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NEWSLETTER

Introduction

With the change in the ISSS to IUSS as part of the international scientific community, the IUSS activity is now organized into four Divisions. The former Standing Committee on the History, Philosophy and Sociology of Soil Science (HPSSS) with Prof Dan Yaalon as Chairperson, has now become Commission 5 (HPSSS) of Division 4 entitled The Role of Soils in Sustaining Society and the Environment. C4-5 is now responsible for putting out this Newsletter, continuing to work together with the Soil Science Society of America Council on HPSSS.
The first task of the new editorial team of this Newsletter is to thank the team, which have recently resigned. Our thanks are in the first place due to Dan H. Yaalon, who has been active in writing many entries, assembling other relevant material from authors around the world, and being the motor in preparing many issues of this Newsletter. In his last editorial, he pays tribute to the persons who have been instrumental in bringing to light the first 10 issues. We should like to add our thanks to them wholeheartedly: Douglas Helms, Paul Reich and Fay Helms Griffin, all in the United States of America.

We realize that the new team has a difficult task! We will try to follow the road outlined by our predecessors. Like them, we are an editorial team, depending on the cooperation of the members of the Soil Science Society of America and the International Union of Soil Sciences, who are interested in the field of our specialization: the History, Philosophy and Sociology of Soil Science. We count on them to let us have news in the form of brief or longer articles, announcements of meetings, other news items, such as activities in other organizations or Unions, which are relevant to our work and interest. We will be glad to publish them in the Newsletter! Please see the last page for details of the submission of material for the Newsletter.

In this Newsletter some important and interesting articles, book reviews and announcements are included. Because of urgent other commitments this issue is published somewhat later than first expected. We hope to be able to publish the next issue later this year, depending on the amount of material received. The Newsletter is available, as before, to all who are interested, via the IUSS website: www.iuss.org
You have seen that the format has changed too. It is somewhat less attractive than the former issues, we must confess, but over time we will learn. Hans van Baren, assisted by Hans' son Bart van Baren, has assembled this issue.
Please let us have your comments and suggestions, and, of course, your contributions!

The editors

Contents

A Brief History of Archaeological Soil Chemistry

E. Christian Wells, University of South Florida, USA

Soil chemistry has played an important role in archaeological research for nearly a century. Much of the early work focused on the relationship between soil phosphate and ancient human settlement to identify archaeological sites. Today, however, archaeologists draw on more complex multi-elemental assessments of anthrosols to consider links between soil chemistry and a wide variety of human behavior, including agricultural traditions, household activities, and ritual practices, among others.

This article presents a brief history of archaeological soil chemistry, with the aim of increasing awareness among soil scientists of the ways in which soil chemistry articulates with archaeological research. Generally, soil chemistry in archaeology considers three areas of study: detecting and dating prehistoric sites, reconstructing past agricultural practices, and determining the location and structure of ancient activity areas.

Detecting and Dating Archaeological Sites
The first influential studies on archaeological soil chemistry were published in Europe during the 1920s and 1930s, and were concerned with the application of phosphate analysis for detecting archaeological sites. In generating soil maps for the Swedish Sugar Manufacturing Company, Arrhenius observed that soils from areas of medieval occupation contained elevated levels of phosphorus compared to unoccupied spaces. The archaeological importance of this observation relates to the unique manner in which humans interfere with phosphorus cycling in ecosystems and to the fact that this element is relatively inert once fixed in soil.

Arrhenius' studies, along with those of Lorch, Dauncey, and others in the decades that followed, led to the development and application of a variety of field and laboratory techniques designed to detect soil phosphates with the objective of prospecting for archaeological sites. The influential work of Eidt and others in the 1970s and 1980s contributed to important methodological advancements, including techniques derived from chromatography and fractionation. Working together over the past ten years, archaeologists and soil scientists have refined these techniques and developed alternatives. Today, archaeologists mostly employ qualitative field procedures using commercial test kits, although some have begun to experiment with laboratory-based weak acid-extraction and strong acid-digestion approaches using ICP-spectroscopy, which produces quantitative results.

Since the early 1960s, soil chemistry also has been employed in radiocarbon studies of soil organic matter and pedogenic carbonates to determine the chronological significance of archaeological deposits. However, these approaches are not often applied to archaeological work because they are currently cost prohibitive for the meager budgets of many research projects, although they have proven useful for studying long-term changes in ancient environments.

Reconstructing Prehistoric Agricultural Traditions
While soil chemistry and agricultural science share a long history, their application to archaeological domains of inquiry is a relatively recent phenomenon. One of the earliest studies was by Cowgill and Hutchinson in the mid-1960s, in which they employed soil chemical analysis of a lake sediment core in the Maya Lowlands of Central America to investigate the effects of intensive cultivation of the region's soils prior to the sixteenth century. They found that widespread cultivation accelerated soil erosion, which resulted in the accumulation of thick clay-rich deposits in Petén lakes. Not long after this work, another study, by Provan in the early 1970s, applied chemical analyses

to anthrosols from Bjellandsøynæ, an Early Iron age farm site in Norway. By investigating exchangeable Na, K, Ca, Mg, organic C, total P, and total N, Provan observed that the distribution of brown podsols correlated with cultivated parcels of land, while iron-humus podsols signaled undisturbed soils. These early studies were important because they not only provided archaeologists with a research design and methodology for identifying ancient cultivated landscapes and modeling their impacts on local environments, but they also demonstrated that elements other than phosphorus can be used to investigate the ways in which agricultural societies practiced cultivation.

Aside from these isolated cases, however, only since the mid-1970s has soil chemistry played a major role in archaeological research concerned with reconstructing prehistoric agriculture. At first, these studies were largely limited to research on enrichment and depletion of certain plant macronutrients, namely P, N, and K, over time. More recently, however, soil chemistry has been incorporated into large, interdisciplinary projects that combine archaeological survey and excavation with physical and chemical analysis of sediments, palynology, and molluscan ecology.

In addition to elemental detection, studies of stable carbon isotope ratios (i.e., 13C/12C ratios) have become particularly important to prehistoric agricultural studies because of the characteristic isotopic signatures of C3 and C4 plant groups. Corn, for example, is a C4 plant that is enriched in 13C relative to most other cultivated and wild plants. As a result, distinctive carbon isotope signals produced by ancient corn crop residues may be preserved in the humic component of soil organic matter. Humus extracted from buried A-horizons of soils that were likely used for agriculture is enriched in 13C, indicating that corn was grown in these areas. These kinds of studies have been used to trace the spread of corn agriculture in the woodlands of North America and in the tropical forests of Central and South America.

Investigating Ancient Activities

Applications of soil chemistry to site prospection and ancient agriculture have opened up a new avenue of archaeological research: the investigation of ancient activity loci in prehistoric households, plazas, and other spaces. The basic premise is that certain chemical compounds are deposited in soils as a result of particular human activities. For example, phosphates are deposited as a result of food preparation and consumption, sodium and potassium compounds are generated by the production of wood ash in hearths and kilns, and iron oxide and mercuric sulfide are accumulated in soils through the use of certain pigments (i.e., hematite and cinnabar) in ritual settings, such as burials and caches. Since these compounds are rapidly fixed to the mineral surfaces of sediments, they tend to remain stable and immobile (resistant to horizontal and vertical migration) for very long periods in the form of adsorbed and complexed ions on clay surfaces, and as insoluble oxides, sulfides, and carbonates, all of which can be detected with extraction or digestion procedures and appropriate analytical instrumentation.

In the mid-1960s, Cook and Heizer of the United States noted a number of chemical properties of anthropogenic soils from archaeological sites, including high concentrations of P, Ca, and organic matter. Soon thereafter in the early 1970s, Heidenreich and colleagues published their work on Iroquoian long houses at the site of Robitaille in southern Ontario, Canada, which examined the distribution of Ca, P, Mg, and organic carbon. By mapping the distribution of these elements across the archaeological site, they were able to determine the precise locations of the long houses.

More recently, researchers have recognized that different activities can result in similar chemical signatures. As a result, many of the studies carried out today that are focused on activity areas make use of ethnographic observations of human behavior, specifically, the ways in which human activities impact soil chemistry in non-industrial, “traditional” societies. Luis Barba and his colleagues at the Laboratory of Archaeological Prospection, part of the Mexican National Autonomous University's Institute for Anthropological Studies, have been at the forefront of this research. Working in the households of indigenous groups in small, rural villages in various parts of Mexico, they have demonstrated that variation in certain chemical elements, compounds, and soil properties can be used to detect and study domestic activities, such as cooking, storage, and craft manufacture.

Concluding Thoughts

Although soil chemistry is only now becoming a standard instrument in archaeologists' toolkits, it is nonetheless of critical importance in some areas of investigation. Chemical analyses of anthrosols that combine both organic and inorganic material residues provide a powerful means to reconstruct past human behavior in a range of contexts. Future advancements in the method and theory of archaeological soil chemistry inevitably will rely on ethnoarchaeological research aimed at linking soil chemical signatures of modern human activities with those of prehistoric peoples in archaeological sites.

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V.A. Kovda - Meetings with a Great and Unique Man

Dan H. Yaalon, Hebrew University, Israel

Friends, colleagues, young and old soil scientists, pedosphere and biosphere fancier. I have come to commemorate the birth one hundred years ago of a great and unique man – Viktor Abramovich KOVDA with whom I had the privilege to exchange ideas intermittently over a period of 30 years. I have met Viktor Abramovich for the first time in 1960 during the 7th International Congress of Soil Science in Madison, WI, USA. By then the 56 years old Viktor Kovda was a well known soil scientist, especially dealing with the origin and properties of saline soils, a Moscow University Professor and vice-president of the pedological commission of the ISSS, and widely traveled.[1] For me it was the first trip to America, a few years after my Ph.D.[2] Viktor Kovda and his *a la mode* colorful shirts was much in evidence.

The meetings and the field trips of the Madison congress were memorable for a number of reasons. At the previous 1956 Soil Congress in Paris it was decided to prepare for publication, with the help of FAO, general soil maps of continental regions, several drafts of which were presented in 1960 in Madison. It was now decided to publish a complete set of Soil Maps of the World in several sheets, with the active help of UNESCO and FAO. This took some 20 years to accomplish under the actual direction of a number of coordinating committees of international soil scientists. Kovda and others reported regularly in the literature on the progress of this grandiose effort . And it was memorable for the introduction of the new USDA Soil Taxonomy (7th approximation), another cause for some divergence in approach with our Russian colleagues. Equally memorable were the extremely well organized pre- and post-congress field trips enabling an East to West review of the variable soils and the acquaintance with the diverse American countryside. The saying that "the more soil profiles you examine and discuss with others, the better you understand soil formation and distribution" was brilliantly demonstrated.

For some of us, highly appreciative of the early significant contributions of Russian

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[1] Viktor Kovda visited first time outside Russia in 1930/31 for a one year stay with the well known soil chemist George Wiegner in his Zurich laboratory and also participated in the 3rd ISSS Congress of Soil Science in Oxford, U.K. in 1935. He became fluent in English and German and good in French, certainly a rarity in those years after the Soviet revolution.

[2] My research thesis at the Hebrew University of Jerusalem dealt with physico-chemical aspects of salinization in calcareous soils and was followed by a post-doc stay at the Rothamsted Experimental Station in England, catching up on pedology, geochemistry and clay mineralogy.

pedologists in the 19th century and the subsequent decline in later Soviet times in spite of strong governmental support was at first a puzzle. There were some outstanding personalities . What were their significant insights and achievements based on? Lots of background data which we never see? I admit that that it was a kind of long term project for me to find out what made the top Soviet soil scientists - the few outstanding leaders tick so well. Certainly Viktor Abramovich Kovda, together with his contemporary, equally illustrious and frequently scientific adversary Innokentii Petrovich Gerasimov, belong to this select group.[3] Here I wish to commemorate him, by reporting on my contacts over the years with Viktor Abramovich, partly in the framework of the difficult East-West scientific relations of those years.

