

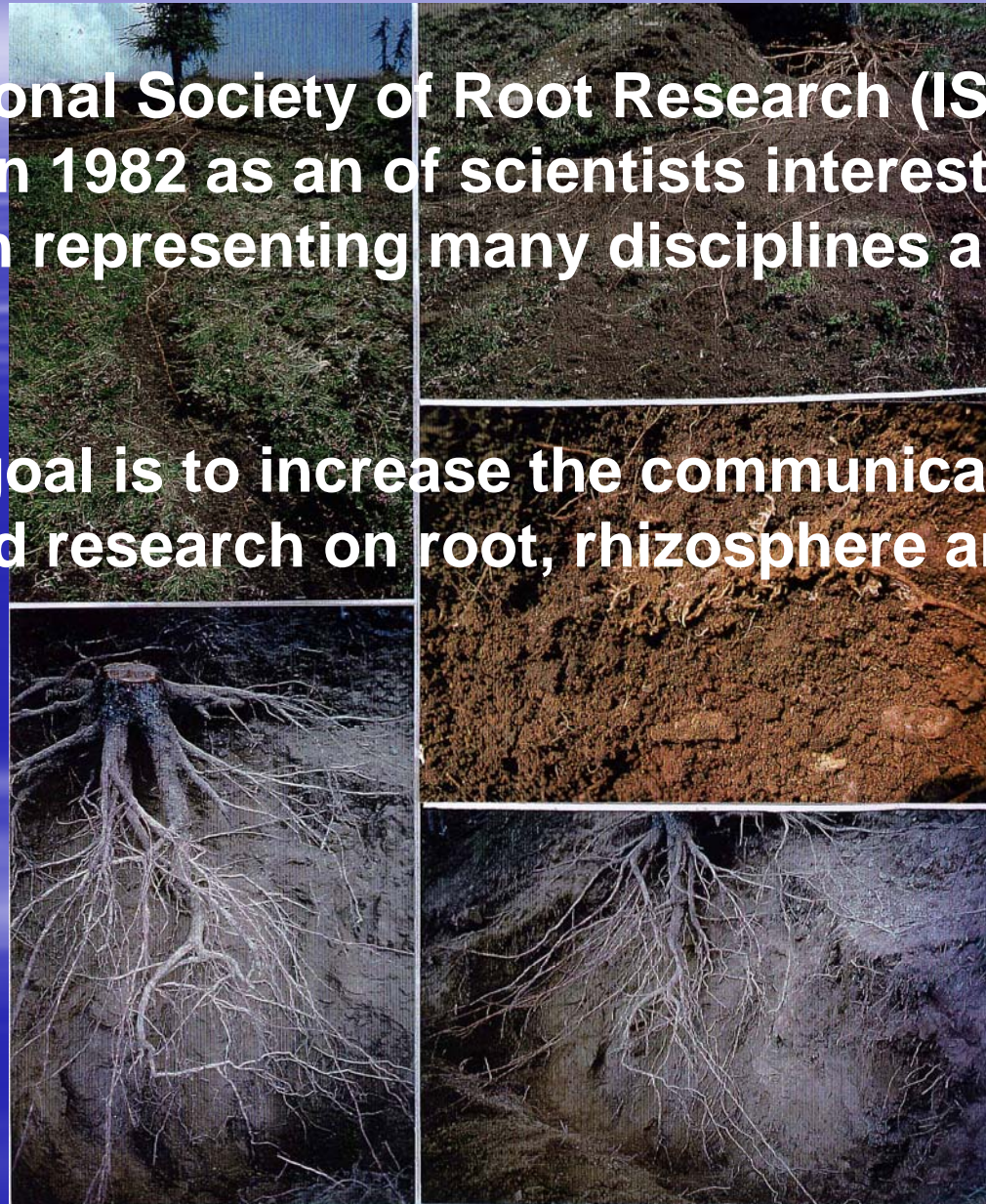
The study of plant roots – insight into a hidden world

Plant scientists have many years emphasized only the aboveground plant structures and ignored the hidden belowground plant world



The International Society of Root Research (ISRR) was established in 1982 as an organization of scientists interested in plant root research representing many disciplines and nationalities

It's primary goal is to increase the communication, cooperation and research on root, rhizosphere and related topics



The 1st ISRR-Symposium on "*Root Ecology and its Practical Application*" in Irnding, Austria, 1982

