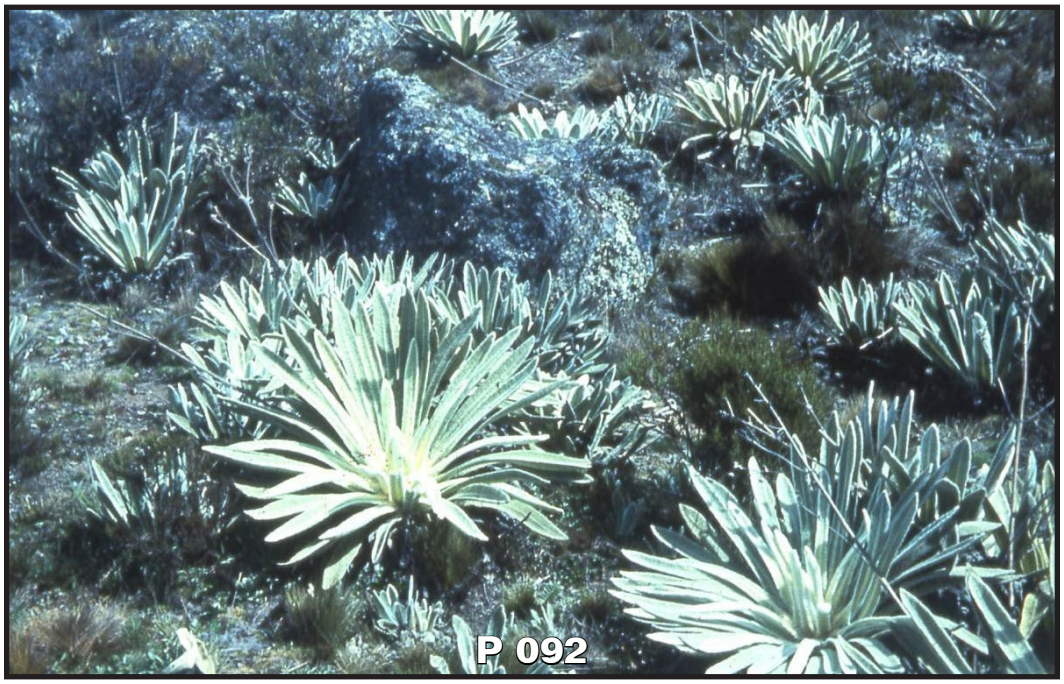



Eye witness accounts - that used to be what lawyers needed in trials - who saw what happened. We commonly see what we have been trained to see - at least we are influenced by associating certain colors and/or patterns with specific objects. When we see the unusual it captivates us - for example, this deeply rutted roadway. It appears that a heavy truck, or many trucks, had been traveling here and the weight caused the wheels to sink into the roadbed. Shadows from a nearby fence now record the shape of the road. Fascinating - in fact I hadn't seen such a scene ever before - but now I can see it again and again. Or so it seems. Along the beach at Cococabana in Rio there are wonderful sidewalks designed and built by artisans. Here they have used black basalt gravel chips and white limestone chips to create this extraordinary pattern - the surface is flat, not indented - and so we observe an illusion. We see one thing and think it may be another. It is somewhat like the clever artistry of 3-D drawings where similar objects on a flat surface are displaced slightly and our brain eventually detects that some appear closer (raised up) and others appear farther away (depressed or recessed back) - the resulting combinations are designed to show yet another pattern - an illusion - that is fun to see. Sometimes a stereoscope is used to help in detecting such 3-D patterns. Recently I saw a diagram of soft edged pink balls forming a circle. When staring at the center of the circle, the balls were noted to be pink and moving clockwise around the circle, and then one by one they disappeared. Blink your eyes and once more there is the original circle of pink balls. Illusions - our mind seeing things differently than what we thought. Do we have such phenomena in soil science?

Most commonly it occurs mentally - for example, in upstate New York many soils around the edge of the Adirondack Mountains have a dense subsoil and its lack of color and blocky structure was thought to indicate this was a C horizon. It occurs at relatively shallow depths - 14-20 inches or maybe a little more, thus the soils were considered to be shallow, weakly developed ones. Descriptions of the glacial soils were also brief. Some years later the concept of fragipans swept the country and these brittle, plate like structures, some with weakly outlined coarse columnar polygons were evidence of the "fragipans". Many are thought to have relict features associated with periglacial freezing and thawing - and if these materials are to be fragipans - where is the C horizon - what thickness have these soils - what concepts of evolution and genesis now should we hold forth? An illusion - seeing what we are trained to see - influenced by our teachers, our colleagues, the literature! Of course - that is partly the way of science - the degrees of uncertainty that mean hypotheses are working models - imperfect in detail - but usually brilliant in simplistic design of explanations of what we interpret based on what we see, feel, hear, taste, and believe. Our senses are not fool proof - but they are the tools we have evolved with and with which we build our stories of what happens, who we are, what is taking place, the stories of myths, of religions, of the familiar, of mysteries, and so be careful of the illusions you be creating for those who follow!




Mt. Rushmore in South Dakota with the sculpted features in granite of four U.S. presidents is a remarkable sight. Washington, Jefferson, Teddy Roosevelt, and Lincoln - designed and drilled and carved out of the Black Hills granite. See it for the first time, or the hundredth and you stand in awe at such an achievement. Reminders of the history of this young democracy and some outstanding leaders. Public TV has shown a documentary on the development of this monument - it is awesome as they would say today. I first saw this as a child when our family was going to visit Yellowstone Park - that was in the late 1930s. Throughout the world one sees memorials and statues and architecture that are outstanding accomplishments - I think I have enjoyed those honoring a person or a concept much more than the war memorials that dedicate the lives of young people in the struggles of segments of society. Why? Because for me war represents the tragic misunderstanding and lack of compassion among people - and it misses the purpose of humanity.




The brighter long pointed leaves are the "frailiones" plants that dot the subarctic environments in parts of the Andes Mountains. The leaves are soft and pliable, and feel like plush fleece in your hand. Their softness is like baby skin on your face. It has some properties

of “down” and has often been used to fill mattresses and pillows of indigenous folks. For ecologists it is an indicator species of unique cool-to-cold, semi-arid areas - especially in South America. When first introduced to this plant in 1972 it held a strange fascination for me. Here was a counterpart of “lamb’s wool” and even some “milkweed” seed pod fluff - highly absorbent plush bio-materials. Put a piece in your pocket and feel it occasionally between your fingers - soft, comforting, pleasing to the touch. And so as you travel in the highlands, one’s eyes keep watch for patches of frailiones - markers, indicators - of softness within a rather harsh environment. To the outsider it is exotic - to the insider it is a welcome friend - an important component in a special ecosystem. As one has opportunities to visit other ecosystems it is possible to become familiar with the relevance of such kinds of vegetation.

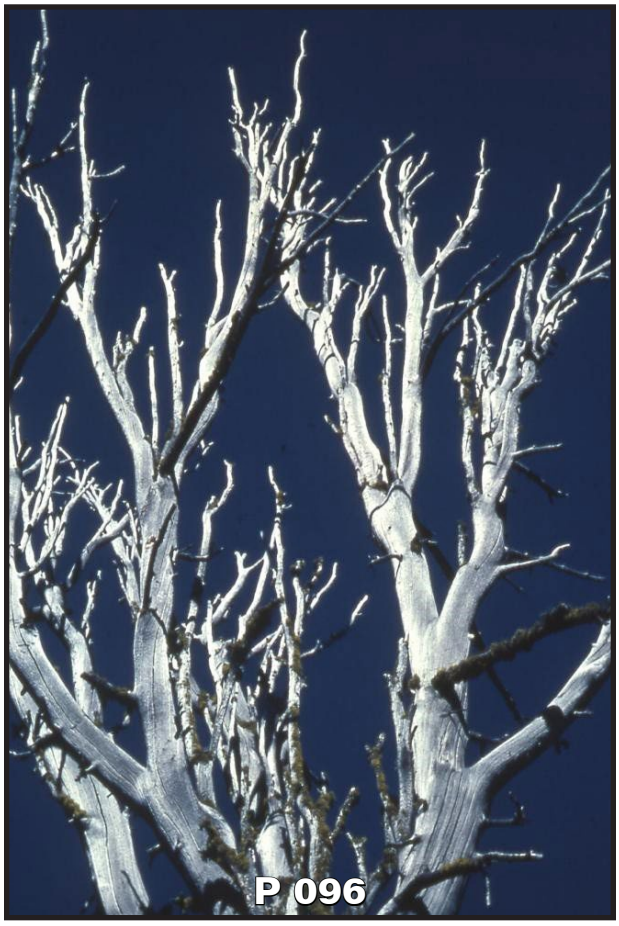

Who has not wandered in an old growth forest and had to fulfill that urgent longing to stop and look upward? It is like a 3-D perspective turned on its side. Railroad tracks, roads in the woods, a street bounded by large apartment buildings - they all appear to retreat to a vanishing point. Here in a northern California redwood forest the view is almost breathtaking - it draws you up into the tree tops where an unfettered view of the surrounding countryside may be available. There comes a realization that humans are not dominators in this territory - they are a piece, a part, a member of a larger community - a system within a system - and a part of an unknown all-encompassing system whose metaphysical metaphors are legion. Is this a cathedral in a forest setting? Is this a view into the unknown uncertainty of the future? Is it not a lesson about “humbleness” and the role that we as individuals may have? A kind of symmetry is commonly presented to us - a pattern within a pattern - a message within a message. How thankful I am to have been afforded the luxury of experiencing similar vistas in many places - magnificent reminders!


Each year there must be tens of millions of rice straw bundles - cut by hand, twisted with a shank of more straw and set on the ground to await the drying rays of sun and after the threshing the straw is bundled again. It is a process done for so long that it is almost like a reflex - it just happens without thinking about what one is doing. Rice padi occur under so many conditions and so many places - and so the mastery of making a bundle is shared over time and over space again and again. This bundle was at the Ecological Research Center not far from Changning, China in 1987. What is so intriguing to me is how artful such a bundle is -the shape is so commonplace that generally it goes unnoticed - the materials, too, are insignificant - the product of a cycle of growth understood yet not understood. How often in life we see what was unseen before - at a moment that burns its image into the recesses of neural storage - to be marveled at another time. So much of life's routines may be similar - repetitive actions done without thought - but with the unwritten knowledge of a hundred life times.


There are layers of stories here if we would but take the time to see things unseen - unsaid - and forgotten all too quickly. First of all - there are attractive young women with eyes filled with curiosity about what goes on beyond the confined location. A young child goes to the field with mother - for safety, for survival, for stimulation, for learning - but as an added burden to a strong young woman. Tears and sadness - no - acceptance, tradition, expected behavior.

The traditional dress seems pretty eloquent for field work - preparing the field for planting, tilling, and harvesting - decorative additions that in themselves have a unique richness of ritual, meaning, and recognition. From time to time you see an open mouth and the strong purplish coloration from long continued use of betel nuts to dampen the pangs of hunger that encroach on each day's activities. Not a complaint - just a way of life so foreign to our pampered luxury of ways of life so different. As you look again you notice a barbed wire fence - it separates you from them - it holds each in abeyance - a kind of reminder that there are always separating divisions in life. Culturally you and they are different - they are hill tribe women in a village north of Chang Mai in Thailand - in a world that doesn't include yours  wherever that might be.

