
The logo for Seed Science Research, featuring the words "SEED SCIENCE" in a larger, bold, white font above the word "RESEARCH" in a smaller, white font, both contained within an orange rectangular box.

Seed Science Research – Special Issue

Seed Innovation Systems for the 21st Century

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The natural traits of the wild relatives of the world's main crops make them potential sources of genes and adaptive traits for agriculture. Beyond this narrow focus, other species offer exciting possibilities for new medicines, fibre plants, and other uses. But which species are being and should be evaluated for such traits and who owns the intellectual property? For those already identified for potential exploitation, do key policy frameworks help or hinder access to the seed genetic resources around the world; and in any case, can the seed supply chain meet the projected long-term sustainable use? For species already in the supply chain rapid developments in 'omics' technologies through to large scale, automated production facilities for phenotyping are changing the outlook for seed science research. But looking forward, which innovations are needed soonest, will have the greatest impact on the seed trade and help seed scientists address the greatest society challenges? To answer many of these questions will require a detailed understanding of many aspects of seed science, particularly in relation to:

- ***Seed memory – how environment influences traits during development***

Seed development is highly sensitive to the maternal environment with subsequent impacts on seed quality traits (longevity, germination, quality/vigour) and internal chemistry. But which molecular and biochemical signalling networks control seed responses, are they quantifiable, do they provide prediction of adjustments to climate change and how long are they imprinted on subsequent seed performance?

- ***Seed life span – the science of maximising survival***

Lowering moisture and temperature is the basis for extending seed lifespan. Except some species produce seeds that are drying sensitive; and for seed that tolerate desiccation, conventional seed storage (dry at -20°C) for the long term is a possibility but not a probability. Changing the physical environment, such as lowering temperature (cryobiotechnology), is one intervention to enhance seed lifespan, but can genes for longevity be understood and manipulated, can survival be chemically extended, and can the physical environment be optimised for each species? Moreover, can a mechanistic understanding of seed desiccation intolerance take us closer to making a recalcitrant seed orthodox for storage?

- ***Seed form and function – the morphology of success***

“Their problems of form are in the first instance mathematical...and their problems of growth are essentially physical problems” (D’Arcy Wentworth Thompson, 1917), so which mathematical and physical rules govern the form and function of seeds across the Plant Kingdom and what insights are revealed about the evolution of seed traits, including dormancy, that might contribute to species success?

- ***Seed germination and stress – environmental thresholds and species resilience***

Seeds commit to germinate over a species-specific or seed lot-specific set of environmental conditions, delimited by thresholds. But when they fail to germinate beyond these thresholds are they dormant, under stress or held in suspended animation; and do such responses tell us something about species resilience and niche competitiveness?

- ***Innovation systems -***

From small scale innovations on seed quality to ‘omics’ technologies at the single cell level, high throughput germination phenotyping, bioimaging, etc., various technological innovations will define the rate of advances in seed science in the 21st century.

Content: Will comprise invited papers from the 13th Triennial Meeting of the International Society for Seed Science **and** submitted papers.

Open Access: The Editors will be able to offer a reduction in Open Access charges to authors through an arrangement with ISSS and the organisers of the ISSS Triennial Meeting.

Manuscript submission closing date: 31 August 2021, via the Seed Science Research website: <https://www.cambridge.org/core/journals/seed-science-research>

Seed Science Research, the official journal of the International Society for Seed Science, is a leading international journal featuring high-quality original papers and review articles on the fundamental aspects of seed science, reviewed by internationally distinguished editors. The emphasis is on the physiology, biochemistry, molecular biology and ecology of seeds.