I was well aware of his book on the Origin of Saline Soils and their Regime (Kovda 1946/7) and the many unfamiliar Russian terms freely used there. Many terms not used in the West, such as solonchak, solonetz, solod, takyr and many more, were frequently used without definition. I had quite a few questions for him because of my interest in aridic pedology. This started our regular scientific exchange which eventually covered many topics including some disagreements. Most memorable was the four months stay in Central Asia as a UNESCO Fellow at a course sponsored by Viktor Abramovich.

The 1960's – in Tashkent and Romania

During the 1950's Arid Zone Research and Development was a fairly central point in the activities of UNESCO. Much of the activity included organizing symposia and publishing a series a valuable research volumes, including a hefty multi-authored volume on 'A History of Land Use in Arid Regions' (1961). In it V.A. Kovda reviewed in a masterful way the 'Land use development in the arid regions of the Russian plain, the Caucasus and Central Asia', showing his broad knowledge of these deserts. When V.A. Kovda was appointed Head of the Exact and Natural Sciences Department of UNESCO with its seat in Paris, he organized for 1962 a soil salinization and hydrogeochemistry seminar course for fellows from Near Eastern countries in Tashkent, Uzbekistan. By then he was Director of the UNESCO Natural Sciences Division. It seemed to him and the other decision makers a good way to use up the accumulated Russian currency locally rather than to transfer the rubles into expensive dollars and to demonstrate the recent achievements in these regions.

I was delighted to be selected by my governments UNESCO committee as one of the three Israeli participants. The other two were a hydrogeologist and plant physiologist. Israel at that time was still counted amongst. the developing countries and we formed without any difficulties a friendly group together with participants from Egypt, Lebanon, Jordan, Iraq, Turkey, Afghanistan and Syria, all 15 with at least the first science degree and several years of experience. After a brief introductory visit to Moscow, we moved

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[3] Viktor Abramovich Kovda was elected Corresponding Member of the USSR Academy of Sciences in 1953. But over most of the years, though holding various research assignments at the Academy of Sciences, his major centrum of activity was as Professor and Head of the Soil Biology Department (later Faculty of Soil Science) of the Moscow State University. He held numerous official and honorary, both Soviet and international positions and was a prolific writer of scientific articles, pamphlets and books.
His contemporary, Innokentii Petrovich Gerasimov (1905-1985) was elected full Member of the USSR Academy of Science in 1953 (Corresponding Member 1946) and was the Head of the Geography Institute of the Academy of Sciences for many years. He dealt extensively in soil geography, classification of soils and Quaternary landscape development . The Science Academy with its many workers was the centrum of his wideranging activity and considerable influence in the soil science community over the same time period as that of Kovda. He too was a prolific contributor to scientific journals and books. Though occasional articles were published jointly, frequently they appeared as adversaries.
Both Kovda and Gerasimov were members in good standing of the Communist Party and the Soviet Establishment, no doubt to the great advantage in promoting their careers and especially in the freedom to travel overseas, something which was during most of the Soviet period a privilege given only to a select few.

to Tashkent where we lived comfortably for nearly four months in a big central hotel (later destroyed by the 1966 earthquake), walked together to lectures at the Hydroingeo Institute given in Russian by some of the prominent scientists of the country, translated sentence by sentence by mostly excellent translators into English, and written down by scribes. Yet it was clear that the Russians were not up-to-date with the western literature or the recent advances in western soil research. Divided into two groups, the program was rather diverse; but sometimes there were in the class as many officials as listeners .We requested as many field trips as possible, including visits to ancient historical sites of Samarkand, Bukhara, visited Ferghana, the Syr Darya, Amu Darya regions and their loesses with paleosols, major canals and recently salinized areas along them.

This was a true eye opener of Soviet Russia of that time[4] and how it directed science. The laboratories we visited were poorly equipped. When we came to an experimental station which obviously did not receive much rainfall that year and asked the agronomist responsible for the rain measurements how much rain he had measured this year, he could not answer. He sends the data to Moscow, he said, where they were summarized. He could only refer us to the yearly average. The same applied to the soil profile. The soil must be what the zonal soil map shows, not what you find under your feet. The centralized hierarchical planning resulted in deciding how many soil samples and for what will be analyzed or mapped during this or the next year. Local initiative or new ideas were obviously discouraged in such an atmosphere. It was no wonder innovation was not really evident.

Viktor Kovda came to visit us a couple of times in Tashkent, and showed unquestionable grasp of the broad picture and the problems of the region where cotton irrigation on a large scale was introduced, but also resulted in severe salinization problems. He came for the last time towards the end of the course when an international symposium on Secondary Salinization in Aridic Regions was organized with many visitors from all Russian regions, eastern and western Europe and a few from USA. I was pleased to be able to present a summary of our Israeli research on the dangers of secondary salinization through faulty irrigation with sodic water, the only one of the course participants to do so (Yaalon, 1962). By then I became aware that Kovda was adhering to the notion of water laid deposition of loesses which we saw from the Tashkent foothills to the river plains, as if it was decided so at one of the Communist Congresses or Manifesto and was not worthwhile to question. I had a few animated discussions with him on that topic as I could not understand nor accept how such uniform, non-stratified deposits with occasional paleosols in the thick sections we saw could have accumulated in any other way but by eolian deposition. Local loess scientists, led by Mavlyanov, recognized a number of different loess types, including eolian, mostly deluvial or proluvial, some eluvial, coluvial or alluvial of various ages, with or without paleosols. Their maps were quite complicated with few actual indicator details but standard soil data were available.

In the post WW-II period there was great expansion of studies in soil science in the Soviet Union, vigorous activity in training and employment of hundreds of laboratory soil workers in Russia and other communist countries. who were frequently directed by Russian emissaries leading important overseas expeditions. In Kovda's case it was his stay and survey of the soils of China, that

[4] Though essentially free to wander in our free time wherever we wanted, we were obviously watched because of the many colored slide pictures we took, both of the new and the fascinating old city. These could not be developed locally (as opposed to the black-and-white films) and the accumulatiom of these roles of undeveloped films intrigued our hosts. To our dismay they were X-rayed secretly and spoiled in our rooms on the last day before our departure from Tashkent, discovered only upon our return home.
For us Israeli it was memorable to discover a large number of Bukharan Jews, settled in these areas for hundreds or thousands of years, who were active in various simple crafts and trades, and also made some contact with Jewish refugees escaping from the advancing Nazis who settled in Uzbekistan during World War II. Most of these immigrated later to Israel.

eventually resulted in the book on the 'Nature and Soils of China' (Kovda, 1959). Thus it was not surprising that by 1964, when the next soil congress (8th) was held in Bucharest, Romania, it was largely dominated by soil scientists from Russia and Eastern European countries, trained in the traditional way and who had little opportunity to travel to the West or even follow western publications.

By that time I was less timid in my criticism of the low standard of the many presentations, especially realizing that nothing new was really presented. The same old methods and concepts were repeated over and over. The new advances in clay mineralogy, micromorphology, lessivage, catenary slope differentiation, isotope dating, slickensides and vertisol recognition – all were first recognized and conceptualized in the West by promoting innovation and originality in research. I frequently muttered 'nothing new' to my neighbors or expressed similar thoughts in direct questions. For many years thereafter several of my friends (Russian, Georgian, Czech) recollected how such comments, previously unheard of in their countries impressed them.

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At the same time Viktor Abramovich confirmed to me his superior standing far above the general level of Soviet Russian soil scientists in his plenary lecture, comparing the history of soils on several continents, which complemented admirably the draft presentations of several general soil maps of selected continents (Kovda, 1964). The broad picture characterized very much his hypotheses and later discourses. Here he specifically indicated the great difference between soil landscapes of glaciated and tectonically affected older regions. As no detailed references are provided this may have also been an early mention of the idea of the importance of the Quaternary hydromorphous process of soil formation on lowland plains (in addition to the previously discussed processes of salinization). Later he and students elaborated the paleo-hydromorphous hypothesis in some detail for the Russian Plain but did not present convincing data, though he defended the hypothesis against critics.[5]

The later years

The 1960's and up to mid-70's was the period when the Israel Program for Scientific Translations (headed by Miriam Balaban) arranged for the publication of most of the classical Russian soil science books.[6] This helped in no small way to inform the English-speaking world of the origin and early development of our science (Bunting, 1968). In 1971 it finally included Kovda's classical Origin and Nature of Saline Soils (Kovda, 1971). Later it included also some important current books, which I had the pleasure to recommend and to edit some of the translations (Fridland, 1976). But the isolation of the new generation of Russian and East European workers from contacts with the West and western literature harmed the progress and innovation in Russian soil science and only few high level works were produced. For soil physics this is well described in some detail by Kutilek and Novak in my History of Soil Science – International Perspectives (Yaalon

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[5] Perhaps one event deserves to be told in greater detail. Gerasimov's critique and Kovda's reply on the paleo-hydromorphic effect notion of Kovda (Kovda & Samoylova, 1966) were discussed in *Pochvovedenie* (Gerasimov, 1968; Kovda, 1969). When in 1970 I helped to organize the Amsterdam conference on Paleopedology, under the auspices of ISSS and the INQUA Paleopedology Commissions, essentially to discuss advances in dating soils by C-14 analyses of organic matter and pedogenic carbonates, Gerasimov was invited to present a plenary paper on paleosols. It was not long before we received an urgent request from Kovda to let one of his collaborators present results of relict paleosol studies in the Russian Tambov Lowland, which we did. Kovda could not attend and neither did Samoylova, but the paper was included nevertheless in the proceedings published. Gerasimov suggested that it is only a local example of relict features (Yaalon, 1971).

[6] The translation project was helped by generous financial help of the United States, which used for this purpose the soft currency funds accumulated in the country from the sale of American wheat, as the dollar poor Israel was not able to pay at that time for these imports in hard currency dollars. In a way similar to the use by UNESCO of the soft currency rubles for the Tashkent and similar seminars accumulated from Russian and East European UNESCO contribution payments.

and Berkowicz, 1997). Russian pedologists now also recognize that the international isolation of Soviet scientists, the monopolization of certain doctrines and the repressive actions (including prison sentences) of those who even vaguely opposed them, greatly retarded the development of soil science during those 'bad' year (Ivanov and Lukovskaya, 1999, Zonn 1999).

I invited Viktor Kovda several times to visit us in Israel, but unfortunately this never became possible. By the time we held the International Conference on Aridic Soils (Dan et al., 1982), which no doubt would have interested him, diplomatic relations between USSR and Israel were broken (in 1967 after the Six Day War) and even scientific visits became difficult, until the resumption of relations during the 'glasnost' of Gorbachev. We met in 1968 in Adelaide, Australia, at the 9th Congress, where Kovda was elected President of the ISSS to be responsible for the next Congress in Moscow[7] and again in 1971 in West Germany at the Pseudogley and Gley meeting. I continued to send Victor Abramovich my publications and New Year cards, including a beautiful one depicting spectacular weathering features of soft sandstones in the Negev desert. To my surprise I saw the picture a few years later reprinted in his new soil science textbook, without mentioning its source or where it came from (Kovda, 1973). This was just like the treatment of out-of-favor scientists whose names disappeared from publication lists or encyclopedias. Fortunately all this is now a matter of the sad past.

When the Dokuchaev Institute of Soil Science was detached from the Academy of Sciences and transferred to the Agricultural Academy of Sciences, its scientific reputation declined sharply. Its leading soil scientists were engaged in various small scale soil mapping, conducted expeditions or soil surveys in vast Soviet Asian regions, with related investigations aiding large scale melioration projects. As a result there was no high level institution dealing in basic physico-chemical, mineralogical or biological soil science research as it developed in the post WW-II years in the West. This was frequently a topic for discussion during our occasional meetings and no doubt also among the leading soil scientists. By 1970 he succeeded in establishing and directed a new Academy of Sciences Institute of Soil Sciences in Pushchino charged with high level basic research in soils.[8] The Pushchino Institute, which gradually expanded its staff, was intended to fill this gap.