Linguistically there is a chasm uncrossable for them as well as for you. But there is a link - a potential bond - look again at their faces - peer into their eyes - the flicker of humanity resides there - just as it does in yours. Women's Rights - human rights - freedom to be and to become - choices - desires - dreams - illiterate inexcusable - uninformed except as permitted. Oh the barriers of the human mind are far more serious than any barbed wire can ever be. How often must you experience this set of feelings - this helplessness, this hopelessness - before inside you start to change - your attitudes are more flexible, your tolerances more real, your willingness to openly discuss, and maybe, yes, just maybe your heart begins to open - and change eventually is forthcoming. So many stories.

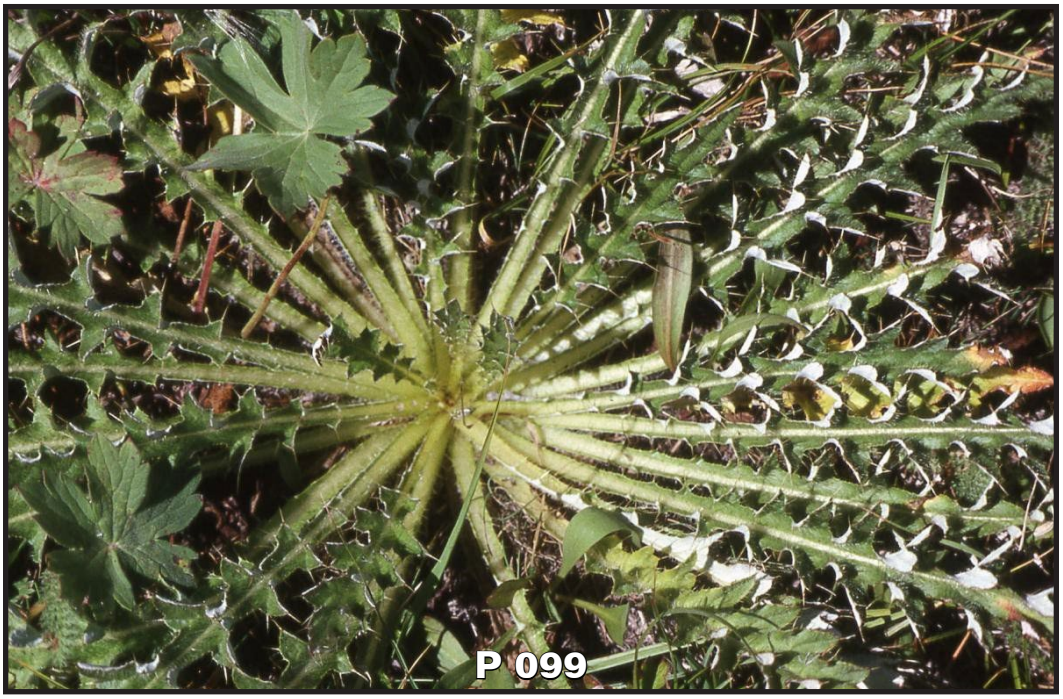



Sure - it's just an old dead tree - but in its own way it is a special old dead tree. Look at the intensity of the blue sky - why is it so brilliant today - why does it frame this ragged bit of flotsam so eloquently? Maybe because you are meant to focus on the branches of the tree - are there messages, why, for whom, what, when. I haven't yet learned how to readily converse with the energy of biota but I sense some of the energy. If this were a horizontal plan-view it might trace the rivulets - the stream ways, the flows, the joins, and the combining forces of natural waterways in a watershed never yet seen, or maybe never simulated. First order, 2nd order, 3rd order and maybe even a 4th order branch are symbolized here. Perhaps the lesson today is about how new life reaches out becoming ever more fine and thread-like as time extends the pursuit of existence - what a marvelous example. I also wonder about whether fractals would permit me to describe this structure and whether mono- or multi-fractals would be needed. Is the archway there as an invitation - waiting for your response? Another messenger from a world of charm, of unknowns, of comfort, of unheard messages?


One weekend on a drive toward Haleakala mountain on Oahu we came to a farm - horticultural extravaganza - of “protea” flowers. Totally new - never heard of them - what are they - please come and walk among the rows and drink in the beauty of the diversity of protea. Captivating, mesmerizing, a stunning display of blooms that had not ever etched a blank space in my data bases - how delightful, how wonderful - something akin to being a child again in a candy store! Where to begin - what to see - what to know - how to just sit back and listen and watch? All things have energy - so why are we so ignorant of it? I blinked my eyes and as they opened there was a crown - a jewel for a head dress - an adornment for royalty - why now - why here - why me? How often have I talked about doing the best we can - being the best we can be - giving to others what we have to give? And here is a symbol - a velvety crown of glory - it belongs to all who believe - to those who so graciously give to those whose hearts are open and reach out to others. What a wonderful moment - what a delightful reminder of the goodness that surrounds us!


If you grew up far enough north (or south) you know about the magic designs of frost on window panes. The growth of moisture crystals into patterns that exist for a brief span of time

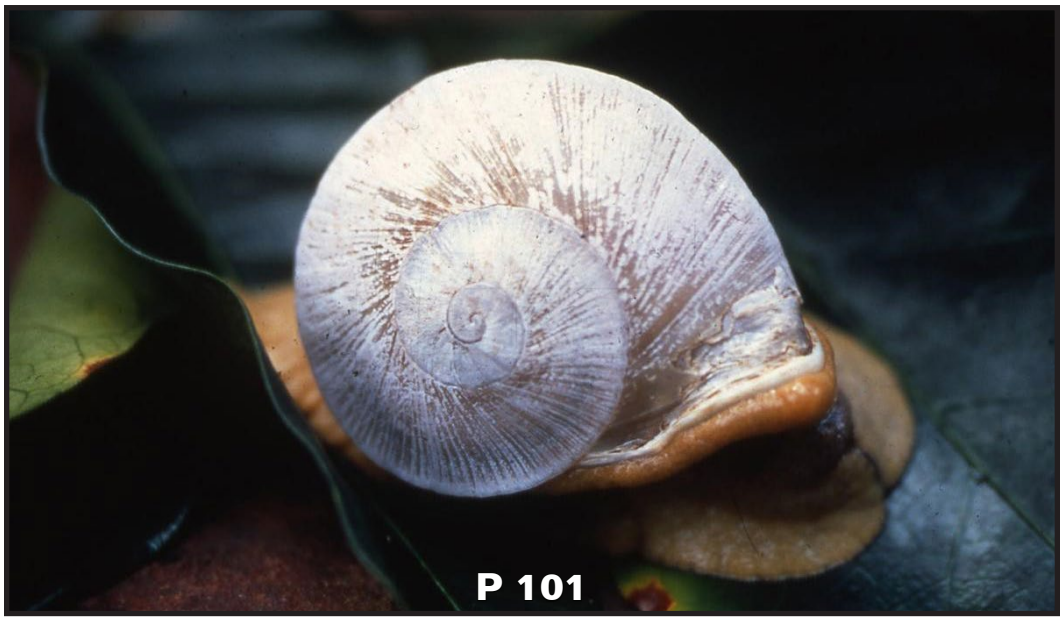
and never again will be seen - in the same way at the same place in the lifetime we are provided. But here is another kind of frost - it is rime frost - it grows like feathers attached to a quill and the prevailing breezes stream them out in their own marvelous display. Whiteface Mountain in the Adirondacks of New York state had been the site for a number of our investigations - and as usual, we always learned far more than pedological stories. Winter Olympics come and go - and so did some soil sampling on snow-covered slopes - but as we stopped on one curve on the winding road there was this display of rime frost - built on a cable nearby. I hadn't seen much rime frost so this was rather special - it brings to life memories of people, events, places, and sights that have long passed into other realms. What do we understand about climates - for most of us - not very much at all - so this too is a reminder to be tolerant - especially with uncertainties!




Who in the field has not walked by a plant whorl - stopped and gazed at the striking pattern there portrayed? It captures our attention and for a moment we are mesmerized by the symmetry - a pattern repeated very, very often in nature. Surely it is a mechanism developed over millions of years to enhance its ability to survive and to ensure its reproduction. Photosynthetic efficiency - capturing sunlight from as large an area as possible - and providing a central focus to attract the relevant passersby who may visit and assist in the pollination process!

Our desire to influence - to reach out to others with a message - our hope to complete successfully a task - and trigger a change - that is, the concept of extension work - is here before our unseeing eyes. Yes, we slowly realize the message - the silent reminder of working to make the world a better place - captured in a flower, an arrangement of stems and leaves, even in the whorl of a thistle. It has been shown that only a dozen or so shapes, designs, or patterns dominate our world - but the variations provide a splendor seldom matched.

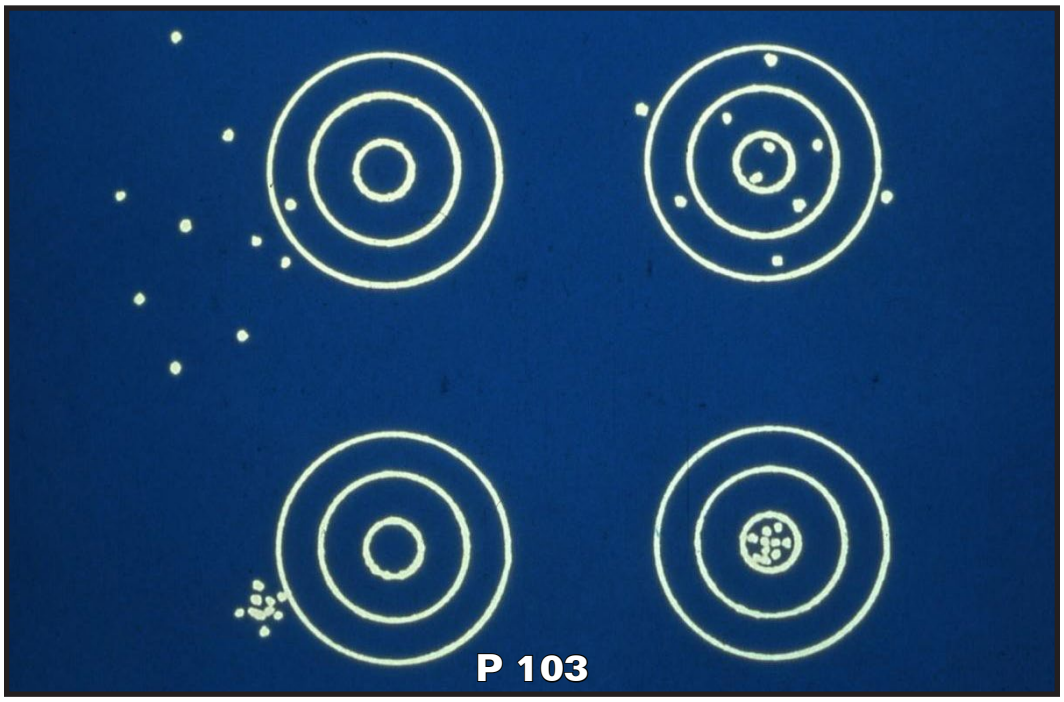

Images - wonderful, wonderful images - so many revolve around the necessities of everyday living. Activities, materials, timing, practicality, elegant solutions - they are here. Here in a 1970s young rubber plantation in Malaysia the image is of a technology passed from generation to generation. Collecting cups fashioned from coconut shells. The fresh cuts in the bark channel the latex fluid gently into the waiting vessels. Knowing when to tap, where to tap, how to tap are the pieces of knowledge that give rise to professional rubber workers. Their skills are taken for granted as they eke out a meager existence - working both new plantations and harvesting in older less systematized forests. But what else is here? Togetherness - standing side by side - like friends, or spouses, or lovers - supporting each other - sharing the location - sharing experiences together but apart - each as individuals with meaning and purpose. How so much like life. Images - yes, they are stored in our brains - they bring forth reactions, thoughts, memories - and messages from the stories that surround us in nature. Wonderful, wonderful images!




