



# My friend, the soil

## A conversation with Hans Jenny

Hans Jenny, no stranger among soil scientists, has begun to receive wider public recognition for his many professional achievements. Last year, SCSA presented Jenny, an SCSA member, its Honor Award. More recently, the book accompanying a new British Broadcasting Company television series, "Bellamy's New World," was dedicated to Jenny. Then in February of this year, a symposium was held at the University of California—Berkeley to commemorate Jenny's 85th birthday and to raise funds for the Hans Jenny Land Conservation Fund, which is used to acquire land chosen by Jenny for its value to soil appreciation and study.

A native of Switzerland, Jenny came to the United States in 1926 as a Rockefeller Fellow. He joined the University of Missouri—Columbia faculty in 1927 and moved to the University of California—Berkeley in 1936. Jenny's early research produced a new, quantitative description of soil genesis. While at Missouri, his work

took a practical bent, focusing on problems of declining soil fertility in the Midwest. His well-known text, *Factors of Soil Formation*, was published in 1941.

A colleague has written of Jenny's research career: "In a field of knowledge, truly original ideas are rare, and particularly those which are pursued to the point of stimulating an entire generation of scholars in the field."

Though his career pushed into numerous technical frontiers, Jenny's interests also demonstrated a broad, imaginative concern for the soil. In this interview, he discusses his view of soil as a thing of beauty—its profound part in art history, its dynamic ecological "life"—articulating a view of soil that offers a more exciting, creative perspective for soil conservationists and laymen alike.

Jenny was interviewed by Kevin Stuart, a graduate student at the University of Hawaii.

■ **KEVIN STUART:** *Would you tell me what the basis is for your appreciation of the aesthetics of soil?*

■ **HANS JENNY:** I am surprised; how did you know of my interest in soil art? Well, soil appeals to my senses. I like to dig in it and work it with my hands. I enjoy doing the soil texture feel test with my fingers or kneading a clay soil, which is a short step from ceramics or sculpture.

Soil has a pleasant smell. I like to sit on bare, sun-drenched ground and take in the fragrance of soil. As yet, neither touch nor smell sensations have been accorded aes-

thetic recognition, but colors delight painters, photographers, and writers, as well as you and me.

In loess country, plowed fields on slopes show wide bands of attractive color gradations from dark browns to light yellows, caused by erosion of the surface soil. Warm brownish colors characterize fields and roofs in Cézanne's landscape paintings of southern France, and radiant red soils of the tropics dominate canvasses of Gauguin and Portinari. Soil profiles viewed in pits may reveal vivid color and structure patterns of layers or horizons. I have seen so

many delicate shapes, forms, and colors in soil profiles that, to me, soils are beautiful.

Whenever I offer this reaction to an audience, I notice smiles and curiosity, but when I follow up with slides that depict ebony black mollisols of Canada, titian-red oxisols of Hawaii, and gorgeous soil profile paintings by such famous artists as Grant Wood of Iowa, Dubuffet of France, and Schmidt-Rottluff of Germany, the hesitancy turns into applause.

■ **STUART:** *How would you explain the lack of aesthetic appreciation of soil on the part of many soil scientists?*

■ **JENNY:** I don't know. Maybe they lacked early exposure to art appreciation. My grandfather was a wood carver, and his sons and daughters kept an interest in art. In high school I had an art teacher who took us regularly to current art exhibits in local galleries and museums. Soil profile art is not akin to classic paintings with themes; rather, it resembles abstract art; and if you are used to thinking of soil as dirt, which is customary in our society, you are not keyed to find beauty in it.

■ **STUART:** *Why talk about soil imperceptibles, like beauty, and should this be an important aspect of soil science?*

■ **JENNY:** Confronting an exposed soil cut may be an exciting event. Soil speaks to us through the colors and sculptures of its profile, thereby revealing its personality; we acknowledge it by giving soil a name, albeit in a foreign tongue, but we don't mention our emotional involvements. In fact, our soil language is lifeless, and the soil descriptions in our publications are utterly boring to the farmers, ranchers, foresters, sportsmen, and newcomers who are sup-

posed to read them. Articulation would strengthen our feelings about the soil body. Casually and in formal lectures, we may want to talk more openly about soils and do it more enthusiastically. We may even become more interesting persons. We may gain new friends, and they might hold a positive opinion of the soil resource.

■ **STUART:** *How important do you think soil science and soil scientists are in influencing the rest of the society's ideas about soils?*

■ **JENNY:** Quite unimportant, I'm afraid. Our technical articles are being read by a small coterie of fellow specialists, and the leading national press ignores them completely. In its heydays of the 1930s and 1940s, the Soil Conservation Service electrified the nation and got the school children involved, but those days are over.