At the same time Kovda continued to write and publish articles and booklets during these years both in local and international journals, especially on the topic Biosphere alteration and preservation and joined the Editorial Board of several overseas interdisciplinary journals. His writings were wide-ranging, flowed smoothly and interestingly, but were not always well documented, and frequently cited unsubstantiated and exaggerated figures. In 1979 he published in the journal Climatic Change the idea that increased agricultural production through the use of irrigation in arid areas would reduce the increasing CO2 content, i.e. greenhouse gases, of the atmosphere by increasing the total biomass. By then I too was involved with climate change as chair of the Israeli Committee for the IGBP (International Geosphere-Biosphere Project) and felt the need to respond in the next number of Climatic Change, pointing out some of the fallacies of the proposed supposition (Kovda, 1979, Yaalon, 1981). I don't think he took kindly to this. The meetings during the Soil Congresses in 1982 in India (12th) and 1986 in Hamburg, Germany (13th) were our last ones and essentially uneventful. He was elected Honorary Member of the ISSS (later IUSS) in 1982. The age difference between us was 20 years and I have

[7] I did not participate in the 1974 Moscow ISSS Congress (some Israelis did) because I was not permitted to participate in the field trips to Middle Asia which I have selected.

[8] The Pushchino Soil Institute carried several different names, first Agrochemistry and Soil Science, then Soil Science and Photosynthesis, when directed by V.A. Kovda, and now Basic Problems of Soil Science.

always treated him with greatest respect, though also at a somewhat critical approach. Conclusions must be based on solidly checked data.

During my visit to Moscow in the winter 1990/91 for an IIASA Global Soil Change Project he was bedridden and I could only send him warm greetings through another participant and close friend Istvan Szabolcs. His last paper in *Pochvovedenie* was published in 1991 (Kovda, 1991) and dealt with, like most of his publications in the last 20 years, with the Biosphere and the human impacts on its transformations. When I visited the Pushchino Soil Institute in 1992 for an international conference on soil evolution, I was asked to say a few words during a commemorative meeting for V.A. Kovda. We all missed him. He was a unique and inspiring scientists.

Pedology and soil science are exceptionally complicated systems. Besides those measuring and providing by experiments all kinds of useful data, which are often time consuming to produce and sometimes frustrating to digest, we need however a small number of people able to see the broad picture for integrating the various components and presenting sound conclusions and innovative hypotheses for future direction of activities. Only the best are up to this challenge and will succeed. Viktor Kovda did.

Acknowledgement. I wish to thank Ms. I. Kovda for the invitation to contribute to the memorial and to four of my colleagues for commenting on a previous draft.

This paper will be published in Russian by the Dokuchaev Soil Science Society later this year.

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The list of references can be requested from the author.

Soil Fertility Management in Nineteenth Century New Zealand Agriculture

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This research examined the practice of soil fertility management, and the rationale behind it, in 19th century New Zealand agriculture, with particular attention being paid to agriculture in Canterbury and Otago. This entailed the description of both the existing soil environment, and perhaps more importantly European perceptions of that environment, and then an exploration of fertiliser usage relative to the agricultural history of local areas, with the aim being to determine whether fertiliser use (or non-use) was respondent to environmental or economic conditions, or even behavioural transfer (in the case of immigrants). To this end, agricultural journals (and prior to that, agricultural reports in newspapers) were examined exhaustively, and this was complemented by the examination of relevant material in contemporary and secondary literature (including statistical indices such as produce prices). The relationship between European agricultural and indigenous Maori cultivation practices, and in particular, the latter's non-use of manure, was also explored.
From the start of colonial settlement in the 1840s, well-read farmers were kept informed of overseas discoveries in agricultural chemistry by newspaper publication of extracts from foreign agricultural texts and periodicals, and local lectures at farmers' clubs, but it was not until the late 1860s that the wider farming community was prepared to apply this knowledge. 'Artificial' fertilisers were not introduced until the mid-1850s, when Peruvian guano was imported (via Australia); subsequently it was displaced by bone-dust, phosphatic guano from the Pacific, and, from the early 1880s, by locally-produced superphosphate. The research for this thesis has shown that in general the balance between produce prices and land and labour costs determined levels of fertiliser use,

although environmental factors, such as natural level of soil fertility and climate, were responsible for regional variations. The most notable of these variations was the very high rate of fertiliser use around Auckland, compared to that in other centres, in the mid-1850s and early 1860s, which was caused by the predominance of poor soils in the region. Another important finding was the way in which the construction and deconstruction of the 'biometric fallacy' - the idea that the luxuriance and height of vegetation was proportional to the fertility of the soil - led to temporal changes in the desirability of areas for agricultural settlement. This thesis therefore adds an important environmental dimension to previous economics-based explanations of soil fertility management practice in New Zealand.

Synopsis

As the first practitioners of Western-style agriculture in New Zealand, Maori farmers and mission farmers both drew more heavily than later groups on their respective 'agricultural' heritages when determining practices for managing soil fertility. Ultimately, their weddedness to these heritages proved to be their downfall, as the novel agricultural ecology created when settlers brought European crops to New Zealand proved ill-suited to both heritages. The mission farmers were unable to implement a Norfolk-style crop rotation because there were no bees to fertilise clover, and in any case the humid climate and poor soils kept cereal yields low. Likewise, the continued rejection by Maori farmers, on spiritual grounds, of manure use posed problems for the substitution of kumara by potato cultivation, since potatoes demanded more nitrogen from the soil. Maori farmers tried to counter this by more forest clearance and expanding areas under fallow, but these steps created conflict with Pakeha settlers used to agriculture being confined within designated property boundaries. Ultimately, however, it was not flaws in the approach to soil fertility management that marginalised Maori agriculture. Instead, Maori farmers became disillusioned in the late 1850s, when crop prices collapsed, and then in the mid- and late 1860s the government confiscations of large tracts of land following the New Zealand Wars crushed the chances of its revival .

Philosophical esteem for their agricultural heritage was also significant in the minds of the wave of Pakeha settlers who came to New Zealand in the 1840s, but it was soon countered by environmental perception. On the one hand, settlers thought that if 'scientific farming' was the object of agriculturists 'at home', then something along similar lines ought to be practised here. Certainly the *New Zealand Journal* tried to maintain this 'improving' spirit by publishing news of recent developments in agricultural chemistry in the early 1840s, and the early establishment of local agricultural societies at each settlement also reflected this ideal. Having said this, experiences such as that of George Duppa, whose lost a vast sum preparing land, English-style, for cultivation, discouraged settlers from replicating in full British farming practices here. On the other hand, the 'biometric fallacy', which correlated luxuriant vegetation with rich soils, and which, ironically, bodies such as the New Zealand Company had propagated, suggested to farmers that New Zealand's forest and alluvial soils were so much richer than those 'at home' that they did not need any manuring. The same could not be said of other soils, though even these were rarely perceived as having low fertility.

The pattern observed in the early 1840s suggests that settlers accepted the 'biometric fallacy', and managed their soil fertility accordingly. At Nelson and Auckland, which possessed little forest, farmers began applying lime and dung to their land almost immediately, whereas at Wellington and New Plymouth, both forested areas, farmers commenced continuous cropping while not bothering to manure their land. Wellington and New Plymouth settlers did, however, manure their vegetable gardens, which indicates that they regarded manuring cropland as an inefficient use of their resources, rather than being unnecessary altogether. The real as well as perceived environment also encouraged the initial differences in approach at the four settlements. Farmers bringing 'fern land' into production suffered from depressed crop yields in the short-term, because of nitrogen immobilisation during bracken decay, while, conversely, farmers bringing forest soils into production benefitted from the temporary nutrient boost provided by the ash and detritus left by the 'bush burn'.

Once this breaking-in phase was complete, crop yields at the various settlements began showing signs of convergence, and a common approach to soil fertility management also began to emerge. This commonality suggests that economic factors had superseded philosophical and environmental ones as determinants of soil fertility management regimes. During the early 1840s, the high cost of labour was a disincentive to manuring, and by the late 1840s, it became even less favoured because of falling prices for agricultural produce. This created a risk of soil exhaustion, but fortunately rising wool prices encouraged the conversion of worn out crop land to pasture instead. Pasture did not pose great demands on the fertility of the soil, and in addition, stock grazed on it could be folded on arable fields, thereby enriching them without the need for much human intervention. Auckland and Nelson farmers, who had previously put considerable effort into manuring their land, now joined with their Wellington and New Plymouth counterparts in resorting to this 'convertible husbandry'-type approach of cropping fresh land and spelling worn out land under pasture. Auckland farmers were also helped by the acquisition from Maori of rich volcanic soils in the mid-1840s. Consequently, the only significant soil exhaustion seems to have occurred at New Plymouth, where stock numbers remained low relative to the area in crop, essentially because of the limited availability of natural and sown grass.

By the early 1850s, farmers sought a new approach to soil fertility management, which could accommodate the large increases in the acreage of cereals and potatoes inspired by the Victorian goldrush. Growth of turnips in Taranaki and Auckland indicates the beginnings of a move towards rotational cropping, but it is likely that the severe labour shortages hampered use of farmyard manure. For this reason, when produce prices peaked in 1854 and 1855, merchants imported Peruvian guano into four main settlements for the first time. Although guano was expensive, its concentrated nutrient content relative to bulky organic alternatives allowed users to revive soil fertility without expending much labour. Then in 1856, agricultural prices dropped back due to rising Australian output, and guano imports to the three main centres other than Auckland almost ground to a halt. In addition, settlers again switched their attention to wool production. While this shift in emphasis was driven primarily by economics, undoubtedly the increased appearance of soil exhaustion during the late 1850s also encouraged it. At New Plymouth, where, as mentioned previously, a lack of pasture constrained sheep numbers, heightened interest in agricultural chemistry emerged in the late 1850s, but agricultural development halted when the New Zealand Wars engulfed the area in 1860-1. At Nelson and Wellington, meanwhile, agriculture, together with guano importing, had a brief revival at the start of the 1860s, but thereafter settlers at both places chose to concentrate almost all their efforts on intensive pastoralism.

The one main settlement to deviate from this pattern was Auckland. The cause of this deviation was environmental - namely the infertile nature of the soils which Auckland farmers developed after the mid-1850s, once the fertile soils at its hub had been taken up. The soils at the agricultural frontier were deficient in both plant-available nitrogen and phosphate, and it proved impractical for farmers to cart bulky organic manures to such remote places. When farmers used guano, however, they obtained much improved yields. Large quantities of first Peruvian guano, and then phosphatic guano, were thus imported in

Auckland from the mid-1850s onwards. Typically, in a year when agricultural prospects were good, more than 100 tons were imported into Auckland, whereas at the three other main settlements, imports rarely reached the level of 10 tons. By the late 1850s, farmers also began looking for cheaper local substitutes for guano, of which bone-dust proved the most successful. It should be said, however, that this use of 'artificial' fertiliser did not change the broad strategy of Auckland farmers when it came to managing soil fertility, that is, cropping new land for a few years and then converting it to pasture. In this case farmers used guano to boost crop yields while they prepared their land for grass sowing. After 1863, when the outbreak of the New Zealand Wars created havoc for agricultural operations to the south of Auckland, Auckland farmers switched their focus almost entirely to intensive pastoralism, though phosphatic fertilisers continued to be used to a large extent, because of the helpful role they played in pasture establishment.

The initial approach taken by settlers to soil fertility management in Otago and Canterbury mirrored those in older settlements during the 1840s. In Otago, the difficulty of producing crops from 'fern land' once again proved a spur to liming and manuring in the early years, but by the mid-1850s, farmers moved onto richer alluvial soils, and they were happy simply to rely on their natural fertility. In Canterbury, however, 'dry swamp' soils were available for cultivation almost immediately, and so even at the start at settlement, when the traditions of English farming should have been freshest in the minds, farmers showed little propensity to use manure. This shows that the influence of the 'biometric fallacy', which would have suggested that Canterbury soils were infertile, had started to wane. Then, in the late 1850s, Otago and Canterbury farmers both began moving away from continouous cropping towards intensive pastoralism. Falling prices for agricultural produce probably drove this more than soil exhaustion, although Otago settlers had become more conscious of the latter.