A snail - a white shelled snail going about its business - searching for food possibly. Does it have a scientific name - I'm sure it does for that is an over-arching urge of humans - to identify, name, and classify objects, events, or whatever. Yet beyond that - there is grace and beauty -

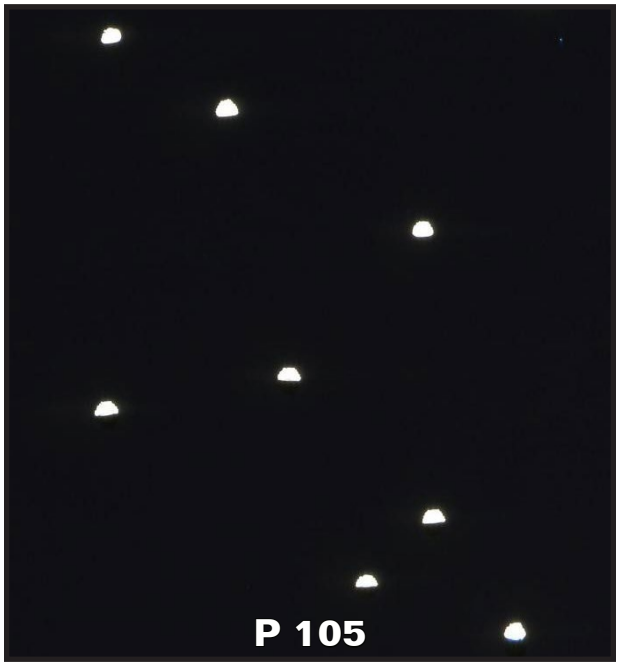
contrast of shapes, colors with finesse - motion, albeit slow by our standards. When things seem to go wrong because the right events aren't happening as quickly as needed - or certainly slower than we want - it seems that the world is moving only at a snail's pace - so slow how can anything ever be accomplished? On a geologic time scale the snail is jet-powered racing through time faster than a speeding bullet. On a snail's scale I have no idea if time has the same relevance or significance that we humans associate with our daily routines and schedules. At this moment, in this place there is silence and there is no movement - the eye sends energy pulses to a brain and if we are gentle there is a host of thoughts cascading around when just being makes the "moment" a delight!


I don't know the real name - so I call them "pancake fungi" as they remind me of a favorite food - pancakes. These grew out of an old rotting stump in our back wooded area in Fairfax. They don't last very long, usually less than a week but are a delight when they suddenly appear. Once in a while there are some toadstool puff balls and rarely the marvelous ice plants - those delicate ones without chlorophyll and so they look ghostly in their translucence. But here in the sun is a layered cluster of disc-shaped fungi gracing the woods - basking in the daylight - waiting for the syrup of nature! Color patterns almost like growth rings on trees with whitish edges like a bark covering. Somehow these friendly transitory fungi exude a comfortable mood to the beholder - another opportunity to share the colors, patterns, organization of nature one more time. It is a joy to see, ever so briefly, these denizens of the forest as they move through their cycles of evolution, growth and beyond.

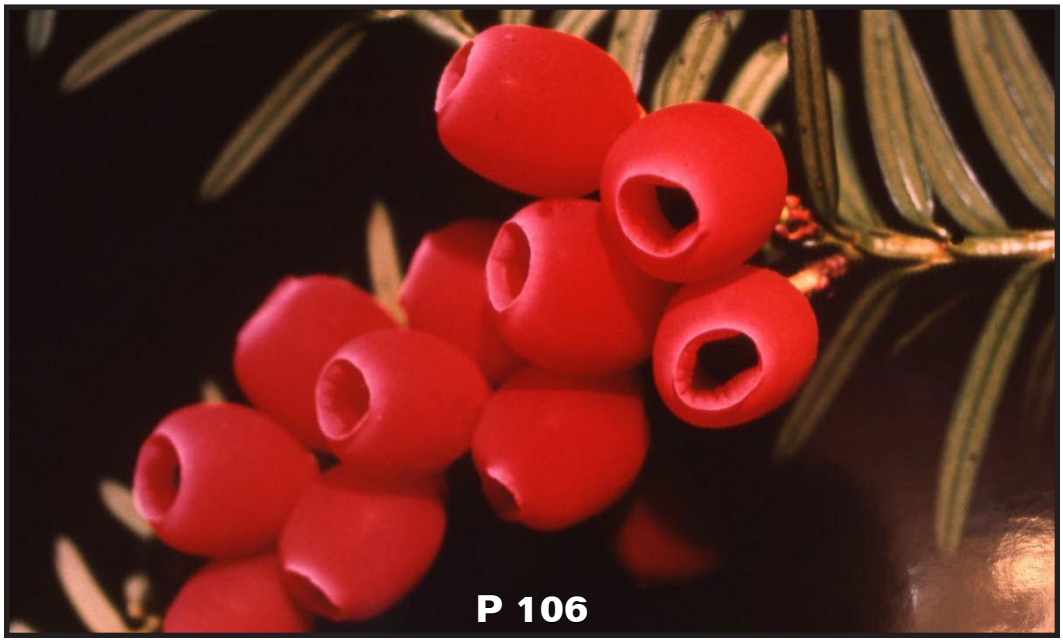



Roy Simonson used to tell a story about his shoe repairman. They discussed, from time to time, the meaning of precise and accurate. The man could not say precise so he said “precisal” or “presically” - likely a holdover from the old country and not a comfortable transition into English. He would explain to Roy that he wanted his repair work to be very good - accurate. “Well, not exactal”, he would say - I want it to be “precisal accurate”. And that, of course, was the ultimate quality of work under the given circumstances. We had been discussing a lot in the soil survey the degree of accuracy of our map units. Statistical measures could be applied to estimates of the amount and area of inclusions in a given named map unit delineation. So how do you express to the lay public what you mean by a mean, an average, a deviation, maybe a standard deviation, a population, the possibility of not being right, and so forth? These seemed to be reasonable expectations of users of soils maps and soil information. But how would it be appropriate to portray these concepts hoping others might understand? I imagine I saw or read some ideas about shooting at a target - and if so, I immediately adopted it as my own because I thought I understood it. The illustration was intended for a reader, but the intent was also to help field soil surveyors talk to others about some of the things we know about the areas we delineate on maps. Internally we spend a lot of time convincing ourselves we know the difference between classification (taxonomic) units and map units (things on a map and named in a legend). We are so sure of ourselves, we discuss it over and over and over again. So who are we trying to convince? Assume, for a moment, that a shooter’s target has a center bulls-eye and that the average or mean value of whatever it is we are measuring or discussing lies somewhere within that inner circle. Thus if we fire a number of shots, or arrows, or throw darts and a few of them are in the bulls-eye, we will consider them as being accurate. Others in the surrounding rings are associated, some closely, some loosely, to the accuracy or central value. The farther out from the center, the less accurate they are and the less chance (or probability) that we would, or should, accept them as good representatives of the real average or mean value. So a widely scattered shotgun pattern might include the mean value but overall the collection of shots would not be very accurate. Now consider that our shots clustered closely together - well, that is good precision. But if the cluster is off to one side or another, and none are in the bulls-eye we have high precision of an inaccurate value. We begin to realize that we need a combination of precision and accuracy to reach our goals, to really hit the target, to know where we are. So as the shoe repair man said, he wanted to be “precisal accurate”. We accept his perception as truly wanting to be “on target”!


A tall, thin skyscraper, a rounded building looking like a TV saucer and several other structures in the cluster - an imaginary set of buildings in a space movie? No, it is the legislature of New York State in Albany when it was quite new. We were passing through on our way to a soil survey field review - possibly in Rennssalear county. Atypical buildings on a new capital campus and a highway leading up to the group - impressive? It certainly was for me - a person more used to the old red brick, or marbled courthouse and capitol building structures throughout much of the Midwest U.S. Here was progress, innovation, willingness to depart from the past and reach to the future. Time after time I used this picture to illustrate that change is real, it is happening all the time, and it can be very pleasing at the same time. The new capital of Brazil, Brasilia, is a cluster of newly constructed structures in what once was the middle of nowhere but a symbol of change, of progress, of the times. And here in Albany was functionality skillfully blended with esthetics - a symbol, a sign, a hope for the future.



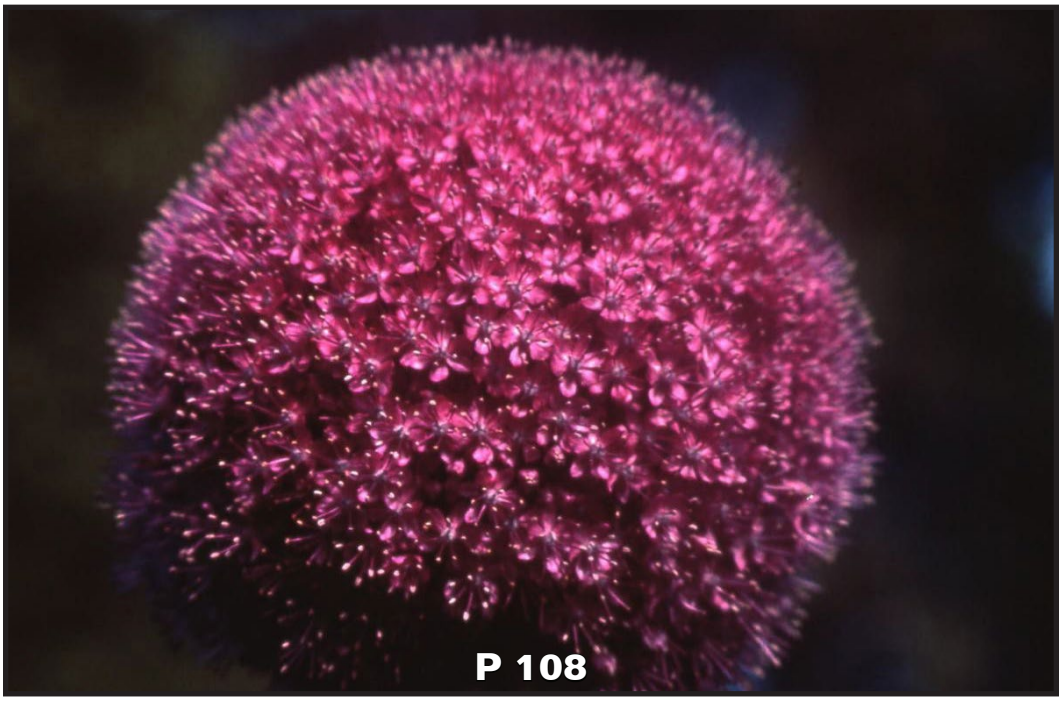

One time I was preparing a slide talk and I wanted to mention the nursery rhyme, “Twinkle, twinkle little star, shining in the sky so far, I wish I may, I wish I might, have the wish I wish tonight”. It was a metaphor about looking to the heavens and wanting a bright future for the soil survey. But where do you find a picture of the stars without resorting to 6-pointed paste-on stars, or 5pointed gold stars for a job well done? Nothing seemed to satisfy me - eventually I pulled out a “black out” slide - those are the ones that didn’t get taken in your camera and so there was no picture - just dark undeveloped positive prints - I always saved a few to use as fillers when you wanted the room to remain dark. I got a needle and poked some holes in such a slide and - voila-a star-studded midnight black sky. One could build on the whole poem of the star and slowly relate our concerns about our own future - wondering what might be - could we influence it - was it merely a survival effort we were engaged in - or what? Wishing upon a star - an age old custom - a touch of comfort to put with uncertainty!