Some months ago the *Christian Science*

*Monitor* published a lengthy discourse on soil deterioration, but I could not detect an echo in the city press. Perhaps as long as supermarkets are well stocked with food, the city dweller does not look beyond. It is a shame that the many excellent and interesting papers by soil scientists remain confined to library shelves. New findings by chemists, geologists, geneticists, and ecologists are regularly reported by the media, and commented upon, but the subject of soils seems to be taboo. I suspect that our intellectual isolation and our invisibility have to do with the lack of formulating exciting ideas about soils themselves and their relations to people, and the shortage of popularizing soil science writers.

I am tremendously interested in what the public reaction will be to "Bellamy's New World," now being shown abroad by the British Broadcasting Corporation. In

an eight-part television series and in an accompanying book, David Bellamy offers a remarkable botanical history of America in which he stresses the significance of soils for plants and men, and describes, with charming enthusiasm, important soil profiles.

■ **STUART:** *How would you describe the idea of soil as interpreted by the discipline of soil science?*

■ **JENNY:** To my famous teacher G. Wiegner, soil was an object to apply known principles of colloid science and to discover new ones. He expressed little interest in the contract of humans with soil. My former colleague Richard Bradford studied soils in the laboratory and field with the aim of helping farmers man-

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**Arbor Day by Grant Wood**



age their soils and provide food for humanity in general. That's why he worked for years on international agricultural projects with the Rockefeller Foundation.

A soil creed that began to spread in the 1920s states that soil is a *natural body* that deserves scientific study and contemplation, as is accorded other natural bodies, the organisms, rocks, oceans, and stars. This formulation marked a radical change from viewing soil as merely a cog in the agricultural production machine, yet the creed has benefitted farming in many important ways.

My own approach to soils has changed several times. In my younger years, with my farm background, whenever I thought of "soil" I visualized a plowed field. You seed a crop and what yield you get depends a great deal on the nature of the soil. Later, during my Missouri work on soil humus contents, I soon realized that the prime source of organic carbon in soils resides in the organic matter furnished by tree litter fall, grass mats, crop residues, and root production. In California, I got involved with pristine and near-pristine grasslands and forests and began thinking

in terms of the "larger system" that is composed of *soil plus vegetation plus animal life*, a combination that is now known as ecosystem. Hence, I see soil in the context of a living, dynamic ecosystem, either a natural, or an agricultural, or a silvicultural one.

■ **STUART:** *You talk about living systems. Why is it important to you to include this aspect?*

■ **JENNY:** Many ecologists glibly designate soil as the abiotic environment of plants, a phrase that gives me the creeps. Is the bark of a tree the abiotic environment of the tree? And what about the bacteria-rich rhizosphere? Looking at the root-soil boundary under the powerful electron microscope, an observer cannot tell where the biotic part ends and the abiotic part begins.

Soils contain over a thousand different species of lower animals, the earthworms, pill bugs, nematodes, millipeds, termites, ants, springtails, and amoebas, not to mention the millions of molds and bacteria. My late teacher, Professor S. A. Waksman, discovered in soils the microbes that produce the antibiotic streptomycin that cures tuberculosis; he, who signed his letters as "soil microbiologist," was awarded the Nobel Prize in medicine. When I add up the live weights, exclusive of roots, estimated by soil biologists, I find more living

biomass below ground than above it, amounting to the equivalent of 12 horses per acre. The soil organisms consume oxygen from the soil air and give off carbon dioxide, and the summation of the multitudines of respirations characterize the metabolism of a soil individual. Hence, I designate soil as a living system. Bellamy talks about the living soil. It is, however, not an organism because soil does not multiply; you don't find two masses of soil where there was one.

If all the elephants in Africa were shot, we would barely notice it, but if the nitrogen-fixing bacteria in the soil, or the nitrifiers, were eliminated, most of us would not survive for long because the soil could no longer support us. I can't help thinking of the claim that healthy soils make healthy people, and as an extension, I am intrigued by the thought that good soils make good people, but that notion seems untenable. Well, not wholly so. Working in the garden with spade and hoe soothes the minds of many people.

■ **STUART:** *You described how Wiegner and Bradfield looked at the soil, but I wasn't sure where you placed yourself.*

■ **JENNY:** Observing soils, studying them, and reflecting on them induces respect, if not wonder. All of us relate to soil unconsciously in our daily nourishments that make us participants in the continuous flow of nutrient atoms that originate in the soil. And in the final act our bodies are returned to the soil.