After the Otago gold-rush in the early 1860s, the alluvial plains of Canterbury and Otago became almost the sole regions of importance in New Zaland agriculture. The rush also transformed local economic conditions, although not in a way that encouraged manure use. While transport and labour costs climbed steeply, surplus Australian agricultural produce kept local prices from rising proportionately. Moreover, the rapid expansion of the agricultural frontier meant that most land being cropped was relatively new to cultivation. In consequence, imports of guano, which began to Dunedin in 1860 and Christchurch in 1862, remained at a low level until 1864, when the wheat price reached unusually high levels. The much larger population base created by the influx of migrants did, nonetheless, create a market for meat and dairy produce, which in turn began to lead to a more mixed farming approach in Otago in the mid-1860s. In Canterbury, meanwhile, farmers had run into trouble when they tried to take the 'convertible husbandry'-type approach which they had employed since the late 1850s beyond the areas of 'dry swamp', which had all been taken up by about 1860. On the drier soils of the Canterbury Plains, they learnt that the naturally low organic matter levels would not support good pasture growth after three or more cereal crops had been taken off them. Soil exhaustion had become common by 1865, and consequently, agriculturists adjusted their management regime to include green crops. The momentum behind mixed farming in both Otago and Canterbury grew even more in 1867, when a huge Australian wheat surplus convinced farmers that the Australasian market for grain had reached saturation point. The prospect of farmers growing more root crops led in turn to the initiation of local bone-dust production in both Dunedin and Christchurch in 1867.

The loss of the Australian grain market was felt throughout the late 1860s and early 1870s, as small farmers tried to find successful alternatives to this trade. Amidst fluctuating prices for wheat and wool, some moved almost exclusively to intensive pastoralism, others fell back on convertible husbandry, and another group turned to crop rotation. This option involved cultivating wheat - now grown for the English market - in tandem with pasture and green crops, used for raising stock to produce meat and dairy goods, as well as wool.

Ultimately, therefore, the soil fertility management regime which farmers adopted depended on their expectations of the relative prices of grain and pastoral produce. Meanwhile, the development of local industry, such as meat preserving works, and the expansion of the railway network allowed increasing supplementation of farmyard manure with factory wastes. Nevertheless, in areas remote from industry, shortages of manure continued to be suffered - this serves as a reminder of the 'contribution' of transport to fertiliser application costs. Agricultural education also started playing a key role in encouraging farmers to conserve soil fertility at this time. Because of their uncertain prospects, farmers were keener than usual to discover how agricultural chemistry might help them, and accordingly scientific and educational institutions began to undertake agricultural instruction and conduct soil analyses.

Environmental factors, meanwhile, ensured that more phosphate fertiliser was used in Otago than in Canterbury. This was especially true after 1872, when root crops began to be grown extensively. The root crops grown in Otago and Southland tended to be swedes, which need more phosphate than the turnips grown in Canterbury. In addition, the cool climate in Otago prevented its agriculturists from successfully growing peas and beans instead of root crops. Some Canterbury farmers did grow these legumes, enabling them to supply nitrogen to the soil directly, rather than having to manure their land with the dung from stock fed on the root crops. Lastly, parts of the Mataura Valley, an important farming area in Southland, also contained soils that were deficient in plant-available phosphate.

In the last era in which this thesis examined agriculture in Otago and Canterbury, namely the mid- to late 1870s and early 1880s, the relative prices for wheat, wool and meat continued to be the major determinant of the approach farmers took when managing soil fertility. Although large numbers had embraced rotational cropping in the mid-1870, a coincident rise in the wheat price and fall in the wool price saw small farmers rush into wheat cropping. This, together with the newly improved access to land that the railway provided, caused a shortlived land boom that collapsed in 1878. Because the supply of cultivable land was running out, many settlers in Canterbury, and to a lesser extent in Otago, borrowed heavily to finance land purchases during the boom. These settlers usually ended up with large debts which compelled them to grow wheat, because it alone could provide the fast profits needed to meet their liabilities. As the land concerned was often not very fertile, much of it quickly became exhausted, but the above mentioned economic imperatives hampered farmers' adoption of more fertility-conscious cropping regimes.

Gradually, the attention drawn to this problem by agricultural commentators encouraged farmers to resume rotational cropping, and manuring with a combination of farmyard manures and 'artificial' fertilisers. Having said this, only the successful inception of refrigerated meat export in 1882 removed the risk of serious environmental deterioration across large areas of Canterbury and Otago. This trade made it possible for farmers to earn a good return throughout a crop rotation, rather than having to rely on the years when they were growing cereal crops. In a related development, local superphosphate manufacture also began in the same year, thereby ensuring the availability of phosphatic fertiliser for use on root crops. The scene was set, therefore, for a more sustainable agricultural system, based around rotational cropping, to operate in the future.

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See also: V. Wood. Appraisal soil fertility in early colonial New Zealand. Environment and History, 9: 293-405, 2003.

A Brief History of Commission VIII Soils and the Environment of the International Society of Soil Science, 1994–2002

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By the early 1990s, the need to emphasize broad role of soil and soil science in society was appreciated by the leaders of the international soil science community. The seven commissions into which the work of the ISSS was divided were based on background sciences, i.e. soil physics, biology, etc., and two applications, one to soil fertility and one to soil technology. Six commissions had existed since the early congresses, soil mineralogy as the seventh was added later. In addition there were four subcommissions (seven since 1994), one of which was "Soil Conservation and Environment." There were also working groups, 16 in 1954, e.g. soil and moisture variability in time and space. The ISSS Bulletins of the period have details on the activities of these groups. The History, Philosophy and Sociology of Soil Science was one of the working groups (since 1994 standing committee), the only one not concerned with specific technical studies of soils or with the applications of that knowledge.

The importance of soil to human welfare, indeed to survival, combined with the lack of understanding in the population of the nature of soils, urged soil scientists to find ways of explaining their science. Since most soils studies were carried out with public money, expenditures that were being more closely examined, it was also necessary to convince the political leadership. These were the conditions under which the ISSS leadership planned a new organization to fit new needs. The result was the present IUSS, with Divisions and Commissions, and including the issues of human welfare in the soil environment.

A step toward this change was taken at the 1994 International Congress of Soil Science in Acapulco, Mexico with the formation of an eighth commission, "Soils and the Environment." Officers were appointed, with Christian DeKimpe from Canada as Chair, and the understanding that elections would be held at the 1998 Congress in Montpellier, France. Officers for Commission VIII were nominated and elected by vote at the 1998 Congress. Dr. DeKimpe was elected Chair.

The Commission, in fleshing out its mandate, prepared a position paper for its future activities on topics including habitat diversity, habitat stability, and sustainability. It also prepared a position paper on soil degradation. Emphasis was on the impacts of human activities on soils and of soils on human activities. Commission VIII work was to emphasize working jointly with the other Commissions as well as groups outside of soil science. There were two main interpretations of the title. One group saw it comprising largely of interaction of soil with the inanimate environment, e.g. contamination of soils by heavy metals. The other group had a broader definition, which included how people interacted with their soil environment.

Commission VIII organized a symposium on "Soil, Human and Environment Interactions," hosted by the Institute of Soil Science, Academia Sinica in Nanjing, China in May 1997. It also cooperated on two meetings in western Europe in 1996. Four symposia were organized at the 1998 Congress on: soil pollution, soil and climate change, soil desertification, and urban and suburban soils. At the 2002 Congress in Bangkok, Thailand, four symposia were organized: Urban and sub-urban soils: specific risks for human health; food security and land use; attitudes toward soil and land use: past and present; and soil indicators for sustainable land use.

The title of Commission VIII, "Soils and the Environment," was broad, and the last decade of the century was a time when the word "environment" was highly prized by soil scientists. Overlapping suggestions for symposia came up from different commissions in planning for the 1998 congress. Environment cuts across many soil science issues. It was obvious that the new group needed to plan programs jointly with other ISSS commissions, and that in the long run a different way of dividing soils studies would have to be made. That different way was achieved in the new IUSS structure.

The 2002 Congress was the last one organized under the ISSS structure. The eight commissions were replaced by four divisions under which eighteen new commissions were organized. The activities that Commission VIII had begun now fell under Division 4, "The Role of Soils in Sustaining Society and the Environment."

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Remembering Charles Kellogg

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Editors Note: Charles Kellogg was the Chief of the U.S. Soil Survey for 37 years until his retirement in 1971. This is a presentation make by Robert Kellogg last fall (November, 2002) at the ASA/SSSA Meetings in Indianapolis, IN as part of the Kellogg Symposium. Robert, son of Charles Kellogg, is a retired professor of Icelandic literature at the University of Virginia in Charlottesville. He and his wife reside in Charlottesville in the winter and Reykjavik, Iceland during the summer months. (email: rlk@virginia.edu)

Charles Kellogg began his career as a teacher of soil science at North Dakota State Agricultural College (North Dakota State University as it has since become) in 1929 and continued in that position for four years, when he joined the Soil Survey of the U. S. Department of Agriculture in 1934. Students populate my memories of our life in Fargo. Several college women boarded at our house, and my father's students were vivid presences in our lives. They remained family friends for the rest of my father's lifetime. And in an extended sense of the word he remained a teacher as well.

Early on, I learned that a soil scientist, especially a surveyor, spends most of his summers in the field. For quite a few years my mother, in the best spirit of American frontier womanhood, would set out from Fargo in our 1923 Pontiac and drive the 1000 miles to our family's farm neighborhood in central Michigan. That car did not have a trunk, so all the luggage had to be tied behind a sort of folding gate on the running board. Several times one of my father's students, a delightful and generous man named Red Striker, drove with us to eastern Minnesota. It was good to have a man along for the times (and they were not rare) when it was necessary to take all the bags off the running board to get at the jack and spare tire. Although on occasion my mother proved herself equal to the task.

"Essentially, all life depends upon the soil . There can be no life without soil and no soil without life; they have evolved together."
Charles E. Kellogg, USDA Yearbook of Agriculture, 1938

My two sets of grandparents were still young enough to be active and entertaining. They lived only 5 miles from each other, and we all had what I considered to be a grand time. My sister and I would shuttle back and forth, spending about a week with the Kelloggs and a week with my mother's parents, the Reasoners. During my time with the Kelloggs I inevitably learned a lot about both my father and my great grandparents and the farm my great grandfather had homesteaded, coming out from Tompkins County, New York. People would say that I looked and talked a lot like my father, which of course flattered me. I was a pretty skinny little kid, and once my grandfather and I walked up to a neighbor some distance away from us. He said he wasn't sure at a distance who I was, "But I said to myself if that's

Charlie he's fell off some." At the end of the summer my father would come out to Michigan and we would make the return trip either to Fargo, or later on, to Washington. My mother and sister and I made our last trip to the old neighborhood in the late winter of 1980 to accompany my father's body to the cemetery of the little Methodist church there. It was the first time I had been there with snow on the ground. The two farm houses were of course far smaller than they had been forty years earlier, and we didn't stop. We did not know the people living in them.

Washington has often been said to have been a comfortable and conservative southern American city in the 1930's, and that is my memory of it too. It was not a center of art or theater in those days, had only a few good restaurants, and rolled up the streets at about ten o'clock at night, leaving all the monuments and statues to enjoy the hours of tranquility, and in the process earning a goodly measure of contempt from my father, who had begun seeing some of the world's great cities by then.

"Each soil has had its own history. Like a river, a mountain, a forest, or any natural thing, its present condition is due to the influences of many things and events of the past." *Charles Kellogg, The Soils That Support Us, 1956*

On the other hand it was a perfect place for children to grow up. We watched the building of the new National Gallery of Art (or the Mellon Gallery, as we called it) going up on Constitution Avenue, marveling at the beautiful Tennessee marble that turned pink in humid weather. When we visited my father at his office in the South Building on Independence Avenue, we rode up in elevators with uniformed operators wearing white gloves.

And the city did have pleasures for a family with children. One of my happiest memories is of my parents and sister and I driving downtown on Sundays to eat in a fancy restaurant, after which we went to the movies at either Lowes Capitol or Lowes Palace on F Street. The Capitol was a special treat because it had an orchestra and stage show in addition to the movie. I am sure my father enjoyed these outings, but I also supposed as I grew older that he spent his Sundays this way in some measure to teach my sister and me how to enjoy good things in life.