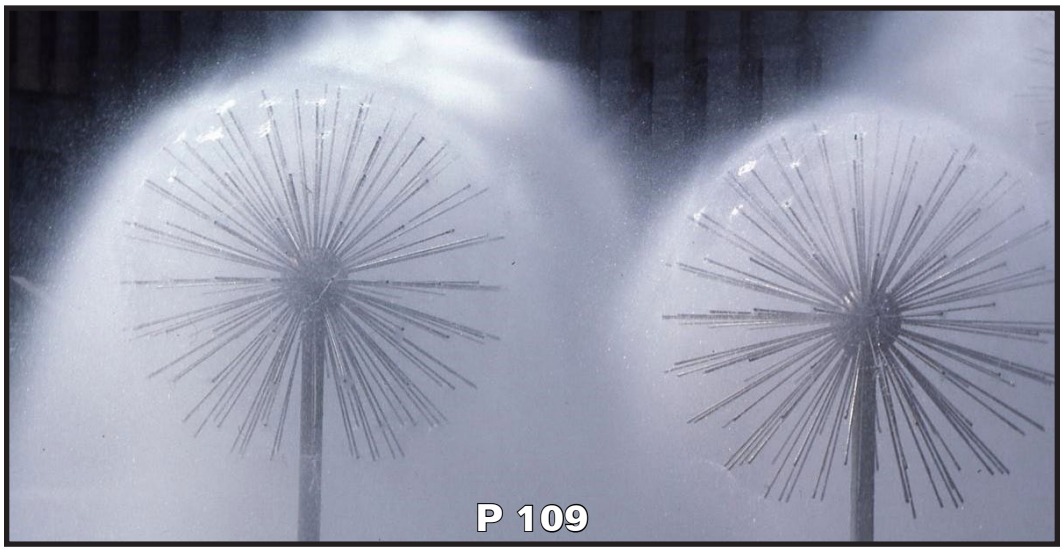

Yew berries. Many people live near yew trees or shrubs and yet have seldom seen the berries. This closeup was snapped by a professional photographer at Cornell University and it was blown up to about 10 x 14 inches. My wife, Helen, bought me this outstanding photo as a gift. She knew that I liked photography and often would find the subtle, hidden elegance of nature unseen by many folks. This picture has graced the walls of my home office for more than a quarter century and it still captures my attention and, mesmerized, I marvel at the spectacular features of these red berries whose open mouths invite your senses to draw closer - to get engaged - to become a part of the moment. So much of God's world is like that - enticing you to get out of your skin and become a traveler in another realm - to bask in the delight of such exotic splendors - to go where only you can go - and become what? Who knows what our soul cries out for - who knows the urges of millennia gone by - begging us return and "be there" - invited and totally absorbed?


One of my favorite statues of all times - the Awakening on Haynes Point in Washington, DC. There on a surficial bed of wood chips are members of a body emanating from beneath the

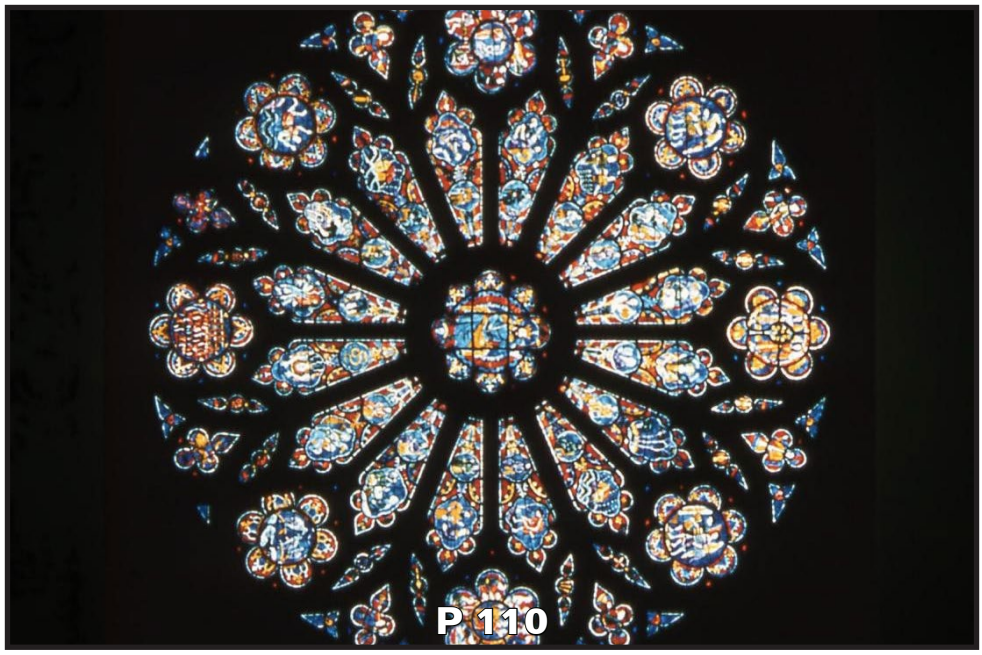
surface - reaching up and out - a hand here, a leg, a foot, an arm grasping, and a huge bearded head crying out in anguish at all that happens to a thing - a Rip van Winkle vision - coming into being once again after a long, long rest in another place, another time, perhaps another culture. And here - a simple hand - breaking the surface into a new life - starting a new beginning -does it say something to you? Does it foretell the struggles that lie ahead - does it reach out into a huge, huge unknown without comprehension? Or is it an assurance that change is never ending, that there will be one awakening after another - in time - in space - in our mind as we too struggle with an existence we have yet to understand. Hold my hand, embrace my heart, lead me in the pathways that lie beyond today. It is just a hand - yet what a plethora of thoughts it does evoke!




A giant “allium” blossom - a member of the onion family - tall stalk and the purple shooting ball when in bloom. I first remember seeing these in a field near Yakima, Washington and wondering what they were. The folks there told us they shipped the flowers to many places by air freight - even NYC. When we got back to Ithaca we planted some allium bulbs and they were great - this is one of them. It is a common pattern in nature but marvelous whenever we see it. A number of times I used this picture when talking about the importance of an effective outreach program - a tenet of agricultural extension agents worldwide. Information is gleaned from research at some place, and then repackaged, focused and sent forth to be of assistance to those who welcome such help. There is a certain beauty in the symmetry, the overall shape, the color, and the analogy that this represents. Is such a teaching tool effective? Does the allium reproduce year after year? The answer is yes - the beauty of effectively working together.

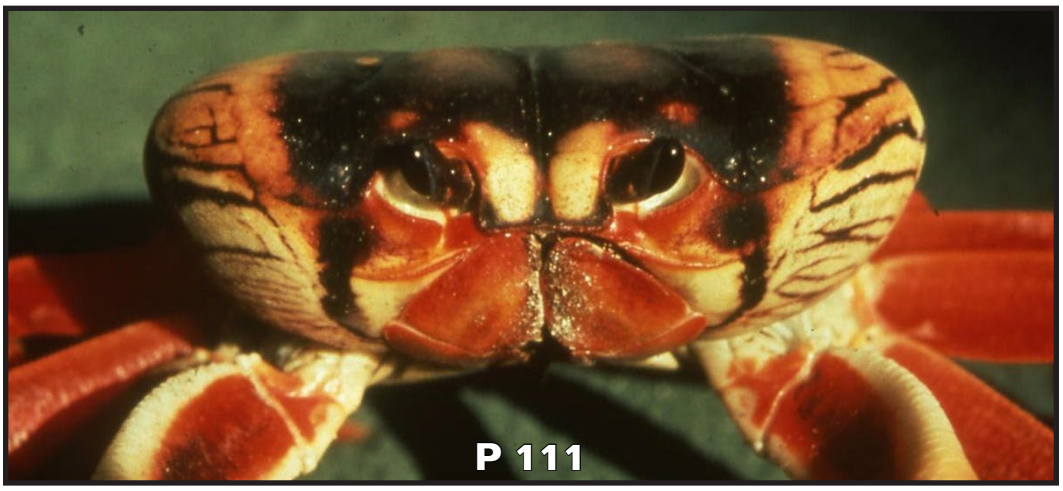



When I visited Almaty in 1988 it was still Alma Ata - capital of Kazakhstan. It was for an international conference about soil classification. I first met Prof. G.V. Dobrovolsky there and was introduced to him by Prof. Boris Rozanov. On the way to the conference center we passed by a government office building and in front in a small park were these fascinating fountains. They looked like dandelions in action - waving their slender tentacles in the breeze. As kids we used to spend many happy moments blowing on mature gone-to-seed dandelions to watch the whirling, twirling fanfare as the carefully crafted aerodynamic parachutes were propelled into the air and dispersed at the whims of the wind. Here was man imitating nature - did he ever think of the many analogies that such a scene might evoke? Even in metal and water the pattern is striking - poignant - fun to watch. As has been said the real role of science is to assist man to achieve a meaningful harmony with nature. So be it!




The patterns of nature are also common themes for the symmetry and geometry of man's artistic renditions. This is the famous Rose window in the Washington National Cathedral - the last big cathedral - finished only last century. The stained glass was made in the Blencoe foundry in West Virginia - a now sleepy little town whose foundry is close to the railroad tracks. Like other stained and hand blown glass windows the beauty is most striking when the sun in the western sky transforms the design into a blazing emblem of devotion, praise, and gratitude. As you stand deep in the main hall and gaze up - there is that warm feeling that so often envelops one at the

site of beauty - style - design - professionalism - the craftsmanship of true professionals. Another thought passes through my mind - a flower, a fountain, a window - reinforcing the sensitivity of the metaphors in life - letting us be aware of similarities - of differences - of patterns in thought, deed and inspiration.

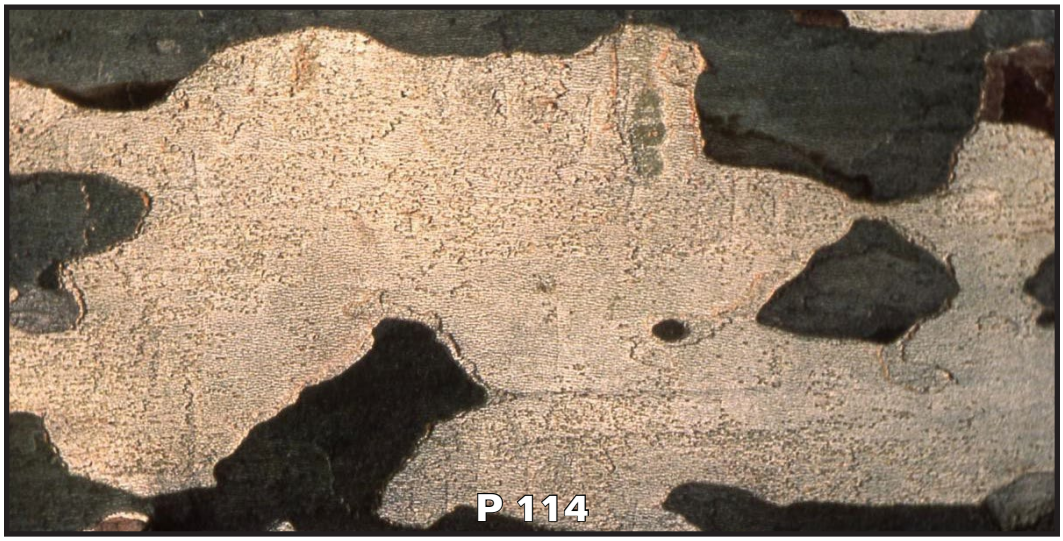



An old friend in Ithaca, Andy McElwee, shared this picture with me after one his visits to Eluthra Island. I was immediately attracted to the richness of color, the boldness of stature, and the intensity of the gaze. Like a statue it commemorates significance to some, nothing to others. Do you sense the look that penetrates your skull - tingles your scalp - and endears this amazing crab on its way to someplace where we really aren't very welcome? We see, hear, touch, feel, think, believe, and interpret - many, many things on our journey.

