**[What areas of basic research, tools and resources are needed to advance biological innovation and breakthrough discovery that are not currently available?](https://extwiki.nsf.gov/pages/viewpage.action?pageId=17694750" \t "_blank)**

* + Tools for fast and accurate assembly of complex genomes including polyploids.
  + NexGen sequencing innovations including cheaper/better long read sequencing and single molecule sequencing.
  + Improved software for mining and visualization of genome scale data and cross-species genome comparisons; especially for researchers who do not routinely work with –omics scale data.
  + Enhanced availability of phenotypic and genotypic data for plant genetic resources, including mapping populations, crop wild relatives, and cultivar collections.
  + Tools for high-throughput phenotyping of organoleptic traits in perennial Rosaceae species including imaging, physiological, metabolomics, or other techniques to study and assess complex traits.
  + Prediction programs based on cross-species systems biology analyses, to predict global transcript/proteome/metabolome changes in response to specific stimuli, the environment, or transgene modification.

[**What areas of research, tools and information are needed to accelerate the development of sustainable systems for food, bioenergy and industrial feed stock production?**](https://extwiki.nsf.gov/pages/viewpage.action?pageId=17694753)

* + Development of plant transformation technologies for recalcitrant crop species.
  + Technologies that reduce plant juvenility time and improve overall breeding efficiency and speed.
  + Easy to use resources and tools for breeders that enable the integration of genomics data and molecular markers into parent/offspring selection.
  + Molecular marker platforms for breeders that are user friendly, robust, and cost effective.
  + Improved understanding of the key regulators of developmental, defense, abiotic stress, sexual compatibility, and metabolic pathways.

[**What areas of research training and skills are not currently being met?**](https://extwiki.nsf.gov/pages/viewpage.action?pageId=17694757)

* + Many traditional plant biology fields have an aging workforce including plant breeding, horticulture, plant physiology, phytopathology, and biochemistry. Young scientists with interdisciplinary training in these fields are needed.
  + Integrative research programs that unite the traditional plant biology fields with the tools and information that genomic analyses provide.

[**What information and resource repository needs are not currently being met? In this regard, are there opportunities to leverage existing datasets and resources?**](https://extwiki.nsf.gov/pages/viewpage.action?pageId=17694755)

* + Increased support for the Genome Database for Rosaceae (GDR) to keep pace with the rapid expansion of –omics scale data being produced by the Rosaceae community.
  + Integration and enhanced interoperability of existing databases and webservers in order to more efficiently link genomic information with germplasm, phenotyping, literature, and other related databases.

[**What opportunities do you see for leveraging investments through international coordination?**](https://extwiki.nsf.gov/pages/viewpage.action?pageId=17694759)

* + More/better funding opportunities for cooperative international research teams to promote enhanced scientific collaborations.