Another Sunday ritual was eating popcorn for dinner, after the big midday meal. We listened to Jack Benny, Fred Allen and Charlie McCarthy on the radio. In fact while the rest of America was being terrified by Orson Wells' realistic presentation of the War of the Worlds, we in our happy ignorance were listening to Charlie McCarthy. My father liked Fred Allen so much that once when he took us all to New York he got tickets to the Fred Allen show. At some point poker was added to our Sunday ritual. Teaching us some of the intricacies of seven card stud and five card draw was my father's idea of giving us a social skill that we might be able to enjoy later in life. He was not such a purist as to forbid some wild cards, within the bounds of reason. More or less along the same lines as the poker was his urging me, when I was older, to take typing in high school, an enjoyable experience which produced, as he knew it would, excellent results in both graduate school and the army.

Many years after these idyllic days, my wife and I were visiting my parents from Boston, where we were living. It turned out that on our way back we could ride on the train with my father as far as New York. I should add that he always struck my wife as a stern man, focused entirely on his work and his reading. So it was totally unexpected to spend the hours to New York with him in the club car of the train, where he bought us drinks, told us stories, and made the time fly by. I liked seeing him away from home. It was enough to make me want to attend a Soil Science Society meeting with him, where his spirits may have been similarly elevated.

In addition to learning the rudiments of poker, I grew up as a beneficiary of my father's teaching in other ways. He was a patient and good-natured writing tutor. It was only when I went to college that I stopped showing him occasional drafts of my work in the long pursuit of a style that was clear, accurate and logical in structure. His love of teaching, long after he left North Dakota for Washington was an aspect of his mind and personality that unified his public and private lives. For quite a few years he taught in an institution called the Graduate School, a kind of institute for continuing education, sponsored by several government agencies. He taught John Stuart Mill's logic. When driving into Washington became too much of a chore for him, the students came to our house instead.

Another example of his desire to teach anyone who wanted to learn from him is the reading list for soil scientists that he prepared for his students at NDSU and that went through many revisions and augmentations since its first general circulation in *The Journal of the American Society of Agronomy* in 1940. Typically this list included what he considered to be the classic texts, from ancient writers to contemporary, in soils and farming, and related social thought. But the most striking feature of his list was its inclusion of what he considered to be the great books in literature, philosophy, and religious thought. The copy of *A Reading List for Soil Scientists* that I own was published by the USDA in 1968, but I have heard of a still later edition, in which the proportion devoted to literature is even more substantial.

"Nature has endowed the earth with glorious wonders and vast resources that man may use for his own ends. Regardless of our tastes or our way of living, there are none that present more variations to tax our imagination than the soil, and certainly none so important to our ancestors, to ourselves, and to our children"
Charles Kellogg, The Soils That Support Us, 1956

My father's cultivation of the habits of a general reader had a great influence on me as I matured as a reader. Now having spent 45 years of my life as a teacher of literature I look back in wonder at his incredibly good taste in selecting the works he recommended and in the library of books that I inherited at his death. He owned first editions of many important modernist authors and he collected scholarly editions of his favorite writers from the past: John Evelyn, Samuel Pepys, Jonathan Swift. He liked the French symbolist poets, Marcel Proust, and especially, his pre-eminent favorite modern author, James Joyce. He had first editions of all Joyce's works, and many pre-publication installments of *Ulysses* and *Finnegans Wake* in pamphlets and magazines. Somewhat surprisingly perhaps he read just about everything written by D. H. Lawrence, much of it in first editions, which like the other modern authors he collected he simply bought as they came out.

My father read widely in modern history and biography. One of his favorite books was the two-volume collection of letters between Oliver Wendell Holmes and Harold Lasky. He read Leon Trotsky's *History of the Russian Revolution* and was an interested student of Soviet agriculture. He traveled to the USSR before the war was quite over in Europe to celebrate the 200th anniversary of the Russian Academy of Sciences. (At one of the banquets he ate mastodon soup. The Russians had found a mastodon frozen in a glacier, thawed him out and made soup.) Later he returned for a more leisurely tour of the other republics. Part of his interest of course was stimulated by the very considerable Russian contribution to soil science. I know he felt a kinship with farmers everywhere, without respect to politics. But this took our government a while to understand as they quizzed him and others about his political sympathies. He told me once that a man came to visit him from the FBI and wanted to know what he thought about collective farming. My father launched on to one of his patented lectures, saying that in some places, even in America, it was a system that seemed to work. He thought, too, that it worked in Israel and in peasant communities around the world, including the Soviet Union. The agent was not an ideal student, growing fidgety after a certain time, and he broke off the conversation by saying, "Well, I can see that you are very serious about this."

Much of his study in the last fifteen years or so of his life was guided by Joyce's

Finnegans Wake, which he annotated and used as a guide for his reading of many other writers, from Conan Doyle and Lewis Carroll to early modern philosophers like Giordano Bruno and Giovanni Battista Vico. He read a great deal of Irish history, biography, obscure fiction and popular culture. He was interested in sacred texts of various sorts and owned many versions of the Bible, the Koran, and Indian scriptures. I have benefited often from the concordance of the Bible that was in his library. His reading was guided by an open-minded curiosity and love of good style as well as an intuitive sympathy. He had his own canon of writers. He did not care much for Milton or T.S. Eliot, or even Yeats for example.

Quotes of James Joyce (1882-1941) from *Finnegan's Wake (published 1939 by The Viking Press, New York)*

came at this timecoloured place where we live in our paroqial fermament one tide on another

Countlessness of livestories have netherfallen by this plage, flick as flowflakes, litters from aloft, like a waast wizzard all of whirlworlds. Now are all tombed to the mound, isges to isges, erde from erde.

So you need hardly spell me how every word will be bound over to carry three score and ten toptypsical readings throughout the book of Doublends Jined (may his forehead be darkened with mud who would sunder!) till Daleth, mahomahouma, who oped it closeth thereof the. Dor.

My father was not a religious man. He was brought up as a loosely affiliated Methodist and was a member of the Masonic Order, but I think this was done mostly to please his parents and in-laws. He read the great religious writers, in particular St. Augustine's *City of God*. On few things was he dogmatic: he was in general a rationalist, anti-clerical, a liberal, and like Stephen Dedalus in *Ulysses* he probably believed in the eternal affirmation of the spirit of man in literature. More than in anything else he believed in science. And like many nineteenth-century liberals he was an optimist, with, for example, an unshakeable belief in the ability of science to provide food for the people of the world. He thought that it was our ignorance of cultures different from our own and of social systems that seemed alien to ours that was a greater hindrance to the progress of man than our knowledge of the natural world.

In college my father had been in the ROTC, and I believe that it is correct to say that at Michigan State in those days there was a cavalry unit in the ROTC. He had grown up on a farm and knew and respected animals, especially intelligent horses. One of his closest college friends was offered a commission in the Army upon graduation and they stayed in close touch until the man's tragic death in an automobile accident. When World War II was declared he was a little too old to serve, but beyond that he had begun to wage what became an increasingly painful battle with rheumatoid arthritis. He admired much about the military and worked closely with them and with the intelligence services during the Cold War and Vietnam. He supported that war and was confused and unhappy with the outcome and with its effect on the Democratic party.

My father went to Washington in the earliest days of the New Deal. He admired FDR immensely and uncritically. Another hero was Henry Wallace, the Secretary of Agriculture, who attracted many of the men about him to brain storm such projects as the Tennessee Valley Authority. My father joined this informal seminar at the Cosmos Club in Washington and enjoyed the excitement of new ideas and also the satisfaction of participating in public service, a calling that he idealized

Long before I could understand very much of his literary and scientific interests, I was aware of my father as a charismatic personality who moved in a great world outside of our family. He sent us postcards and letters from around the world. He taught me to value the "covers" of his letters with their exotic stamps, and I have saved a large number. He also gave me the covers of letters that he received at work. And when he returned from a trip abroad he brought us wonderful souvenirs and showed us his pictures, taken aboard ocean liners or in famous cities or in the field. One of those distant places I have since made my own. In the summer of 1950 he traveled with my mother to Iceland, where he spent time with a remarkable soil scientist named Björn Jóhannesson.

I was then a recent college graduate interested in Old and Middle English and understood the importance of Old Icelandic, a language closely related to the early stages of the English language, with a huge medieval literature, some of which even had a place in the *Reading List*. Björn guided my father on a trip through important agricultural areas and to some extent included their observations in his monograph on Icelandic soils. Björn pretended to be amazed when my father told him that I was interested in Icelandic. He said he could not believe that an American student could possibly be interested in such an obscure and isolated place as Iceland. Still, he was pleased, and that first winter in graduate school I received from him a large and remarkable set of books, containing many of the masterpieces of Icelandic literature. It then became incumbent on me to learn Icelandic, which over the course of several years I was able to do. In 1987 my wife and I bought a little house in Reykjavik, and Björn remained a warm friend whom we saw every summer in Iceland until his death about six years ago. Old Icelandic literature has been one of my teaching specialties since my doctoral dissertation in 1958, and it might not be too great an exaggeration to trace this interest back to the trip my mother and father took in 1950.

During World War II my father got the idea of putting in a victory garden in our back yard. It was not one of my favorite ideas, in no small measure because the soil was so poor that it provided more labor for me than was congenial to a lazy high school student. There was a 2-3 inch hardpan about 8 inches below the surface, and when that was penetrated with a pick and carted away, the remaining soil was so deficient in organic matter that we had to work in leaf mold, not just from our compost pile but from any of the surrounding woods that we could raid. My father bought a building lot over in Montgomery County, but I think his intension was to have, although it was some distance away, his own legal source of leaf mold rather than to build a house there. When the war came to an end, my father's garden happily turned into a truly splendid azalea garden. Much of his plant material he got from friends at the Plant Industry station in Beltsville, some of whom were ingenious plant breeders. He was himself very clever at making cuttings. Until my wife and I sold our last house about a year ago, we still had two wonderful little dwarf Korean boxwoods that he had produced forty years earlier.

When I want to commune with my father's ghost I can find him most readily in the works of James Joyce, in the texts themselves but also in the library of books he used to illuminate the densest of their obscurities. He corresponded with famous Joyce scholars and befriended those in need of it. Thanks to the thoughtfulness of his colleagues at Texas A and M University, he even led a colloquium once on Joyce in the English Department. To quote Chaucer in describing his Clerk, "Gladly would he learn and gladly teach."

"As a farmer, man himself became closely attached to the landscape, firmly rooted to the soil that supported him. At times the soil seemed bountiful and kindly and again stubborn and unfriendly, but it was always a challenge to man's cunning."
Charles E. Kellogg

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Note: A biography about Charles E. Kellogg (2 August 1902-9 march 1980) has recently been included in the American National Biography Online. it is written by Douglas Helms (see: www.anb.org/articles).


Fig.1: Kellogg (left) in a beech-oak forest in Wageningen, Holland during August 1950.


Fig. 2: Charles Kellogg with cacao farmers in Ghana during August 1954.


Fig.3: Kellogg taking a rare break in Brazzaville, French Equatorial Africa during August 1954.

The Influence of Liebig in Sweden in the mid-19th Century in Relation to the Establishment of Modern Agricultural Chemistry

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Justus Liebig's 1840 study *Organic Chemistry in its Applications to Agriculture and Physiology* marks the historic turning point noted by all historical surveys of agricultural science. Liebig's mineral theory, minimum law and rule of return provided scientific underpinnings to agricultural science. The strength of Liebig's mineral theory was that it succeeded in 'translating' the theory of chemistry, into something of concern for society as a whole. Liebig elucidated the relationship between supply of different minerals in farmland and a sustainable society. According to Liebig the existent farming system conducted a *'Raubwirtschaft'* through its export of nutritional substances and the breaking of the natural cycles. Farmers and society therefore needed help from chemists in analyzing the soil and determining what additional nutrients were needed. By depicting chemistry as a solution for creating a sustainable agricultural system and society Liebig brought up agricultural chemistry as an issue in the public debate. However, this broader perspective was not very prominently described in the first edition of *Organic Chemistry*. While the first edition was only 195 pages long, the definite seventh edition from 1862 contained 1 130 pages. Thus, Liebig's reputation as a founding father of agricultural chemistry was established during a period of more than two decades.