We also experience contradictions, differing assumptions and conclusions, conflict, and all too often - when we are looking at the same situation or circumstance. Why such a wide range of beliefs, assumptions, results, conclusions and emotions? Aha, look again at this crab - small, colorful, armored, slow, a creature of another part of space and time. His viewpoint - his vantage place, - is not the same as yours or mine. Viewpoints matter - they are important - to understand others we need to try to see from their viewpoint. Voila!


You are following a small trail in the rain forest in southern Venezuela and suddenly there before you is sharp color contrast and a juxtaposition of leaves telling you this is man-made. But what is it? Note the latex of a crudely tapped rubber tree like in Malaysia. No but it is a method of collecting the oozing sap from some tree here in the fairly dense shade at ground level. One of my soil scientist companions experienced in these jungles tells me it is the collection of chicle sap. Chicle - chicle - but what is that? It is a native product that is used by manufacturers of chewing gum. For me it is a long stretch from the packages of Chiclets - candy coated chewing gum tablets that as a young boy I enjoyed - to this messy, leaf rotting forest floor with two leaves catching the white liquid from a chicle tree. But here it was - the crossroads of innovative techniques and the advances of modern technology. It is worthwhile to see, to think, to sense a surrounding in the beginning place of something all too often taken for granted.


Half a world away in a recently cleared rain forest in Sabah, Indonesia one is astonished by this gigantic remnant of the flying buttresses that held a mighty giant upright in the forest. There is ongoing research at this site - how much erosion will take place, what is the nutritional status of the soils in this altered environment, what will be the re-growth rate of vegetation, will this land support rice and other food crops for an ever increasing population? I had the sense that here was a stump that could commiserate with stumps in a logged redwood forest in the Northwest U.S. Will these trees be lost from the memory after several generations live in this transmigration area? Who knows? It is impressive yet sad that we replace ancient wonders with rapidly constructed villages in the rush to ease the pressure on the remaining resources. But life goes on - change is inevitable - and often new wonders replace old ones - until thresholds are crossed.




It has been written that indigenous minds carry maps of the ecological treasures within the sphere of their influence. They understand much about the relationships of man as a part of nature and are aware of the uncertainties and meanderings that often occur in the interactions of man and nature. So what might such a map look like - I do not know - but I can imagine that the pathway is seldom direct and based on the passage of time there are broadly defined amoeba-like spaces connected by narrower passages, some side excursions, and even enclosures that isolate certain circumstances. This image is of a portion of bark of a sycamore tree in central China. The picture was taken vertically but is shown here horizontally. The next time you stop to examine the unique patterns on the bark of sycamore trees envision the ecological diagrams, connections, and mental maps that may be essential to the survival and

sustainability of indigenous cultures throughout the world - and how little we, as modern technologists, comprehend such things.


In a lovely statue garden near Charleston, South Carolina sets this small bronze boy holding his hands in his lap and gazing down at them. I recall it is entitled, "Just Pondering". What a beautiful capture of such moments - not only as children but throughout our lives when we sit and daydream - considering all kinds of possibilities for the topic of the moment. Several times I have written short articles using this theme - once about some concepts of the Russian soil scientist, Dokuchaev, and pretending to talk to him - I called it "Reflections…". Another time some years later when asked about why there hadn't been more basic research in soil survey, I pondered the matter, concluding that our development of standards and the detailed mapping of most of the U.S. were accomplishments that we were proud of. Also most research was conducted by the university partners of the National Cooperative Soil Survey. Maybe we don't take the opportunities to "Just Ponder" the world around us and what things are, or should be, more relevant to how we travel the journey.


The Sabana de Carora, estado Lara, Rep. Venezuela is an arid, parched, extremely sparsely vegetated region wracked and torn by erosion. It is rather desolate, isolated, and touched with a tinge of sadness. On these windswept clayey sediments stones and shrubs are few and far between - they have to be gathered and brought to special places for special purposes. The ground is so hard and dry most of the time that digging a grave is a serious burden and in death - important persons are covered with sticks and some loose dirt to keep the animals and scavengers at bay - at least for a while. A rustic hand-hewn cross - its engraved initials - JRP - a sign of hope that the interred may rest in peace. The sight was unexpected and as we

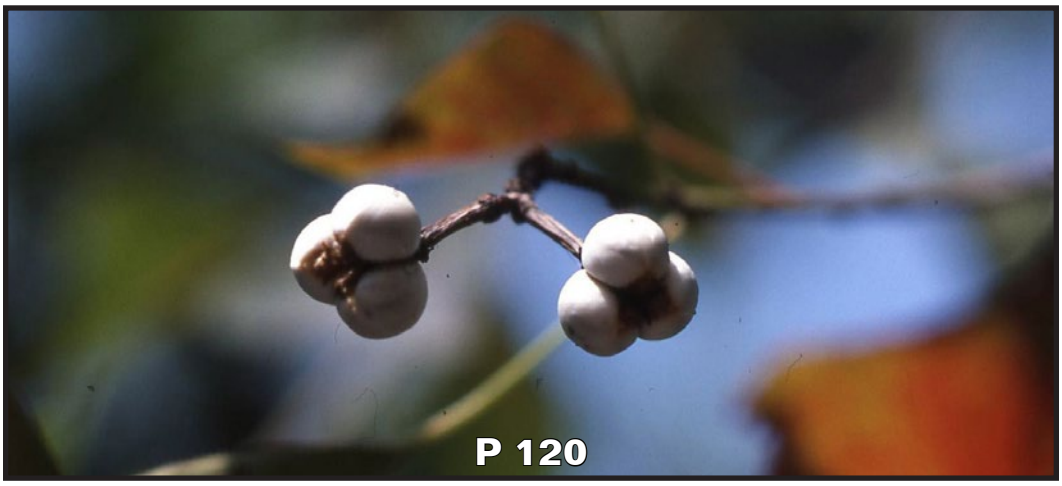
paused - a flood of thoughts passed by on the hot winds of this small desert - helping remind us of the fragility of land, of water, of life itself. Markers and monuments to preserve events passed are everywhere - in many forms, in many expressions, yet tangible to those who build and those who believe. Is an afterlife real or only imagined?


Most of us like wildlife babies - like this little spotted fawn resting quietly in the undergrowth - basking in sunlight - but also alert to where mother is and any strange sounds that may indicate a predator. I remember reading a phrase from a philosopher from India, “Everyone loves a kitten, no one loves a cat” - this was referring to the changes from almost total dependence to that of almost total independence - from trusting innocence to aggressive survival. Our hearts reach out instinctively to the young - they seem so helpless and we can offer them some degree of comfort. In urban environments children usually enjoy a “petting farm” where touching animals is a way of communicating - often without words. Even though we may be aware that in true wilderness - the less strong young are often killed - survival of the fittest and perpetuation of a species - and often the unfit are eaten by their own kind - a careful balance between growth and limited resources. Is the concept of “cute” or “cuteness” associated with babies of most species? An innate emotion perhaps?


If your urban task is to rake up the leaves covering the lawn or crowding around shrubs, the visual pattern is of very little interest - only the shape and amount of material that is to

be moved and removed. However, if you are a casual intruder passing through, your eyes may begin to see the mosaic of shapes, colors, sizes that extend across the earth's floor where you are. Red tupelo leaves are early this year, mingling with various oak, some basswood, and a hickory or two - a pattern of the moment - likely to change with a swirling breath of a cold front moving through. Is there a pattern - or does our mind only want to see order in this mass of leftovers? Many of us see this as chaos - disorganized, random, transitory configurations not worthy of much thought. Yet clever minds have sensed something more - a pattern, new patterns of arrangements that can be described and characterized by "chaos theory" - a growing branch of mathematics. We so often see only that which we have been trained to see. In pedology too? Of course. Limiting? Likely yes!


You walk across a field with Chinese hosts and along a hedge row - something catches your eye on a fall day near Nanjing. No, not the soils, or the lady harvesting sweet potatoes, no it is the shape of leaves on a stalk, an arrangement that is not very common for me. Or is it the way light has outlined this portion of a plant and whose aura attracts your attention? The narrow leaves are pointed but not sharp to our touch. Is this type or kind of bamboo? Very possibly - invasive yet left alone in a hedgerow separating fields. The play of colors, the shadows, the spots of reflected light - this brightness is in stark contrast to the surrounding. Plowed fields nearby are earthy tones of grayish brown - the high moisture content in the atmosphere filters the scene and masks the view beyond - the blues and grays of our host's clothing blend into the surroundings. But here is a respite - a sign - a signal - it is beautiful if not seen? Unexpected, welcome, contrasting having a story of its own to tell - but seldom do we ask - or are aware of the opportunity.




Another surprise that day. Three clustered seeds of an unknown shrub. Tripartite berries hanging before your eyes. What kind of story awaits us here? Assume that you see a model - a pattern of molecules that you cannot see - yet here is revealed the clustering - the joining of electrons - of ions - of elemental components - but your mind has to be able to imagine that such is

the case. Maybe this is a nitrate form - NO3 with its 3 large oxygen atoms. Or the common carbonate form - CO3 - well that would be fitting as we noted some calcareous rocks in a nearby quarry. Or perhaps this is a modernistic example of a three-legged milk stool? Long before 3-D computer imaging there were patterns displayed at our finger tips - forms that help us construct models of things we can only imagine - arrangements that fulfill some requirements of our physical universe - relationships among entities - abiotic and biotic. Depending on our background, training, experience, curiosity, interest - there are stories linking parts of our world together.

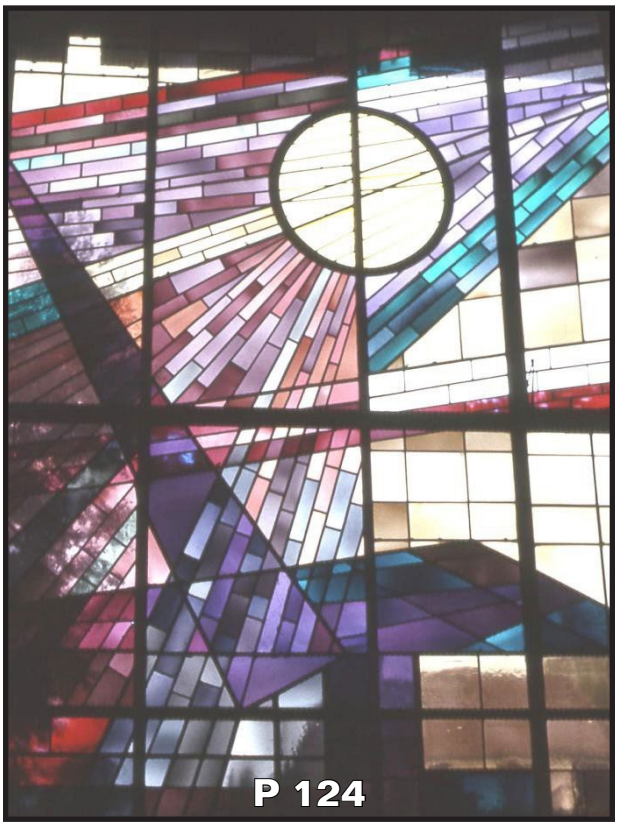

In a forest we seldom stop to admire the special designs of tree bark but here on a dry slope in Idaho is a lovely ponderosa pine. The bark colors blend and merge with the scaly plates of the textured bark. For tiny insects this is a rich suite of condominiums waiting to receive them in the nooks and crannies and connected hallways in the bark. Scales flake off from time to time forming a gentle cone around the base of the tree. When you look up into the branches far above you realize the height of the tapestry.