The 2nd ISRR-symposium on "*Plant roots and their environment*" in Uppsala, Sweden, 1988

The 3rd ISRR-Symposium on "*Root Ecology and its Practical Application*" in Vienna, Austria, 1991

The 4th ISRR-Symposium on "*Root systems and natural vegetation*" in Alma-Ata, Kazakhstan, 1994

The 5th ISRR-Symposium on "*Root demographics and their efficiencies in sustainable agriculture, grassland, and forestry ecosystems*" at Clemson University, South Carolina, USA, 1996

The 6th ISRR-Symposium on "*Roots: the dynamic interface between plants and the earth*", in Nagoya, Japan, 2001

Austria 1982



Sweden 1988



USA 1996





Kazakhstan 1994



Austria 1991



JAPAN 2001

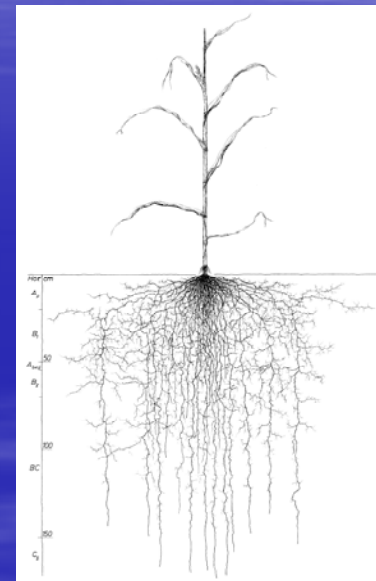
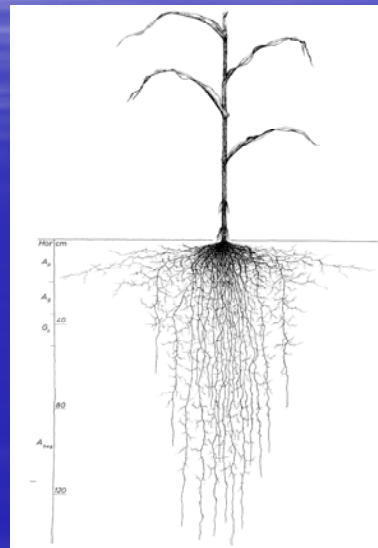
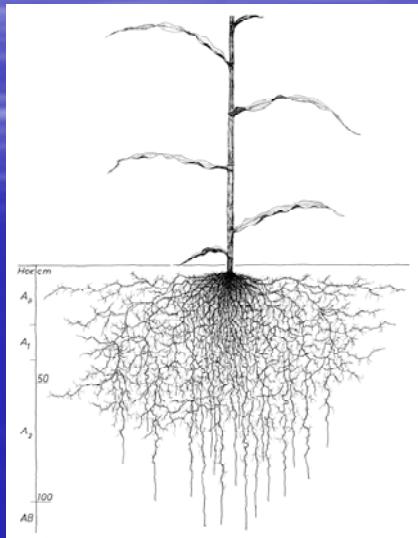


Excursion to Glockner 1991



As a plant scientist, Lore Kutschera stressed the whole plant and tried to relate the structure and function of belowground plant parts to their structure and function aboveground.