In Sweden, however, *Organic Chemistry* got a harsh reception. Already in 1840 the well-known chemist Jöns Jacob Berzelius, who had corresponded with Liebig since the early 1830s, questioned whether Liebig's theories were based on sound scientific working. In a letter to Liebig, Berzelius wrote that Liebig's conclusions were like "iridescent soap-bubbles", which blow away by an accurate scientific investigation. Although Berzelius died in 1848 just before the debate about the establishing of agricultural chemistry in Sweden started, his influence was strong due to his disciples in Sweden and internationally. One of Berzelius' disciples was the Scotsman James F. W. Johnston who in 1843 set up an agricultural chemical laboratory in Edinburgh. Like Berzelius he criticized Liebig's lack of scientific accuracy, but also Liebig's lack of practical applications and visiting work to the farmers. Moreover, to Johnston, as for the first Swedish agricultural chemists, geology had at least the same importance as the chemical approach to agriculture.

Johnston's version of agricultural chemistry had a strong impact in Sweden. The first translations of Liebig's *Organic Chemistry* into Swedish appeared in 1846 and no new translation, except for some articles, were published until 1864. By contrast three publications by Johnston were published in Swedish between 1846 and 1852. Johnston also influenced the first German professor in agricultural chemistry, Julius Adolph Stöckhard, who was one of the promoters of the establishment of the experimental station in Möckern in 1851. The underlying idea of the research station was that there ought to be a place where theories could be tested on a long-term basis and in cooperation with farmers to yield practical results. Möckern became a model for ensuing experimental stations that were established across Europe and the US from the 1850s.

These ideas about an out-going and applied agricultural chemistry also dominated the Swedish debate. The Swedish Royal Agriculture Academy and its secretary, Johan Theofil Nathhorst, played a central role in defining Swedish agricultural chemistry. Nathhorst advocated that agricultural chemistry takes up a position between practical farming and theoretical chemistry in order to make the research results applicable to the peasants. He criticized the "chemical optimists", that is Liebig and his followers, for describing chemical analyzes only as a "magician's wand" for farming. Instead Nathhorst described an agricultural chemist as a person who had both scientific expertise and practical training. This ideal meant that neither pure chemists nor gentlemen farmers could become agricultural chemists. In fact, there was no one in Sweden with this type of background. After a six-years-long search for an eligible candidate for the position as the agricultural chemist at the Royal Agriculture Academy, the German Alexander Müller was employed in 1856. After this first goal was attained the Swedish Royal Agriculture Academy succeeded in establishing an experimental station at Ultuna Agricultural Institute in 1861 and another one at the Royal Agricultural Academy's experimental field in Stockholm in 1864.

One important argument for establishing Swedish experimental stations was the conclusion that Swedish farming could not apply the results from foreign research. Theories in chemistry were universal, but scientific applications must be adapted to local conditions, which are unique. This corresponded with Alexander von Humboldt's approach according to which local conditions were determinant for the lives of plants and animals. Thus, domestic research stations were necessary to study the country's distinctive conditions. The agricultural chemist Carl Erik Bergstrand, director of the experimental station at Ultuna, argued that only laboratory experiments or trials in artificial environments, like greenhouses, would not benefit to the improvement of agriculture. Crucial to the process of transforming chemical theories into practical applications for the farmers was field trials in the open air. Laboratory analyzes and controlled field research at the experimental station must be combined with smaller field trials distributed over areas with different conditions. Further, an agricultural chemist must, Bergstrand maintained, get out of the laboratory to assess the local surroundings and make contact with the farmers. Consequently, for Bergstrand agricultural chemistry was not primary a 'laboratory science', but an applied 'field science'.

Moreover, Bergstrand was very interested in promoting research in agricultural geology. Bergstrand wrote a couple of textbooks about geology, was one of the founders of the Swedish Geological Society in 1871, and he drew an agricultural-geological map of Ultuna. Also Alexander Müller, mentioned above, made several regional agricultural geological surveys and used the new theory of the inland ice to explain different conditions for farming in separate parts of Sweden. Hampus von Post, the third professional agricultural chemist in Sweden at the time, published in 1850 an article called "Relations of Agricultural Chemistry", which described a kind of soil science, and made important empirical contributions to the formulation of the theory of the inland ice. According to Bergstrand this brand of agricultural geology among Swedish agricultural chemists was established by Berzelius in his article "About the Condition of Sweden's Bedrock and Soil" from 1839, and this approach was confirmed by Johnston's influence. One other example of this very close connection between agricultural chemistry and geology was the establishment of the Swedish Geological Survey in 1858. One aim of the Swedish Geological Survey was to produce soil-maps for the benefit of Swedish agriculture. The Royal Agricultural Academy was one of the most persistent advocates behind the establishment.

However, with the translation of seventh edition of *Organic Chemistry* in 1864, Liebig made a comeback in the Swedish debate. Now the focus was on Liebig's broader societal perspectives and the concepts of *'Raubwirtschaft'* and sustainability. This can be illustrated by a controversy between Bergstrand and Hjalmar Nathorst about the large Swedish oats export to England. Nathorst, the son of Johan Theofil Nathhorst and the president of Alnarp Agricultural Institute, argued that the large export of oats and free trade ruined Sweden farmland and his native country. Essential minerals were exported from the country without any compensation, which should be made in accordance with Liebig's rule of return. A tariff wall could stop the oats export and Sweden could instead become a net importer of mineral nutrients. In reply to this statement, Bergstrand claimed that Liebig's and Nathorst's prediction that modern agriculture led to ruin was exaggerated. The strictly chemical perspective of Liebig and Nathorst did not take into account the continuous processes in the earth that moulder the bedrock, thereby enriching the soil with new minerals. Thus, all export from the farmland did not have to be compensated by plant nutrients from outside. From a free trade perspective Bergstrand instead claimed that the oats export was necessary to improve Swedish agriculture and economic development.

The conclusion is that Liebig's influence in Sweden, and internationally, mainly was that by his sharp pen and new editions of *Organic Chemistry* put agricultural chemistry on the political agenda for a while. Thereby different interest and funds could be mobilized to institutionalize modern agricultural chemistry. However, the persons who promoted this process were mainly Liebig's adversaries. In contrast to Liebig's university based research, agricultural chemists, like Johnston, Stöckhardt and Bergstrand, worked in close cooperation with administrators and politicians connected with the governmental agencies and agricultural science societies in promoting the institutionalizing of agricultural chemistry. This resulted in the transformation of Liebig's 'pure' scientific approach to agricultural chemistry into a practical and applied science that emphasized the 'agricultural' aspect of agricultural chemistry. Moreover, for such scientists agricultural chemistry was not only about chemistry. It was a generic term for all kinds of science applied to agriculture.

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See also: E. Mårald. Everything circulates: agricultural chemistry and recycling theories in the second half of the 19th century. Environment and History, 8: 65-84, 2002

The Soil in Oral Culture - *proverbs about soil and the land*

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> *Without proverbs, the language would be but a skeleton without flesh,*
> *a body without a soul.*
> Ashanti proverb (Ghana)

Introduction

One of the distinctive features of human beings that separates them from the rest of the animal kingdom is that they do possess ‘culture’ i.e. a developed sense of knowledge, beliefs and expectations which is shared and inherited at various levels of their social organization, with regard their association with the environment they live in.

One good example of this cultural manifestation is the existence of vast amount of cultural references, through customs, religion, folklore about the land (or for that matter the soil), by virtue of its importance for food production (e.g.Yaalon, 2000; Lahmar et. al., 2001).

In this context, this article deals with a collection of traditional proverbs across different cultures and or countries and aims to look at the attitudes towards the soil. Mention is made on Examples of proverbs on those attitudes are given and mention made on the potential of proverbs for raising awareness about the soil.

What are proverbs and why ?

Simply defined a proverb[9] means 'a short sentence, usually in a figurative expression, expressing well known truths, social norms, or moral themes in common use by a society or social group'. Many proverbs are rooted in a country's ancient cultural heritage or religion. Others may have literary origin, as used by famous people, or may stem from memorable incidents in the past.

Proverbs are an essential part of the oral culture of a society, and are frequently used to define the environment and experiences of a particular society. As the soil, for that matter the land influences all aspects of life, it is a frequent subject of proverbs. Soil or land related proverbs can be found in almost all cultures. Understanding and sharing these will help to have an insight into the lives, values, and beliefs of the people who use it.

Moreover proverbs have proved to be a useful application for educative purposes especially i.e. as a vehicle for delivering important issues. One example of this is the AfriProverbs project (cited in the references section), where native African proverbs were collected and used to draw parallels to biblical teachings.

It has already been noted in the past (e.g. Gibbs, 2001) that the existence of similar kinds of proverbs in different languages suggests that some conceptions of intelligence and reasonable behaviour are to some degree universal. Thus sharing proverbs between different cultures will also help in developing some degree of universal appreciation and awareness towards ‘super culture’ and help in building cross-cultural dialogue for peace and security, as mentioned in UNESCO’s Universal Declaration of Cultural Diversity, 2001.

The study

A collection of about sixty proverbs was done from oral, printed and web resources from as many as countries as possible, where mention of soil or earth or land is made. From this another 30 were selected by virtue of relevance and studied here.

Proverbs have been classified according to their communicative intention and the presence or absence of imagery or metaphor, which has been found useful for cross-cultural comparison as in Charteris-Black (1995).

[9] There have been numerous discussions on the definitions of what a proverb is and the concept of proverbiality, which is not intended to be discussed here. But readers may refer more authoritative articles by e.g. Mieder, 1999; Taylor, 1996c.d.e; Arora,1995; Gibbs; 2001.

In this context, the collected proverbs were grouped into four broad themes: the soil as a source and end of life; the soil as a universal reference; the value of the soil; and the duty to care for the soil. Those proverbs illustrating clear metaphoric use have been labelled with an asterisk (*).

This brief study is intended to show the potential use and is not free of limitations. The main limitation being, that the bulk of proverbs were obtained as translated in to the English language. This might have resulted in loss of style at its best and or in some cases possible alteration of meaning. But this is only one of the common problems of in the study of proverbs (More details in the problems faced refer Taylor, 1996a.)

Table 1. Summary Table of Collected Proverbs

Continent	**Countries**	**Number of proverbs**
Africa	6	7
Asia	5	6
Europe	10	12
Americas	3	3
Oceania	1	2
Total	*24*	*30*

Theme 1. The soil as a source and end of life
The soil has been considered as a sign of fertility and also as that of last exit of earthly life, as the following proverbs illustrate.

The earth is God's chief wife; she maintains the living and guards the dead. (Madagascar)
The earth (soil) makes us grow; the earth (soil) must eat us. (Basque, Spain)
All riches come from the earth (Armenia)
* Black soil produces white bread (Norway)
The earth produces all things and receives all again. (Spanish)

The earth offers you a grave everywhere (China)
You travel on until you return home; you live on until you return to earth. (Ethiopia)
The earth is a host who kills his guests. (Iran)
Six feet of earth make us all equal. (Italy)
As a child, is a man wrapped in his mother's womb; as an adult, in tradition; comes death, and he is wrapped in earth. (Malawi)

Theme 2. The soil as a universal reference point
A number of proverbs investigated also show, acceptance of the soil as a universal comparison point. Examples,

* The chameleon changes colour to match the earth, the earth doesn't change color to mach the chameleon. (Senegal)
Mother earth promised to tell her secrets to heaven. (Serbian)
One is born, one dies; the land grows. (Ethiopian)
The land is a mother than never dies (New Zealand).
The distance between heaven and earth is no greater than one thought (Mongolia).
In this world I greet my oldest survivor – the earth. (New Zealand)
The earth is man's only friend. (Bulgaria)

Theme 3. The value of the soil
Since early civilisation times, the soil has been used a basic object of remuneration, e.g. soldiers were rewarded in land as their pension. It was considered as a long-term investment, which runs beyond the lifetime of the owner.

Instead of a handful of gold, it is better to have a handful of earth. (Turkey)
What the soil gives, no one, not even the sultan can give. (Turkey)
Earth is dearer than gold (Estonia)
Better a ruined than a lost land. (Netherlands)
As you need to dismount off the mule of not your own, so shall you leave the land that doesn't belong to you. (Eritrea)

Theme 4: The duty to care for the soil
The duty to care for the soil has been highlighted with a number of proverbs, urging hard work and caution. With a similar note, outcomes of mismanagement or carelessness warned.