Can you sketch this array of nature - I could not - and I believe that is one reason I am enthralled by the intricacy of this design and want to capture a small piece of it to visit from time to time. Sometimes as we stare - it is as though there is swirling mist and we decipher objects within the randomness of our mind. As we travel in woods and fields we have opportunities to see and hear what must truly be fascinating tales if they could speak to us.


The outstanding arch in Saint Louis symbolizes different things to different folks at different times. It is a reminder that on this planet there are truly overarching objectives that offer us

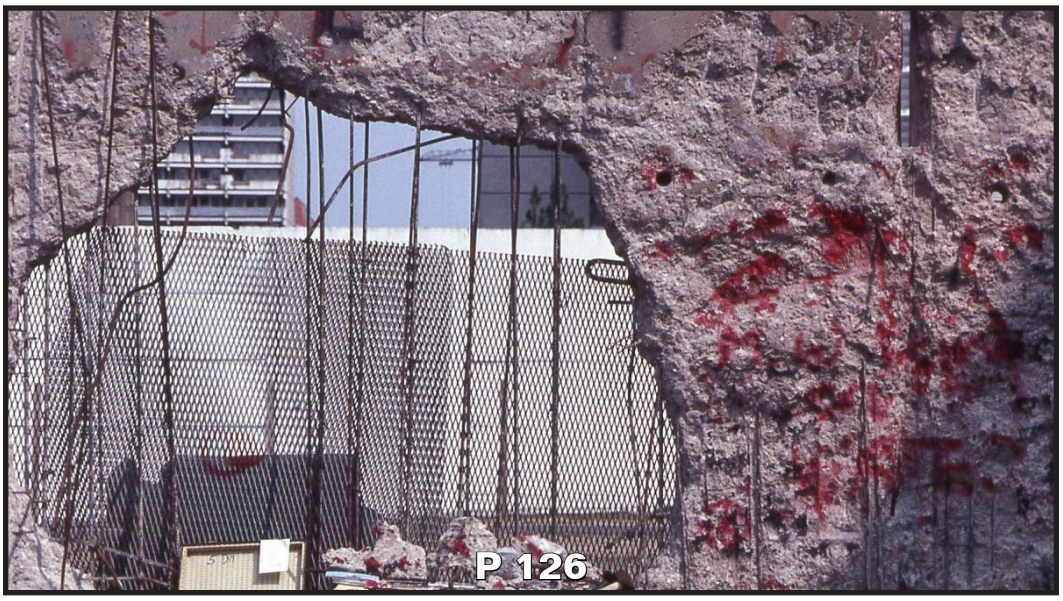
counsel if we will be alert to them. The challenge of mankind is to exist in harmony within the tolerances of nature. All too often it seems to be hollow advice when we see and hear of the grossly inhuman behavior of parts of our civilization at war with others. Have we learned so little in the past 10,000 years? Another idea is the necessary bridging across the chasms that divide us into isolated cultures without empathy and compassion for others. A Chinese philosopher once remarked that if a chasm cannot be crossed in one step, two steps are even less, thus leap. In the brightness of each day the shininess of this arch beams hope to those who are desperately searching again for the commonality of human values. Yes, hope, peace, comfort, outreach, goals, crossings, reaching high above - we are surrounded by metaphors in life.


Did you ever have a creepy feeling that aliens were out there watching and waiting? But what does an alien look like? Where do they hang out on our planet - what do they want - are they intelligent creatures - are we capable of communicating with them? So many uncertainties it may all be fantasy. Meanwhile back on planet Earth at the edge of a cleared rain forest in Sitiung, Indonesia a worm or non-hairy caterpillar peers down on the laborers below as though to better eavesdrop on their conversations. For the indigenous this is no stranger but for the visitor it is an unknown entity. If you are fearful of this planetary passenger what do you suppose it feels? There are so many fascinating things on this planet - known to almost none of us - but locally adapted to ever evolving environmental conditions. Whether the jungle disappears naturally or by man's activities - it may matter very little. But the rate of change may be ominous and forebode degradation and death. Each little speck is related in some manner to every other little speck. Welcome to global interactions.

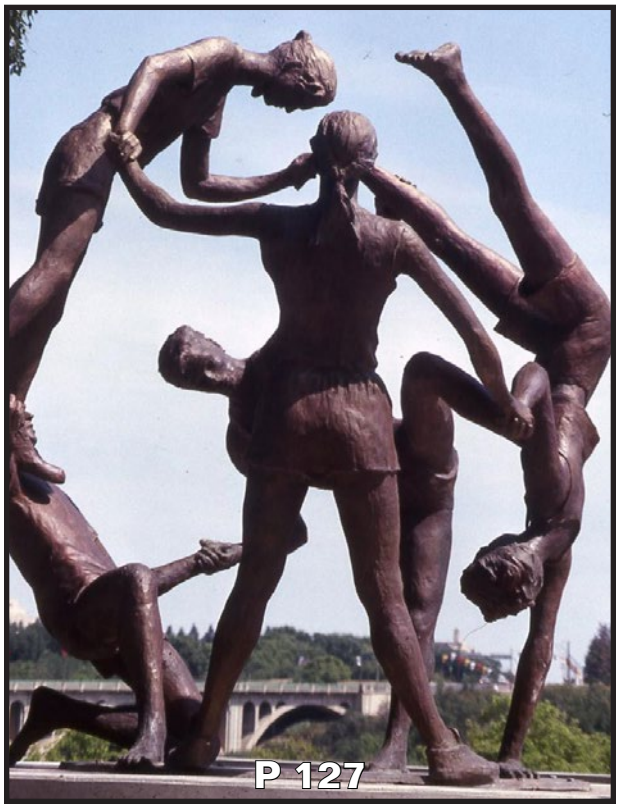



In the Soil Institute in Bremen, Germany is this interesting colored glass window. To even a casual observer there is the sun with its life giving rays of energy streaming down to the earth - transforming many things by this passive transfer. Below the ground surface the compounds have been altered, rearranged, and soil formed. Layering of different colors depict horizons of a podzolic soil common to the sandy soils in this region. Man's interception of sunlight provides for industries, and the host of human activities that make a civilization. Deep plowing mixes the soil horizons that developed under vegetation for thousands of years and so the patterns of nature are transposed to those with man's imprint - at times good, at times harmful to the environment. There are stories within the glass, its shapes, it spatial orientation, and the feelings of not only the designer but the fabricator as well. Workers at the Institute pass by with merely a casual glance at the changing hues in the passing of the day - but we, too, do this to the objects in our own place of familiarity and our minds move rapidly to other thoughts, concerns, and daily cares.


In New Brunswick, Canada September is usually a lovely month. Potato harvest is finished, equipment cleaned and stored for the nest year and the beauty of fall embraces the warm sunny days. For some of us it was a field workshop about Spodosols and how we might improve definitions, criteria, and classification of such soils throughout the world. Not all maple leaves go from green to yellow to red - no, some announce change with rich golden orange hues - welcoming the season, trembling with joy at the pleasures of life, anticipating the morrow, and waiting to be recycled. We know that everything dies - and we will die - so the big question for each of us is simply this - since you are going to die anyway - why not make a difference? That's right, why not make a difference? A passenger, a sojourner, a passive object? You have too much to offer, too much to share, so much love to give, so many lessons and stories to pass on - oh yes, why not make a difference? You can do it - right where you are in your microcosm. Thanks maple leaves.




A hole in a wall. It is “THE WALL” that monument to pain, to shame, to blame - the Berlin Wall - to separate ideologies - to reinforce differences - to foster beliefs that tear families apart and teach fear and prejudice far beyond the steel and concrete of a wall. In the opening of 1990 the structure still stood - its ominous presence unlike anything else I had ever experienced. Was this what man does to man - is this a necessary point in evolution of humankind - is it not also a reminder of the terrible, terrible tragedies of the Great War and the unbelievable events that accompanied those years? As Americans we were fascinated - as global citizens we were appalled - heart broken - ashamed - so uncertain of a future on a planet with so little intelligent reasoning for the sanctity of life and all things - large and small - that comprise the components of such a spectacular habitat. But do we learn - or merely repeat mistakes and put them into new settings - updated technologies with symbols of the times? A few months later this wall was torn down - a time to re-build - to move ahead!




In Kiwani park in Saskatoon there is this delightful statue of five acrobats. They capture the fluidity of motion, the necessity of composure and balance, the grace and charm of competent ability, and the utter delight of creation. In reality such a feat is fleeting - momentary - and the exhilaration moves quickly on to another situation. It is a powerful message if we wish to entertain the meaning - it is all about team work and trust. It is about willingness and purpose. It is about desire and achievement. All of them combine to re-enforce each other providing a synergy that transcends each member of the team. The sum is more than the components. In a world where working together to have a better environment takes on special new meaning with each passing day - here is a beautiful reminder of the result - of the respect and trust and ability - of the strength and care and joy - of creating something better - of something bigger - something not possible alone. How often I used this scene to encourage and ask that others support each other.


I like the symmetry - the simpleness - the understated artistry of this pile of sand. In a relatively young forest plantation near Monagas, Venezuela a colony of ants has been constructing their new habitat. The soil is very sandy, the organic enriched surface layer is thin or stripped away during the clear cutting that occurred a few years before - and now the light tan sand of the subsoil graces the surface. When the rains come the shape will flow itself into a new form - maybe to be rebuilt or maybe to be abandoned as the progression of time and life pass by. But for a moment the elegance of nature, the abeyance to laws of physics, the practicality of today, are here - a testimony to the marvels that occur everywhere whether seen or unseen, whether heard or silent. Why here - why now - why not? Of one thing we are certain - the earth and all therein are but players in a story of energy, of form, of brief existence, of some segment of eternity and light. Our restless earth holds treasures if we choose to recognize them as we pass by.

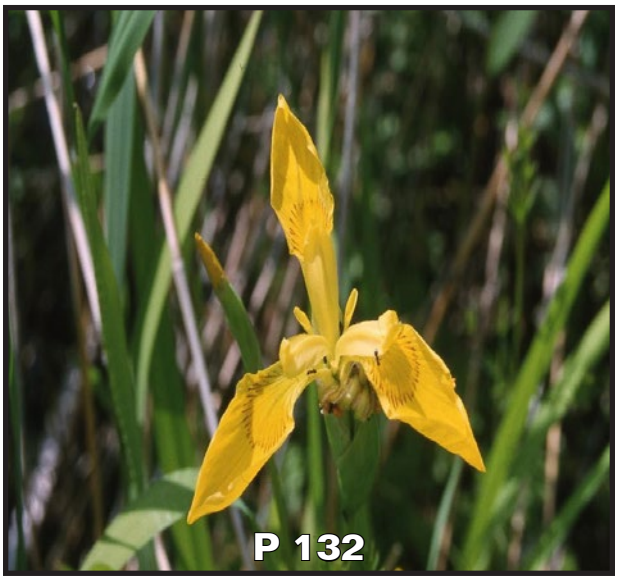

In southern Utah there are many interesting features in the landscape. One area is called Monument Valley where numerous erosional remnants exist - this one is Mitten butte - it is a bit of a stretch to picture a mitten for the left hand with a thumb on the right and a big broad mitten on the left for the fingers. What is awesome to landscape people is the isolated remnant of a thick set of layers of sedimentary rock and the idea that all the rest has been removed. Yes, gone - obviously far away as only the last stages of mass wasting and wind and water erosion are seen today. All this attests to long term tectonic stability - in the upper Colorado Plateau as rivers cut into their side walls and slopes removing ever larger amounts

of sediment. There are erosional records of a number of stages of down cutting by the rivers - some perhaps climate controlled, others likely relatively uniform tectonic uplift - each giving rise to new cycles of down cutting and sculpting the passive rock formations into striking monuments of our restless Earth and its continual changes of an unknown evolution toward extinction.