Loosdorf bei Melk 1986



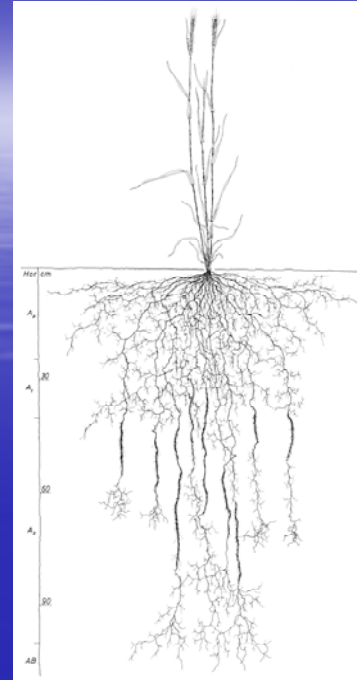
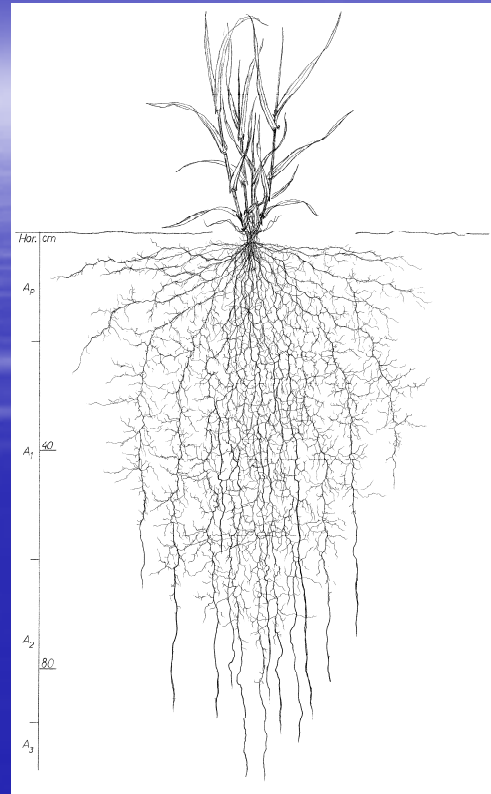
For arable crops, 10-40% of the total net carbon assimilation is located below-ground

The root systems of maize (*Zea mays*) at three different sites in Austria (Kutschera et al. 2009)



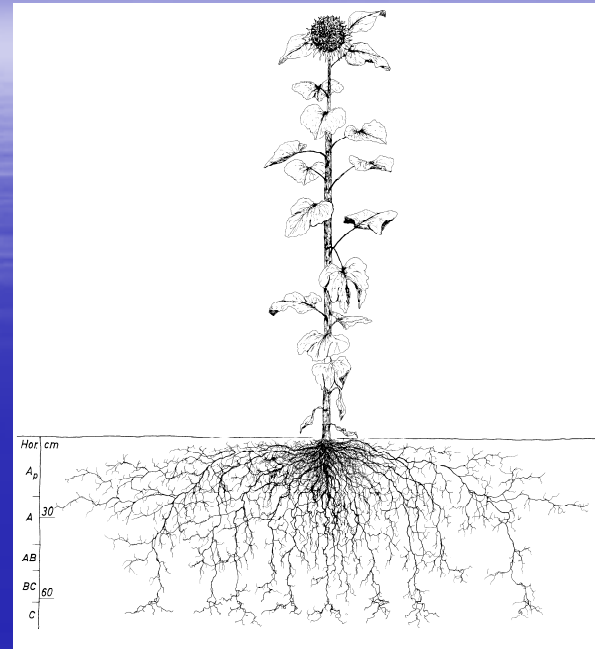
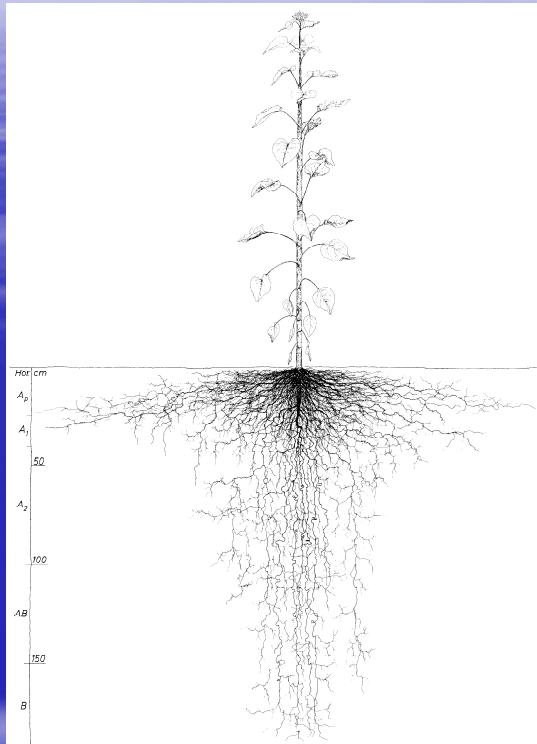
Drawings, often represent the extent, position, and minute branching of the root systems even more accurately than photographs