Some examples of duty:

* The earth is not thirsty for the blood of the warriors but for the sweat of man's labour. (Brazil)
While the sun is still up, let people work that the earth may live. (Hawaii)
We haven't inherited this land from our ancestors; rather we have borrowed it from our children. (Kenya)
We don't inherit the land from our ancestors; we borrow it from our children (USA)
All earthly goods, we have on loan. (Arabia)

But on the caution side, attention is called for lists,

Cheat the earth and the earth will cheat you. (China)
It is better to work in your own land than to count your money abroad. (Croatia)

* He who looks only at heaven may easily break his nose on earth. (Czech Republic)

Conclusion
Proverbs can be used to develop understanding of ones own and of others cultural heritage. This exchange of reciprocity will help develop cross cultural dialogue and appreciation on important topics. Further more, proverbs have a good potential for development of educational programmes in wise soil management, for raising awareness and participation.

Collaboration for more collections and analysis is gratefully welcomed.

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Some web resources:
http://www.afriprov.org/
http://www.bemorecreative.com/
http://www.spreekwoord.net/

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Early Russian Pedology: Some Thoughts on the History and Philosophy of a Discipline

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Introduction and Acknowledgement
The following is a slightly shortened version of an oral presentation given at the Annual meeting of the Geological Society of America in Denver, Colorado, 1999. Over a decade ago, as a student in Loren R. Graham's seminar on the history of Russian and Soviet science at MIT, Cambridge, Mas., I found that very few research materials on the development of Russian soil science were accessible to the non-Russian literate audience. One striking exception to this dearth of

resources was a set of volumes in English translations of papers prepared by the Soviet delegation for the First International Congress of Soil Science held in Washington, D.C., 1927. These papers, collected by Secretary Sergei Ol'denburg and published under the auspices of the Soviet Academy of Sciences, provide a retrospective snapshot of Russian soil science according to its early twentieth-century Soviet practitioners. On the strength of this narrow body of evidence, I argued in my 1989 seminar paper that the "biosphere" concept of Vladimir I. Vernadsky was derived from a viewpoint uniquely advanced by Russian soil science. Whereas in most countries, soil science is seen as a minor member of the physical sciences, Russian soil scientists nominated soil as the focal point for a multi-disciplinary science of the earth, encompassing both inorganic and organic nature, thus bringing geochemical and biological phenomena under one branch of study. It is this idea that the practical demands placed upon an applied science (soil science) could yield a powerful and unifying theoretical framework for collecting disparate physical and social sciences together which continued to intrigue me.

Professor Graham generously cited my unpublished paper in his subsequent book Loren R. Graham, *Science in Russia and the Soviet Union: A Short History,* Cambridge: Cambridge University Press, 1993. I am the "American student [who attributed to Dokuchaev] a 'pan-scientific' view of the importance of soil (p. 288) and source of Grahams's statement that the Russian contribution was more in terminology and design… (p. 230). Thanks to the queries of Dan H. Yaalon, Professor of Pedology at the Hebrew University of Jerusalem, I was induced to reexamine the history of Russian soil science in the light of recently translated works by Russian historians. This essay discusses how Russians simultaneously invented theoretical and pragmatic bases for the scientific study of soil types, by aligning pedology with the natural history model of physical science. It was reviewed and edited by Dan Yaalon.

Early Russian and Soviet Pedology

In the 1920s, Soviet theoretical soil scientists described the birth of their own discipline in terms of its political and economic historical context. Keeping in step with Marxist materialism, they claimed that pedology began in tsarist Imperial Russia because it was a pre-industrial empire, which required a new applied science. The surprising twist to this story is that a generation of practical-minded Russian soil scientists found a way to incorporate all the rest of the earth and life sciences into a theoretical structure whose central object was soil. Students of Vasily Vasilevich Dokuchaev (1846-1903) were taught to integrate geology, zoology, botany, and even anthropology, into a framework that examined the interactions of organic and mineral material in that part of the earth affected by living beings. Such an ecological sensibility is now considered essential to understanding what we call the biosphere, but that word did not exist 120 years ago. To begin to understand this interesting case, I framed the following question: "How and why did Russian soil science become as intimately connected to historical geology as it was to practical agriculture?"

Like other agrarian countries, Russia looked to its natural scientists to provide solutions to problems of extracting prosperity from the land. In one respect, late 19th-century Russian scientists resembled their American counterparts when they took advantage of government support to help accurately map and evaluate the country's natural wealth. Russian naturalists, many of whom were affiliated with the Free Economic Society of St. Petersburg, accompanied expeditions in order to collect and classify botanical, geological, and zoological specimens. In the course of their travels, these men became aware of plans to assess the future tax potential of lands yet to be settled. A. A. Yarilov, Professor of Pedology at Moscow University, recalled in 1927 how that administrative problem of half a century earlier had provided "an opportunity" to develop a scientific system, by means of which a distribution of the territory into economic units could be established."[10] In other words, Yarilov attributed the birth of Russian soil science to that contingent imperial need to assess land values. Here, briefly, is Yarilov's chain of reasoning.

In the wake of tsar Alexander's emancipation of the serfs in 1866, land valuation had already emerged as a key way to ensure governmental authority over the far-flung reaches of even the empire. To oversee land distribution and taxation programs, the government needed a stable body of knowledge about the extent and contents of each parcel. A system based on soil type promised to give a clear and simple measure of the agricultural promise of each tract, one that would not be subject to corruption, dispute, or volatile change. As the 1866 Zemstvo of Riazan stated:

To achieve this goal, the government sponsored expeditions in the 1870s to correct existing maps and to record upon them "scientific" knowledge about soils. Note that these expeditions were not the first to try to assign soil type designations to places. As early as 1851, there had existed a "General Soil Map" of European Russia, which was compiled from the haphazard reports of travellers and land agents by economist-climatologist K. S. Veselovskii (1819-1901).[11] But in the series of expeditions undertaken by Vasilli Nikolaievich Chaslavski (1834-1878) in 1873, knowledge about Russian soils was extended into Besarabia and Moldova. Dokuchaev replaced Chaslavski upon his death in 1878, and produced the revised map of European Russian Soils in 1879 (omitting the Russian-owned territories of Finland and the Caucasus on this map). Dokuchaev then accepted a position at Nizhni-Novgorod.[12] Here, Dokuchaev did indeed begin to develop new knowledge about different soil types and to produce more sophisticated maps. Within the 14 volumes of field investigations he published between 1882 and 1886, Dokuchaev reported his land valuation data while also pursuing the scientific task of establishing a natural soil classification scheme. In 1887, a Statistical Bureau was created at Nizhni-Novgorod to oversee data collection. Dokuchaev hired his student Nikolai Mikhailovich Sibirtsev (1860-1899) to produce local soil maps. Previously, the 1851 map had been on a scale of 1: 8.4 million and Dokuchaev's 1879 map on 1:2.5 million. Through Sibirtsev's new detailed maps, which he now began to produce on either 1: 80,000 or 1: 400, 000 scales, the two men promoted the idea that not only knowledge of local climate and topography was essential to predict the agricultural potential of a given soil.

Dokuchaev and Sibirtsev also produced a natural scale of soil values which served the government's purpose. By setting 100 as the arbitrary maximum fertility index of a soil type, the table allowed a government-employed soil technician to evaluate the agricultural potential of any given plot of land, and to express that value as a percentage of some fixed ideal. Beyond its practical use, the table also represents a significant scientific achievement. Just as mineralogical, botanical, and zoological tables helped field naturalists to identify and situate novel species of rocks and gems, plants, and animals, Dokuchaev and Sibirtsev's table embodied a theory of soil classification which could be modified and expanded to include soils from anywhere in the world. Examining such a table first in terms of its practical implications, we can see

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[10] A. A. Yarilov, "Brief Review of the Progress of Applied Soil Science in USSR," Vol. XI of Russian Pedological Investigations (Leningrad: Academy of Sciences, 1927), 1.

[11] I. A Krupenikov, History of Soil Science From its Inception to the Present, (Brookfield, VT: A. A. Balkema, 1993) -- a translation of Istoriia Pochvovedeniia: ot vremeni ego zarozhdenia do nashikh dnei (Moscow: Nauka), 143; Yarilov, 1.

[12] Situated where the Oka River empties into the Volga, approximately 400 kilometers east of Moscow, Nizhni Novgorod rapidly grew into a major trade and cultural center during the latter half of the 19th century.

that color and gross texture were used as primary indices of a soil's fertility. The scheme's reliance on immediately apparent (quasi-mineralogical) features (as opposed to chemical features which could only be known through laboratory analyses of soil samples) made data gathering easier, regardless of field conditions. But this focus on physical characteristics involved more than just a methodological shift – it reinforced a sense of Russian scientific independence as well. In particular, Dokuchaev's system posed a major challenge to the intellectual hegemony of German chemistry. By the 1870s, agricultural scientists around the world had accepted the theory of soil chemistry advanced by Justus Liebig (1803-1873). Liebig's theory of mineral nutrition had downgraded the value of organic manures in farming, and helped instead to establish the fabulously profitable mineral fertilizer industry. Consequently, some traditional farming practices in the West suffered in the face of chemical reductionism's market clout. But the "potash syndicate" would not be so successful in Russia. There, because of Dokuchaev's work, Chernozem (the most highly rated type) was celebrated as a black humus-rich soil. By adopting natural history rather than chemistry for his disciplinary model,[13] Dokuchaev provided a scientific argument for composting, and at the same time opened the way to a revolution in thinking about soil as a natural body.
Inventing a nomenclature is a typical early step in a new science. Dokuchaev brought to this task a sensibility of "place". As in historical geology, where new rock specimens were named by their discoverers (often reflecting locale), Dokuchaev appropriated ordinary Russian color and texture words for his soil-type names, effectively "Russianizing" pedology. For example, the name "Chernozem" literally conveys to a Russian speaker the object's deep dark color, while "Podzol" is a compound word built from "pod" (beneath) and "zola" (ashy). Subsequent universal adoption of these technical terms could never disguise their cultural origin. And while this nationalistic artifact is undeniably embedded in scientific practice, it would be a mistake to infer that Dokuchaev intentionally designed his nomenclature merely to express Russian national pride. He had a grander vision and purpose than this in mind.
Ultimately, Dokuchaev aspired to explain how all soils are formed. Beginning with the problem of definition, Dokuchaev insisted that soil-type designations include: "relief of the surface, parent-rock, character of the vegetation, [and] geological age [of the land]."[14] In other words, the biological, geographical, and geological history of a place were all responsible for the character of its soil. Based on Sibirtsev's careful mapping of local topography, predominant vegetation patterns, and the mineralogical character of the underlying "parent" rocks, Dokuchaev articulated a principle of the "geographicity" of soil types. This principle came from observing zonal patterns illustrated on the soil maps, and it led to a daring theoretical conclusion. Dokuchaev thought that past and present temperature and moisture conditions were somehow embedded into soil, so that analysis of a sample, according to his theory, could actually reveal the inscribed climatic experience of a place. By the early 20th century, Dokuchaev's system was being used to "decode" the entire genetic profile of soils (Note: this term "genetic" was actually used by I. V. Tiurin in 1927 to describe "the

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[13] John Tandarich reproduces a telling passage from a Dokuchaev pamphlet [The Study of the Soil in Russia, Its Past and Present, 61] in which soil is necessarily to be understood "as a natural history object." See John P. Tandarich, "Pedology: Disciplinary History," Sciences of the Earth: An Encyclopedia of Events, People, and Phenomena, ed. by Gregory A. Good (New York/London: Garland Publishing, Inc., 1998), 668.

[14] K. D. Glinka, "Dokuchaev's Ideas in the Development of Pedology and Cognate Sciences," Vol. I of Russian Pedological Investigations (Leningrad: Academy of Sciences, 1927), 4.

essential peculiarity of Russian soil scientists' work").[15] Once a catalogue of typical soil life-histories had been assembled, the future arability of any soil could be predicted with scientific confidence.