Over the years I have acquired a kind of reverence for the soil, for the creature-world inside it, and for its character expressed in the profile features. Where big logging equipment turns soil upside down to make earthbeds for falling redwood trees, the mass of soil remains at the site and no "environmental damage" is said to occur. Yet the soil profile, the soil's signature and identity, is obliterated. Though I consider such profile destruction an irretrievable loss, I have never seen anybody shedding tears about it. My attitude may be a personal quirk, or a result of lifelong interest in soil. In the latter case, I might not be alone. Whatever, I am glad I feel the way I do.

■ **STUART:** *Has this train of thought led to your actions for preserving virgin soils and their landscapes?*

■ **JENNY:** Reverence for the soil has turned me into a preservation advocate of natural, undisturbed soil, regardless of whether it is a good soil or a poor one, or a rare and endangered soil species or not. My wife, friends, and well-wishers helped pre-

**Northern landscape by Karl Schmitt-Rottluff. Done in present-day East Germany, this painting emphasizes soil horizons of the podzolization process.**



Saarland Museum



serve several soils in California: the pygmy forest ecological staircase (Jug Handle State Reserve), which is an age-sequence of marine terraces and their old soils; the Mt. Shasta mudflow area, composed of incipient ecosystems; Apricum Hill with a fossil laterite crust; and Jepson vernal pool prairie, held by The Nature Conservancy.

Other sites are still under consideration. These natural areas were set aside as benchmarks for assessing man-induced soil changes and for preserving unique segments of landscapes that possess pedological and ecological potential for teaching and research. While reverence for soil was not explicitly invoked, it helped sustain the efforts to secure these lands.

Society grants human beings the right to exist, regardless of whether we are useful or not, and that right cannot be abrogated without due process of law. The same privilege has been extended to a few endangered plant and animal species. I wish society would grant the same right to soil. The prospects are bleak.

■ **STUART:** *Does the soil have a right to be protected for any reason other than that based on what is best for humans? For example, if gold is of value to our society, then why not dig for it and in the process destroy a fertile, producing soil and perhaps even push its remains into the sea?*

■ **JENNY:** Your case is not fictitious. Extensive areas of good soils have been demolished during extraction of their minute particles of gold. The way you phrase the question brings up nature's edict that we humans cannot live without sacrificing plant and animal lives, and that land must be cleared for growing crops and building habitations if we do not want to live as nomads.

Today, the idea of stewardship of land is pitted against the belief in soil exploitation for personal gain and that soil is merely an economic commodity in the marketplace. And who decides "what is best for humans"? I place natural soils and ecosystems, the nature museums, on par with art museums, automobile and railroad museums, golf courses, racetracks, music halls and gambling halls, even colleges and temples. They all use up space and appeal to special groups of people who are not called "elitist," and all these places get public financial support and protection in one form or another.

■ **STUART:** *As a student of the sciences, how did you get interested in soil?*

■ **JENNY:** It was the other way around. I had an interest in soil and to comprehend it I needed science.



**Grassland soil in California. Mellow ambers and browns of subsoil are enlivened by shadows of peds and aggregates.**

In my research I tried to learn how soils are formed, how nature creates soils, and how long it takes to make a soil. In such studies investigators locate soils of known ages that may extend over decades, centuries, and millenniums. They analyze the soils; arrange the data according to soil ages, which yields "time sequences" of soils; and deduce how fast the soil bodies are changing.

One question looms large: What does nature have in mind, what is her goal of soil evolution? For the animal kingdom, evolution is said to improve the design of organisms, leading to higher, more complicated beings, with humankind at the apex.

■ **STUART:** *What plan would you say nature has for soil?*

■ **JENNY:** On soft rocks the several dozens of time sequences so far on hand suggest that in high rainfall regions and in the

absence of catastrophes, such as earthquakes and severe erosion episodes, the production of organic matter as biomass rises from near zero at the beginning of the sequence to a maximum in a few thousand years, and then very slowly declines because the endless water infiltration under high rainfalls leaches out the nutrients of the soil, raises the acidity, and may establish hardpan and claypan horizons that curtail root growth. Often these areas harbor unusual plants and animals that grow nowhere else (endemics), and such soils may play a role in the evolution of species.

■ **STUART:** *Is your query on what nature has in mind for soils a legitimate question, and if it is, why shouldn't we also ask about the purpose nature has for an entire ecosystem?*

■ **JENNY:** You might go a step further and ask what is the purpose of all nature? And if you include ourselves as a part of nature, what is our role on this earth? Soil science, or any other science, cannot provide an answer, only religion or mysticism might do that. □