Zea mays, Austria 1991



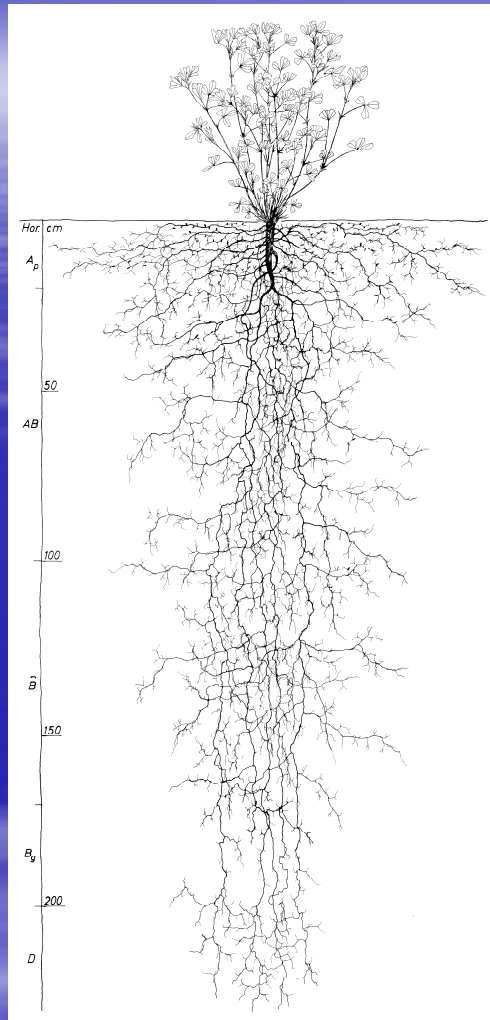
Roots developed under different environmental conditions may differ in morphology, anatomical complexity, size and function

Winter and summer barley (*Hordeum vulgare*) excavated at two different agricultural sites in Austria (Kutschera et al 2009)



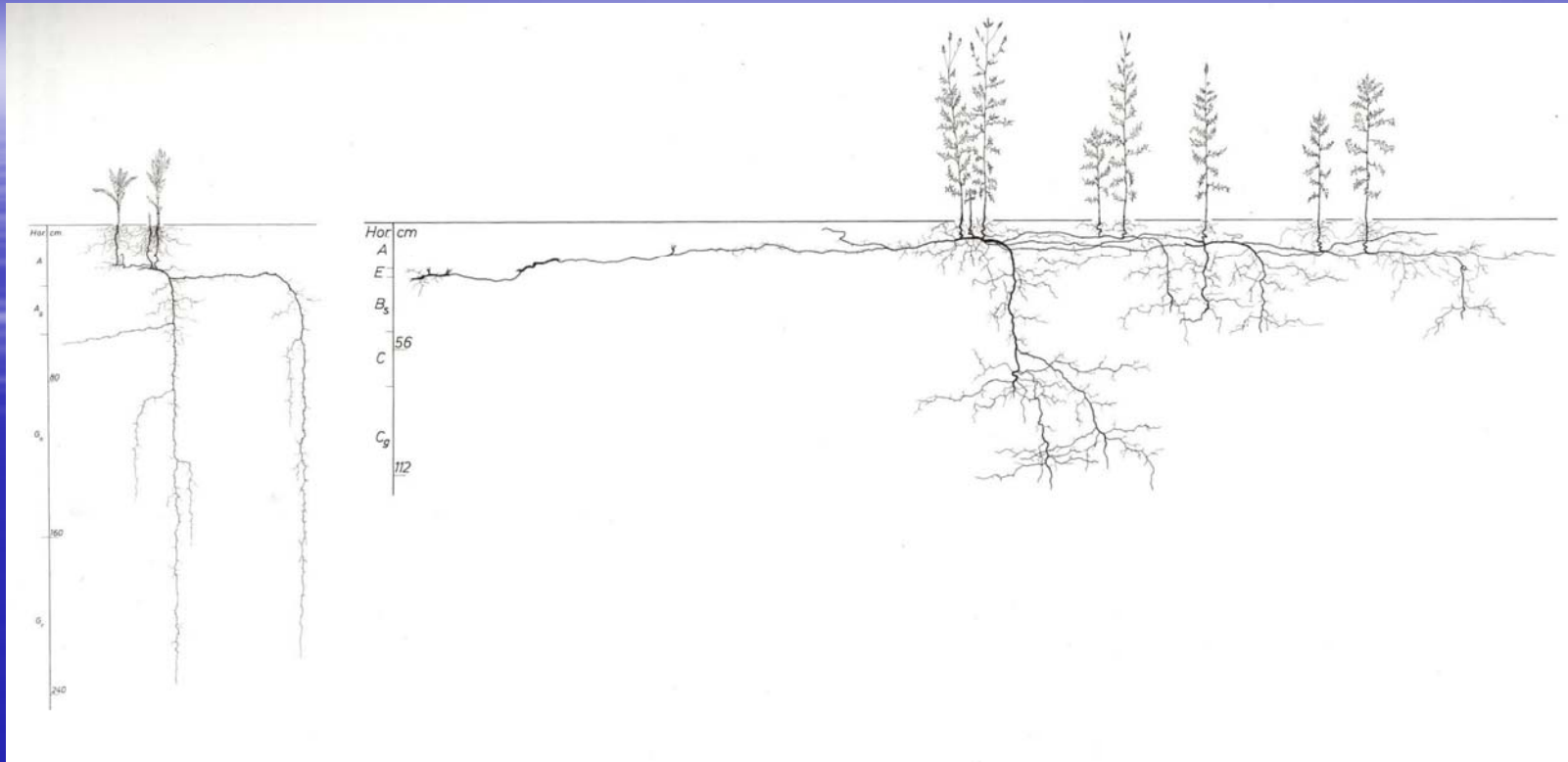
Plant growth performance depends on the integrated functioning of both roots and aboveground leaves