It is interesting to note how the soil valuation scheme Dokuchaev developed at Nizhni-Novgorod stayed remarkably stable, and yet grew to become a deeply embedded part of Soviet administrative thinking. For example, a cursory glance at the *Great Soviet Encyclopedia* entry for Gorky (which is the name Stalinist authorities reassigned to Nizhni-Novgorod in honor of one of its most famous native sons in 1932) shows how features of Dokuchaev's practical soil science had become an essential part of how a place in the U.S.S.R. was understood as recently as 1970. Here is an excerpt from the second page of the "Gorky Oblast" entry in that compendium of general information about the Soviet Union:

While it is worth noting that the editor of this encyclopedia, A. M. Prokhorov, was trained as a geologist, that fact only reinforces the extraordinary degree of penetration of soil science knowledge into Soviet cultural awareness. For purpose of comparison, consider how unlikely is it that an *Encyclopedia Britannica* article on Liverpool, England would even mention technical terms for the soil types to be found on the Lancashire Plain.

Dokuchaev's concept of the geographicity of soil type was important not only for the development of Russian administrative understanding of the land. It turned out to be the critical departure point for the earth science sub-discipline of pedology. By studying place-specific patterns of weathering, soil science was able to move beyond abstract classification schemes and into detailed analyses of those dynamic natural processes that yield soils as their cumulative result. Early Russian pedologists advanced the innovative idea that soils "degrade" from a characteristic parent rock because of distinct sequences of organic and climatic conditions. This idea united both the ancient static tradition of naming and identifying natural objects, and the newer (Darwinian) tradition of ideas about change in nature. Early Russian soil science also represented a bridge between the intellectual domains of geography, climate, and ecology, and the practical concerns of agriculture; a bridge that was built by emulating the example of historical geology. As a result, we better understand that in Russia the pedology discipline became elevated to be the focal object of the earth and life sciences.[16]

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BOOK REVIEWS

75 Years German Soil Science Society

H.P. Blume (Mitteilungen DGB, Vol. 97, book of 380 p., 2001; ISSN 0343.1071)

In commemoration of the 75th jubilee, Prof. Blume (a former president) compiled an extensive account of the history, the activities and the concepts of the DBG (Deutsche Bodenkundliche Gesellschaft = German Soil Science Society) which is the first part of this book (140 pages).

As for the prehistory, soil science in Germany developed from Agricultural Chemistry (soil fertility) and Forest Science (soil evaluation)

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[15] I. V. Tiurin, "Achievements of Russian Science in the Province of Chemistry of Soils," Vol. IV of Russian Pedological Investigations (Leningrad: Academy of Sciences, 1927), 2.

[16] Loren Graham describes Vernadskii's interactions with Teilhard de Chardin and Edouard Leroy in Paris in the 1920s. See Loren R. Graham, Science in Russia and the Soviet Union: A Short History, (Cambridge: Cambridge University Press, 1993), 139.

in the 19th century. From about 1910 German soil scientists (Ramann et al.) contributed to the establishment of the International (at that time mainly European) Soil Science Society (ISSS).

The *German Soil Science Society* was founded with 41 members in Berlin 1926 as a section of the ISSS (with Prof. Schucht as president). In the first decades the Society grew within the framework of European co-operation, and ideas were exchanged in annual meetings. Soils as the basis of food production required proper management with emphasis on amelioration and fertility (fertilization) in a food-deficient country. Remarkable achievements were the evaluation (Bodenschätzung) of all German soils with regard to crop production potential, but also for taxation, the best soils being rated 100 %, further the *Soil Map of Europe* (Prof. Stremme, 1927) and the *Handbook of Soil Science* with 11 volumes (Prof. Blanck, 1932). The war interrupted the progress and separated German soil scientists from their European colleagues and friends.

The hunger-situation in the post-war period (1945-48) favoured the new start of the Society (about 1950), but the tragic separation of Germany into West and East also took hold of soil scientists. This remained so for 30 years, without hardly any contact or visits of national meetings (some personal contacts mainly on international congresses).

In West-Germany, until about 1970, the main emphasis was still on soil fertility, but also increasingly on soil genesis, processes of soil formation and actual soil mapping (carried out by soil scientists of the Geological "Landesanstalten").

After the food production approached self-sufficiency from 1975 onwards, the effect of agricultural production on environment and landscape gained public interest. Therefore, research priorities (also directed by funding policy) shifted to ecological soil functions within the whole ecosystem. The causes and extent of nutrient losses depending on soil filtering properties were studied and soil management practices for minimizing environmental pollution developed. The important goal was to obtain high yields without avoidable pollution effects.

Since the last decade, the concept of *soil protection* against contaminations as well as special rehabilitation measures gained priority. The high soil fertility, resulting from long-time soil improvement, should be protected against undesirable accumulation, e.g. of heavy metals from town waste materials (see: Handbook of Soil Protection, edited by Prof. Blume).

The work of the 8 Commissions and 9 Working Groups during the last 50 years is described in great detail, mainly by former chairmen. The reader will find much information on concepts, meetings and persons from soil physics to soil protection. It may be added that Comm. IV (Soil Fertility and Plant Nutrition) co-operated with the *German Society of Plant Nutrition.*

In East-Germany (DDR), with an own Soil Science Society since 1967, priority remained longer on soil management for food production. An extensive system of soil analysis was created, which, however, did not have a corresponding impact on yield increases. Great efforts were made for a comprehensive soil inventory and soil mapping, further for solving pollution problems and damages of forests in certain areas due to industrial immissions. After reunification in 1990, the DBG has now 2500 members.

Biographies: 60 pages are dedicated to short biographies of many prominent soil scientist, including some foreigners of great influence on German soil concepts. Some names will be widely known, e. g. Scheffer and Schachtschabel, the authors of the standard German soil science textbook. A personal register makes it easy to trace certain persons, but a subject index would also have been useful.

To sum up, Prof. Blume gives an excellent treatise of the German (and thus partly also of European) Soil Science and the changing concepts from soil production to soil protection. The book is well illustrated with historical pictures and readers will recognise many well-known faces. One wonders, however, why this fine work is published as an inexpensive brochure.

It is out of print, but still obtainable from the author for 15 Euro via email: hblume@soils.uni-kiel.de

Arnold Finck, Kiel
(former chairman Comm. IV)

The Earth's Biosphere: Evolution, Dynamics and Change

Vaclav Smil, MIT Press, 2002, 346 pp., 138 figs.

This is a fascinating book, comprehensive on the global scale but not neglecting specific details, - and affordable ($ 33). It will advance your understanding of the multifaceted dynamics of life's diversity and transformations by natural and human action. Its ten chapters, presented in a historical context, are well documented and illustrated, and supported by appendixes. This is the polyglot author's 10th book; again bridging the natural and social sciences. (The previous one on *Enriching the Earth*, which dealt with fertilizers and world's food production, was reviewed in our *Newsletter no 10.)*

Evolution of the history of ideas in this multifaceted field, including the current understanding of the origin of life and energy relations of the biosphere, is discussed in the introductory four chapters in an historical context. The hero in this multidisciplinary volume is the Russian geochemist V.I. Vernadsky (1863-1945), a student of V.V. Dokuchaev, who inspired with his 1926 (Russian) and 1929 (French) book much of the subsequent biosphere thinking and research on the biogeochemical cycling of elements. The staggering amount of subsequent research is duly integrated into grand patterns and some of the most important data selected for presentation. There are over a thousand references, nearly one-third to classical and recent books, about one third to articles in *Nature* and Science, and a list of relevant web sites for actual data. Recent pertinent literature is well covered. A significant part is that both the Russian and other languages literature are cited. May others follow this example.

For our readers it may be of interest how the soil, though only an accessory of the biosphere, is treated in the following chapters. Weathering, the organic carbon cycle and cycles of the major elements are reviewed in chapter 5 with due reference to the function of soils. The concept of soil as a component of the terrestrial ecosystem is mentioned briefly and its biotic components listed (Ch. 6, p.170). It is suggested that the biota strongly influence the entire soil C horizon, perhaps to a depth of 50 m, based on the recent discoveries of deep subterranean microbiotic activity. The biomass and productivity calculations are presented in chapter 7, duly mentioning the work of Darwin on earthworms and Liebig's pioneering calculation of terrestrial productivity.

In *Civilization and the Biosphere*, which deals with the *Earth Transformed by Human Action,* there is a brief mention of accelerated soil erosion due to removal of natural vegetation (Ch. 9, p. 241). The difficulties in quantifying the watershed-measured losses regionally or extrapolating to other regions because of the highly site-specific nature of erosion are mentioned. A non-alarmist attitude is adopted; only for Africa is the situation considered serious. The uncertainties of long-term impacts of global climatic changes due to anthropogenic and natural forcing are probably also less than commonly assumed. The currently fashionable calculations of the monetary values of biospheric and environmental services are strongly criticized

(p. 256 to 259) as scientifically unsupported and inadequate. While concern of the future alternatives is expressed, the book ends on an optimistic note. The final *Epilogue* chapter returns to the early recognition by Vernadsky of humans as the major transformer of the global environments, but predicts on geophysical grounds that the biosphere may exist another 500 million years.

Dan H. Yaalon (email: yaalon@huji.ac.il)

Soil Science in Romania in the 20th Century

Dan H. Yaalon, Hebrew University, Israel

This book of 416 pp was edited by Nicolae Florea and Mihail Dumitru, both members of the Romanian Academy of the Agricultural Sciences, and was published in Bucharest in 2002 (paperback). It contains 20 short reviews on selected topics of Romanian soil science (in Romanian) by its leading scientists and one overview in English, by Florea, Munteanu and Dumitru, including many references, summarizing the main activities and achievements in soil science in Romania since the first soil descriptions in the 19th century.

The agro-geologist G. Munteanu-Murgoci (1872-1935) was an early promoter of the new Russian pedological concepts and a mapper of zonal soils between the dry steppe and humid forest regions. Up to now fifty soil maps at the 1: 200,000 scale were prepared which cover all of Romania and completed in 1994. Currently more detailed, specialized maps for agricultural purposes (60% of the total area), monitoring of land units and soil profile data for a computerized database have been introduced Romanian soil scientists contributed to the work of the ISSS and in 1964 have organized the 8th International Congress of Soil Science with many memorable field trips. Loess and paleosol relations were another frequently researched topic. A useful volume for historians of soil science during the last century even for those not familiar with the Romanian language.

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Annual Meeting of the Soil Science Society of America, Seattle, 31 Oct–4 Nov 2004.

The SSSA Council on History, Philosophy and Sociology of Soil Science is planning a series of oral sessions for the ASA-CSSA-SSSA annual meeting in Seattle. We are looking forward to vibrant discussions that cross-cut time and discipline boundaries, and explore the evolution of our science and profession. We hope that you will consider submitting a contribution.
A special session jointly sponsored by Division S8 will look at Hazardous Materials in Fertilizers. Persons interested in submitting volunteered papers are requested to contact Joseph Heckman of Rutgers University at heckman@aesop.rutgers.edu
A special session The Lewis & Clark Expedition- A Symposium on Jefferson's "Other Agenda"-Soils and Agricultural Potential is being organized by Maxine Levin of NRCS. This symposium is planned for the Bicentennial of the expedition, and the Pacific Northwest venue is particularly appropriate for a discussion of the Corps of Discovery. Potential speakers are requested to contact her at maxine.levin@usda.gov Suggestions for the possible speakers outside of the traditional soil science circles are welcomed.
A general session will also be held. Presentations profiling the contributions of prominent soil scientists, the historical roots of our profession, the role of soil science in relation to allied sciences and society as a whole, the use of historical data sets and archived samples, developments in soil science education, and other topics are welcomed. Persons interested in submitting volunteered papers are requested to contact Ed Landa of the U.S. Geological Survey at erlanda@usgs.gov

Please submit your Title-Summary forms for the annual meeting website via www.asa.cssa.sssa.org/anmeet/

Deadlines: title-summary form 3 May, abstract 28 July 2004.

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For additional information on activities, meetings, publications, and other useful information and links, please consult websites: www.iuss.org and www.soils.org

The editors would be pleased to receive material for inclusion in the Newsletter, preferably as Word files, to hans.vanbaren@wur.nl