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On the Importance of International Communication in Soil Science

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Abstract—This article is dedicated to the celebration of the 100th anniversary of the founding of *Pochvovedenie*, the first scientific journal entirely devoted to soil science. The year 1899 is also significant for the appearance of the first edition of the textbook *Pochvovedenie* (Soil Science) by N.M. Sibirtzev, presenting details of Dokuchaev's concepts of the genetic soil types and an outline of their classification in Russia. In the United States of America, 1899 marks the beginning of the federally supported systematic soil survey at a detailed scale. A comparison with the current situation is made and the need for better international communication in soil science is stressed.

INTRODUCTION

Soil science and the study of soils has had a relatively uncomplicated history without great controversies. It had only a few significant paradigm shifts and is not much in the public's eye, which some recent books attempt to remedy [1, 3, 14]. In books on agriculture written by ancient and classical scholars, only a small amount of space was devoted to soils and their characteristics and management. Much later, starting in the 18th century, more attention was paid to soils, their nature, soil management, and fertility, as books dealing with these topics began to appear in several languages in Europe, summarizing advise to farmers and developers on the best agricultural practices. During the 19th century, scientific observations and analyses of soil began to be published also in almanacs and agricultural journals.

The specific study of soils as an independent object of study in its own right—*pedology*, including its applied aspects of soil productivity and soil management—is, thus, a relatively young science. The results of surveys, analyses, and research began to be published in scientific journals in the second half of the 19th century. Beginning with the last three decades of the 19th century, the Russian school of V.V. Dokuchaev and his followers has contributed most significantly to the basic concepts of soil genesis [5, 15].

Pochvovedenie, the first journal entirely devoted to current scientific research results in soil science was founded in 1899 and continuously published since, an honor not shared by many scientific journals. Apart from being the main soil science journal in Russia, it became a leading international soil journal, now once again fully translated also into English. I would like to discuss in a broader context the significance of this landmark and of two other landmark occasions of one hundred years ago, together with some observations and thoughts on the current state of interregional communication in soil science and some suggestions how to improve it.

ONE HUNDRED YEARS AGO

The year 1899, when *Pochvovedenie* was founded and first edited by P.V. Ototzki (followed for many years by A.A. Yarilov), was also remarkable in two other ways.

The first edition of N.M. Sibirtzev's textbook *Pochvovedenie* (Soil Science) was published in 1899 (in Warsaw). In it he expounded and systematized Dokuchaev's concept that genetic soil types correspond to a definite combination of soil forming agents (factors). This and later editions of Sibirtzev's book [8], the holder of the first chair in pedology at the Novo-Aleksandrov Agricultural Institute of Agronomy and Forestry in Pulavy (now Poland), became most influential in spreading the new pedological concepts, as Dokuchaev himself did not produce a general soil textbook. Subsequently, other equally pedologically oriented textbooks became influential in training new generations of soil scientists.

In the United States of America, the year 1899 is an important milestone in that it marks the initiation by the US Department of Agriculture, Division of Agricultural Soils (later Soil Survey Division of the Bureau of Soils), of federally supported systematic soil surveys on a large scale (1 : 63 000 or better) with the aim of showing the distribution of local soil types (later "soil series"), at that time mainly differentiated by texture and geological substrate properties [6, 9, 10]. In subsequent years, the Soil Survey Division employed several hundred soil surveyors in all states of America. The soil series concept became refined, including the full soil profile. It permitted a better evaluation of the regional soil inventory, helped to devise a taxonomy based on observed properties and especially enabled improved

soil management practices for the benefit of the soil users. Though the preparation of a soil survey inventory is not cutting edge research, it is an essential foundation for it with a high subsequent impact.

Modern earth science is based on collecting detailed and systematic observations, both in the field and in the laboratory, supported by experimentation, followed by data organization and their interpretation, and, finally, presentation of results to a wider audience. Any research is not completed before it is published in a generally available form and eventually, when significant, entering the store of general knowledge in reviews, monographs, and textbooks. Thus, it seems that one hundred years ago, in 1899, two widely separate countries initiated appropriate and significant examples for three of these major aspects, albeit to be greatly expanded and developed in subsequent years: the collection and evaluation of field data (detailed soil survey), presentation of results of research (journal *Pochvovedenie*), and the spread of syntheses and generalizations (monographs and textbook). Much has been built on and developed from these early foundations.

THE CURRENT SITUATION

At present, over 5000 soil science publications appear each year in a variety of languages, mostly in English (~70%), in a large number of scientific journals and in specific thematic publications covering all fields of soil science. Pedology is indeed recognized as an independent science of soil bodies, closely connected to a number of related basic earth and biosciences and significant in various applied sciences besides agriculture [13]. It is taught as such at colleges and universities and requires continuously up-to-date textbooks listing the most recent advances.

Apart from *Pochvovedenie*, there is now a large number of national and international journals specializing in soil science [7, 12], about 30 being most important in publishing the more frequently cited research results. Over 100 significant monographs and textbooks related to soil science are published annually in several languages. Soil surveys are now carried out on a regular basis in practically all countries of the world. Though generally applying much more sophisticated procedures, the detailed field survey has remained its mainstay.

National characteristics and local or language preferences were always a major obstacle in the international communication of soil science. In the early 1960s, some 23% of all internationally recorded soil research papers were published in the Soviet Union [11]. How this proportion has changed recently has not been estimated. Though Russia continues to boast a number of outstanding soil scientists and *Pochvovedenie* continues to be among the leading soil science journals, it must be acknowledged that Russia lost its leading role in soil science long ago. During the Soviet period, it was mostly because of the politization of the scientific enterprise and forced isolation of its young scientists from overseas contacts [4]. Currently, it is strongly handicapped by outdated equipment, inadequate access to foreign publications, and the language barrier.

Russian publications rarely cite non-Russian research, which unfortunately is reciprocated in American or European publications. We are still largely separated by language and reading habits, just like in Dokuchaev–Sibirtzev and Hilgard times when the landmark pedological paradigms were first published in Russia and the USA, respectively, without sufficient interaction among them [2, 5]. A major effort is needed to overcome this.

THE NEED FOR BETTER COMMUNICATION

During the last 40 years, *Pochvovedenie* was translated first in total, later only selected papers of it, together with other translated research articles in the journal *Eurasian* (previously *Soviet*) *Soil Science*. Because of translation, delays, and the large costs of overseas professional translation, this entreprise was in danger of folding, but was then taken over by a Russian publishing company for simultaneous publishing of the Russian and English editions. Hopefully this situation will endure.

However, it seems also imperative that Russian soil scientists publish directly, like some East European, Chinese, South American, and other soil scientists, significant research results in Western language journals which now lead this topic. Since the publication requirements of these are generally high and vary considerably from the Russian practice, young scientists ought to be trained not only in the use of modern equipment and research methodology, but also in the rather strict and demanding ways of presenting research results, separate from interpretations and discussions and fully documented by comprehensive citations of previous and/or relevant literature. At the same time, Russian publications publishing research of more general interest need to include longer, informative English-language abstracts. The preparation of these abstracts or summaries by the authors themselves is excellent training in concise and clear writing. As a result, non-Russian authors will hopefully become better acquainted with Russian soil research.

In a world which only recently became conscious of the limitations of natural resources, including soils, and the often irreversible damaging effects on the environment brought about by humans, basic and applied studies involving soils will increase in importance. Besides the inevitable and needed local problem solving research, we should aim at having more soil science communication that is international, accessible, and relevant.

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