Often we hear or read sayings of the wise men of China - and often they are very appropriate for situations today. Many times I used this slide to present a saying - actually this is a replica of the guardian warriors unearthed in Xian, China - this one is in Hawaii. For example, one saying is, “To know when you have enough is to be rich”. Or “a journey of a thousand miles starts with the first step”, or “Do not be afraid to take a big step if it is indicated. You cannot cross a chasm with two small jumps”. Little quotes often seem to get across a point better than a picture or sentences of descriptive words. Most of us grew up hearing, Confucius says … followed by some clever phrase. When the words are from an ancient culture we somehow think that the thought may still be valid - and nearly - a universal. Using a statue is sometimes a very effective way to get your own message across - as though it had authenticity. Imagine that!


Like Rip Van Winkle awakening from a deep multiyear sleep, or the sudden realization that things had been happening and you hadn’t been paying attention, or an intuition of something that you heard, or read, or saw has a super special significance - any of these reactions are

transmitted by this statue's head. It rises from the earth - from a resting place out of sight - hidden until now - and the anguish of uncertain comprehension surrounds its presence. The artist seems to have been clairvoyant - visioning the rise from obscurity to an open frankness revealed in the blinding light of day. You almost feel like an intruder as this giant awakens from a long departure - struggling to believe - to understand - to comprehend - the event, the circumstance, the lapse of memory and time - but bursting forth in renewed vigor and joy - tinged with apprehension. It is like when we struggle with a problem - and then suddenly the light goes on and we exclaim, "Oh, my goodness, I see it now!" The magic of discovery, the ecstasy of a connection of relationships - ideas and explanations of soil genesis come this way. From the unconscious to the conscious - from the cluttered mess of seemingly random bits of information - a flash, a stroke of genius - a new version - a relationship not before recognized - a story of how things fit together. Wonderful - satisfying - comforting - new - exciting. More than likely such combinations have been understood by others before us - but it is our own experience that provides stimulus to keep these fragments - to weave them together as strands of truth not yet combined in acceptance. "The Awakening" - what a great concept to mold into life like forms and rust proof metal and arranged as the parts of a body breaking forth from the bonds of clay and sand. Our education, our experiences, our training - is a sequence of awakenings - slowly but surely transforming us into more enlightened entities with a storehouse of memories receiving items to store, to recall, to use as we unravel and read the stories recorded in the pages of by-gone times of pedological evolution.

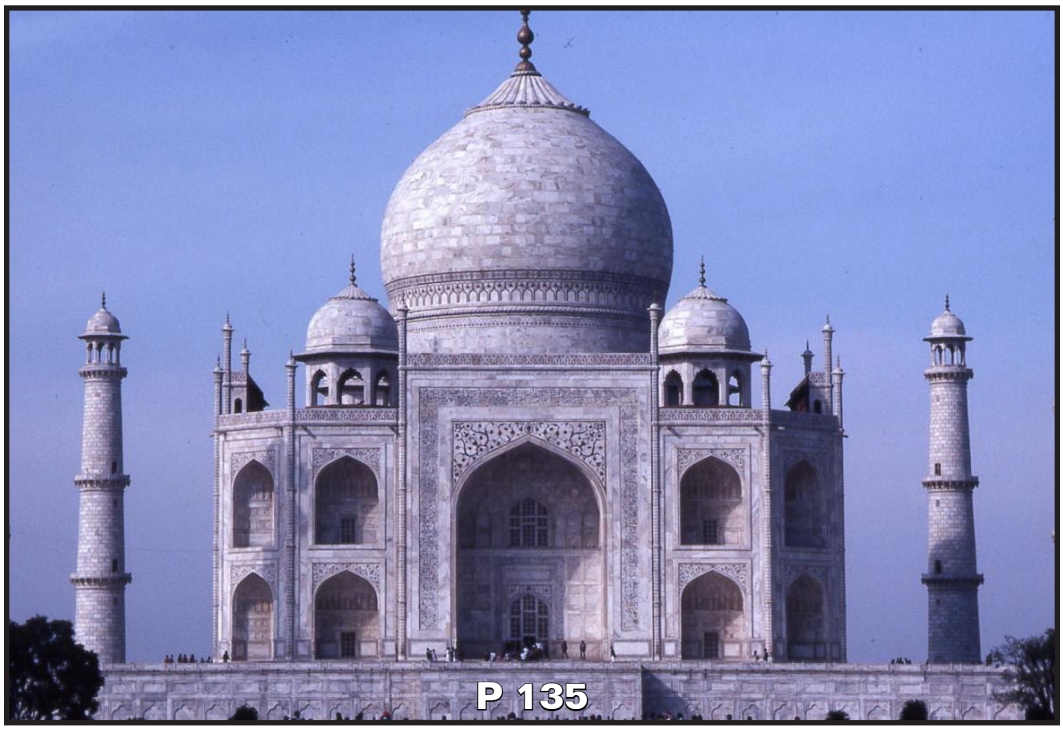



If April showers do bring May flowers, then the swamp iris blossom in May in Bulgaria is a most welcome sight and consequence of previous rain. Like so many blossoms of delicate plants in wet, boggy marshes, this tender iris stands bravely awaiting sunshine, visiting insects, and maybe even a passing pedologist. At a glance the shape is that of wind turbines waiting for the daily breezes to start the windmills of power generation to begin their day. Like their upland cousins the characteristic softness of shape and intricate skillful form takes place with grace and humility. Color is contrasting, clear, bold, eager, and shiny to attract pollinators to ensure once again survival. If we didn't see the flower would it still be beautiful - to whom, and is it beauty or merely genetically coded and honed practicality of survival - a brief but essential activity of almost all life as we know it. To discover a trillium -to discover a swamp iris - to smell fragrance in a passing breeze - to watch the gentle dance of a blossom on this day in May - what a delightful treat!


A curved pattern, like a semi-circle with several cross cutting darker stripes - it is a testimony to the engineering skills of Greek architects. This is a portion of an amphitheater in southern Greece - the acoustics are so keen that you can be seated almost at the top row and hear normal conversation of two people at the apex ground floor stage to the left. The dark stripes are stairways like in modern bleachers at football and baseball stadiums. For you and I it is a marvel - cut stones fit carefully to provide a view and a sound of the events that took place. Supposedly it was mainly for plays - dramas to enthrall the audiences. The Greeks had some very knowledgeable scholars of earth and soil sciences and books were written about the proper way to manage the resources in a productive state while enjoying the bounty of the land. But today much of the land reveals a long history of changing uses and the disaster alteration wrought by erosion - stripping bare hillsides and leaving rock strewn surfaces whose capacity to function well has been severely compromised. Will we forget the lessons learned in ancient time?


A sphere has many intriguing properties that seem to promote survival for some forms of biota and in a physical sense the compact unity of a sphere is spectacular. Additionally the structure can be formed in a myriad of ways and interior designs - here enabling us to observe

the delicate complexity in a road side weed. As we have seen there is beauty everywhere if we can pause and imbibe the essence of such phenomena. Looking into the open spaces of this dandelion plant on Nantucket Island is like traveling in a different time and space dimension - a play of science fiction to hold you spell bound for a moment. Allium and dandelions share the “outreach” design where the center core appears to be a source of energy - a nucleus of information that reaches to its outer extremities and is then dissipated in the struggle to continue an existence far into the pages of new millennia. Yes, this one is special - it is not so common - it has more charisma and charm than some others. What is the trivia that engages our energies so much that often the pleasures of life are missed?

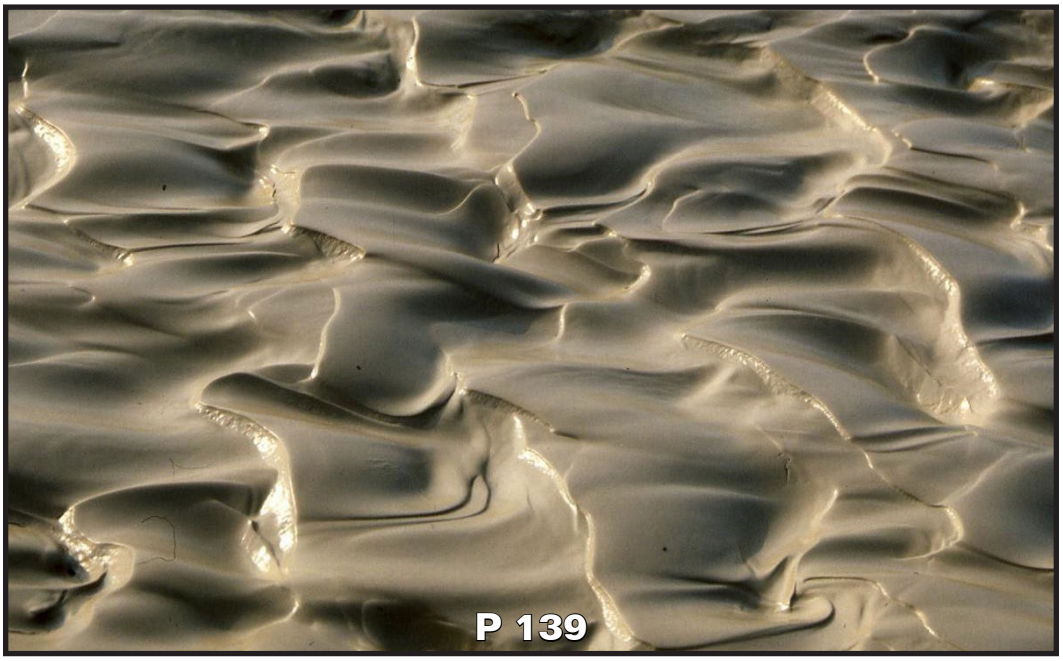



There are always symbols of love wherever you go on this planet - they take many shapes and designs - they are rustic - sublime - exotic - fantastic - memorials to the deep seated emotions that fill our bodies with longing, caring, wanting, needing, irrational, dedicated, and on and on as the sonnets of years gone by regale our minds with tender dearness. Is the Taj Mahal in Agra, India one of the main wonders of the world? The architecture and symmetry are set off by the brilliant shininess of marble in sunlight - one man’s deep seated feeling captured in time and space for his beloved spouse. It is a hushed atmosphere, one holding you spell bound and in awe, it fires your imagination, it soothes the goodness in your heart. Yes one has a new found respect for the power of love - between humans and with their God. Cross the threshold of unconditional love and wrap yourself in the tingling sensations of admiration and respect. Our pathways may be different and the journey unique but this memorial brings us closer together.