The root systems of sunflower (*Helianthus annuus*) in the middle of July 2003 at two different sites in Austria (Kutschera et al 2009)



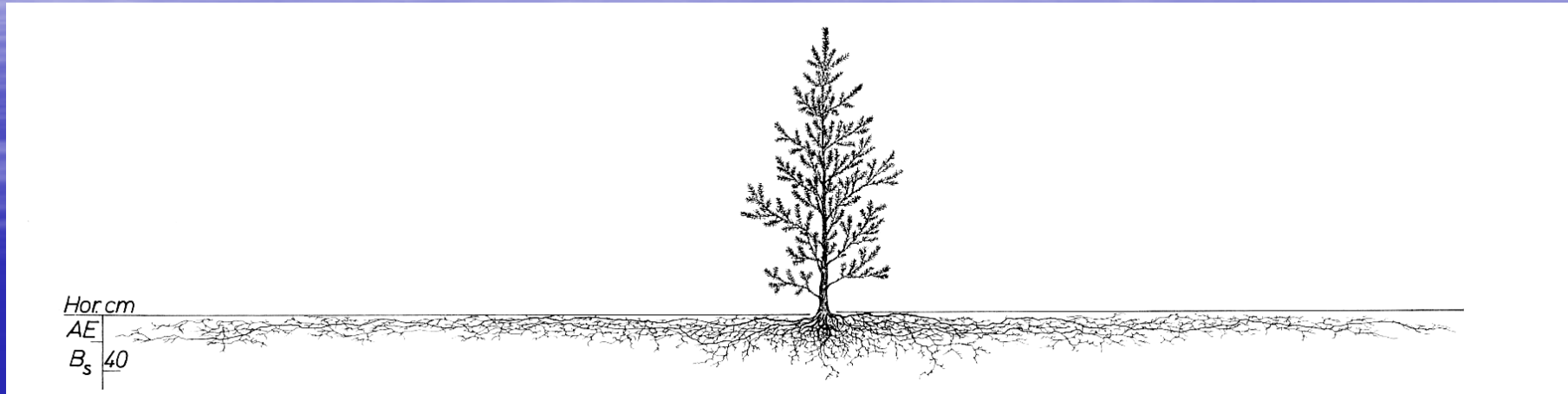
Most available data on root production and root turnover of perennial plants in terrestrial ecosystems suggest large carbon flows to the soil from dead roots and a rapid turnover of the dead root tissues

The root system of alfalfa (*Medicago sativa*) at the end of July 2003 at an Austrian agricultural site (Kutschera et al 2009)



For plants, in a competitive and varying environment, the survival and not necessarily high above-ground productivity, seems to be an stable strategy

Different root systems of the creeping thistle (*Cirsium arvense*) from Jädraås, 1988, in Sweden and from Klagenfurt, in Austria (Kutschera et al. 1997)



The root system of a 13-year-old Scots pine extended more than 5 m from the tree stem

The lateral roots were penetrating about 0.4 m yr⁻¹ from the tree stem

Jädraås 1988 in Central Sweden (Kutschera et al. 1997)