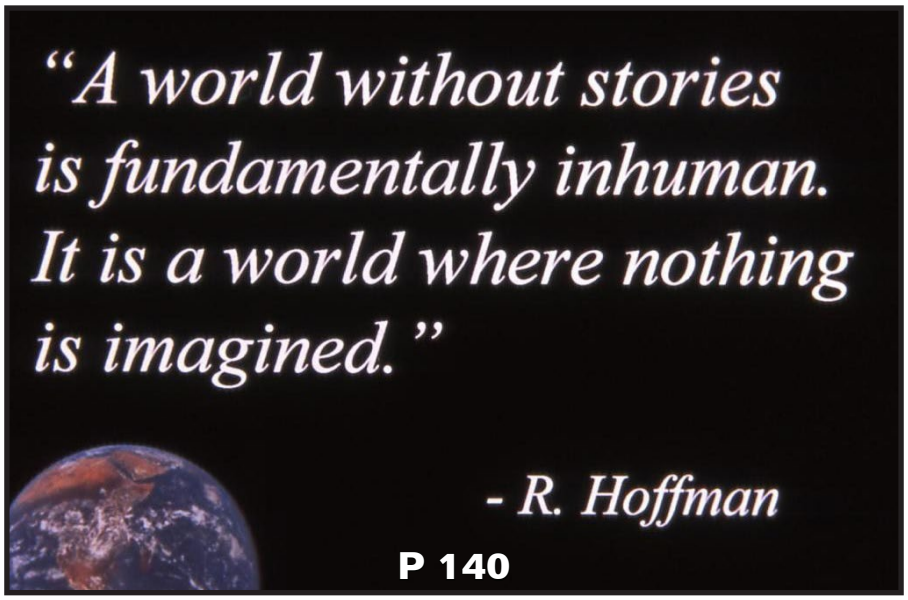

How do you summarize a lifetime of amazing interactions of humans and nature? How might you concentrate a million disparate thoughts and sights and sounds into a symbol that captivates others? How do you know that words aren't necessary to convey the special feelings that we inherently have for our roots in unknown civilization? How does one integrate purpose, function, myth, beauty, and the mysteries of a universe in such a way that it is readily understood? Well, for me, this is that symbol - the combination of earth and sky, plant and soil - held in a human hand. Powerful, really powerful! If you want to sense hope for the future, here it is - struggling but vibrant and growing. If you want to be touched by the inevitable ties of the biota - each depending on the other for survival and future development, here it is. Like an answer to a prayer of thanksgiving, here is an abundance filling an upturned open hand, a gift given freely. Soil as the crucial, essential buffer of life in the milieu of energy fluxes on this earth is an object taken for granted most of the time because it is ubiquitous - it is everywhere - but never quite the same. The teeming life inhabiting a small handful of soil numbers more than our imagination clearly comprehends. But soil is not just a handful of organic enriched topsoil - no it is a collection of very sophisticated products covering the terrestrial environment of Earth. Factors → processes → properties → functions - a paradigm not yet understood, and perhaps beyond our current evolution as an advanced species. Can we love inanimate objects? Of course! A view of the Grand Canyon, a special painting by and Old Master, the tingle of watching the first crocus offer its blossom to a waiting world. Oh, yes, we love many things - sights, sounds, touches and feeling, emotional attachments. I am very grateful for the opportunities I have been provided to experience a few aspects of the grandeur of being alive in this world with its unfathomable design and interdependence. To hold a hand of soil enclosing a new young plant and know that you, too, are a part of this creation - awesome!!


High on a volcanic mountain slope in southern Chile you just might see this blossom - for me it symbolizes the communication between components of the biota - plants and humans. It is so easy to speak to this species - to talk about the manner in which its tentacles stretch out and have small bulbous ends that seem to be receiving sound waves as they pass by. “Hello. I am happy to see you and be in your presence today. Of course, I, too, feel the gentle breezes as they pass by - bringing messages from far away and that will continue on to gently touch the face of a stranger thousands of miles from here”. “Do you stay long with us?” “No, because my time scale is quite different from yours. My attraction to others is not as yours and yet, the function may be ageless”. “I’ll miss you when you go on but will remember your brilliance and radiance for a long time”. “Thank you - that is kind and generous of you to carry me in your memory”. Easy, comfortable, subtle, delightful, colorful, and exchange of universal energy -how very nice!


Ever since my wife convinced me to collect steeples along with soils and landscapes I have watched the skyline for the signs of buildings that man has erected to foster the link with the mysteries of religion. There are so many variations that one’s mind soon is full and knowing what to save and what not - are fluctuations of the passing moments. I marvel at the intricacy of detail in the designs that exist. Geometrics most often as though searching for the perfection of patterns that bring man and God closer to a meaningful relationship. Who needs gold that shimmers - not God - but some inner urge to glorify the sense of being - of community - of realizing that pieces somehow fit together in the complicated interactions of a mind and a dream, of the moment present and the future unknown, of a perceived reality and the uncertainty of faith that comforts the soul. Here in Almaty in Kazakastan one comes face to face with are symbols of the past, the present, and the future. There are many surprises on the journey for each of us. Enjoy - rejoice!




The Gerstle River runs near Tok, Alaska - it is a glacially fed river and thus with the warmth of a summer day, the water rushes through braided channels and overflows the shallow channels settling softly in the quiet backwater sections between channels and higher stream bank and older terrace levels. But most streams and rivers respond in similar fashion to the variations - the fluxes of energy that course the veins of hydro-systems - each a part of a larger collection called the hydrosphere. It is the commonality of systems that eventually become impressed into the cells of our brains - waiting to be recalled - to be compared - to be a general standard of behavior - a bellwether to signal the similarity - the sameness - the timelessness of a restless Earth - a universe in motion - of uncertainty larger than even we want to imagine - repeating, repeating, repeating events and reactions without end. Remember when asked the question - "If a tree falls in the forest, does it make a sound?" Does it take human presence for such things to exist? Are we so much a part of the universe that we must be there? Not as individuals but as a specimen representing the larger community of humankind? Even the sparrows of the field are considered precious - thus tangibles are readily accepted - but what about ideas and thoughts and concepts - are they real, do they exist, where are they, can they be heard, seen, felt, tasted? Okay, so tell me about love - if it happens to another is it real - does it stir the heart and change the chemistry within a body? Does it evoke responsive behavior unlike any other? In the quiet shallow of the Gerstle river the ground up rock flour - the silt formed by glacial action gently swirls, meanders, eases left, right, up, and down, and particles respond to an ever changing regime of energy flow as transmitted by the slowly flowing silt-laden waters. Look, look - see the astonishing uniqueness resting on the river bed - the sun is moving on - the temperatures drop - the ice melt slows down - the flow of water from beneath the glaciers is drastically reduced and now the nearly saturated but non-eroding silts glisten brightly in their moment in the sun. Awesome! Almost unreal - if we did not pause just now and see this - would it exist - who would care - is it of value - is it art - is it sculpture - is it God-given - what is beauty of pattern, and color, and texture when captured over and over in nature? Sometimes we hear that beauty is in the eye of the beholder - but what if there is no beholder? Is there no beauty? If this scene were sands then this could be a landscape of sculpted sand dunes reaching as far as we can see. Oh the play of light and dark shadows and highlights - amazing changes of localized scenery. I felt extremely good the day I saw these little silt ripples - to me they were beautiful - they would have been beautiful whether I saw them or not wouldn't they? They might only exist for one day before being obliterated - does the story of a story teller die when it has been told and the sound waves dissipate into the air? I am pleased to have opportunities that open my mind and my heart to other possibilities!




I believe in stories - I believe in the transmission of values by the spoken word as tales and myths are passed on from one group to another - from one generation to another - from the ancients to the moderns - from the indigenous to the invaders. Yes I believe what Prof. Hoffman captures so succinctly - "a world without stories is fundamentally inhuman". It is a way of saying that the human species passes on more than genetic instincts of survival - it implies that the evolution of the human brain has given rise to possibilities unimaginable - to dreams and visions of futures that may or might be - and those far, far beyond our imaginative speculations. I am not a good or clever story teller and so I have attempted to write down thoughts and ideas and dreams and emotions and deep seated feelings that are brought to the fore by sight. Pictures that stand for many things - a visit to wonderful places, a quiet moment of rapture, the awesome understanding of how small a part of a nation, a continent, a world, a galaxy, and whatever a universe might be - yet sensing that it is okay to want to be a part of some enormously vast surge of energy. Here within the confines of our materialistic domains of today all else seems unreal and a myth of super proportions - but for some reason we are here - at this moment during this time - in these places. Do we have any wisdom to pass on? I don't know - I can only imagine - we are but a collection, a polyglot of thoughts, of remembrances, of illusions, of beliefs - and we become enamored with what has been bestowed on us in our own little journey. Some people are old and wise, and are only early teenagers, others are young and not wise and we in our seventies - well, who knows? The range of capabilities - the myriad of experiences - the totality of being - is indeed very, very large. I have recorded here a small set of stories that I have had the pleasure of being introduced to - that have touched in some way the passion that has filled much of my life. They are not very important - mostly they are of interest to me as I pause and reflect and marvel at what has happened. Some of them may help my children and grandchildren understand a bit more about me - if they care to know. Some may be of passing interest to a few colleagues, friends, and future sojourners in the field of pedology - if that discipline happens to survive the current stigma it has been facing. Nevertheless it has been enjoyable to write in this journal for I have relived wonderful delightful senses as my mind re-visited those stories - it has been like traveling a time and space capsule to touch scenes of yesteryear. If you happen to read a random "peds" or two, you will soon find what is missing in this chronicle. It will stand out and stare you down - it will make you wonder if the writer was human and humane or not. What's missing? People!! My life like most of us has really revolved around human relations - yet here I have concentrated on all other aspects of the trip. I think it is because I have no clever or brilliant way to acknowledge the thousands of people who have influenced me and helped make up the collection - the collage of me - the misshapen, ill-informed rascal who just goes on living in his own optimistic dream world isolated from the realities of life. I am guilty - as accused I am guilty. I am sure that I have hurt more people than I have ever helped - I have ignored actions that could have made positive and meaningful changes - I have retreated within my own Great Walls of isolation - often for

reasons I do not understand - and probably do not want to comprehend. So the admonition to "know thyself" has gone unheeded - kept locked up inside - and not released in this lifetime.
But what about all those people - they were important - they are crucial to the story within a story within a story. I see in my mind's eye faces I cannot put a name with but whose warmth and presence is as real as it was so long ago.
I can't remember details of communications - I never could and so I never tried hard enough to develop such a skill - I live in generalities - in second-hand details only - and eons of subtleties that gloss over what is going on. Is it protection - most likely - is it fear - I don't know - is it pent-up emotions of hate and love so entwined that unraveling it would be torture? I really don't have a keen sense, and now no desire to know.
All my life other people have helped me, taken care of me, protected me, enabled me to move, to be, to go, to see, to feel, to become, to hear, to sometimes even listen. So many faces, so many places, so many circumstances, so many memories, so much pleasure, so good the feelings of friendship, of a helping hand, a kind word, a piece of information at just the right time, a smile, a kiss, a pat on the shoulder all the little things that are what most of life is made of - I don't know how to tell or write those stories - those wonderful life giving gestures of so many, many folks - and so I thank each and every one whose path crossed mine - who provided opportunities to be better than I really was - who accepted me as I was and not what I might become - oh, yes, I am grateful and full of respect and honor for all who have been there on the fringes of my being - you are the stories in my heart - recorded in this journal are stories in my mind. Why did I choose to call these "peds"? Well, in a place of disturbed soils the lumps and chunks of dirt are just clods - they are not naturally formed "in situ" objects - and I have learned the beauty of nature in the organization of components of the solid phase at the interface of the lithosphere and the biosphere - the uncharted land of the pedosphere. Here are patterns of systems within systems that have responded to changes of energy in both time and space on scales I will never understand - but which I may hypothesize and explain to my own consciousness. Naturally formed aggregates of soil material are called "peds" - it means something like earthy. And "peds" is an acronym (I like them, too) for "pedologically exciting discovery stories". And here they are!