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Scientific Areas of Integrated Review Groups (IRGs)

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Bioengineering Sciences and Technologies IRG [BST]

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- [Instrumentation and Systems Development Study Section \[ISD\]](#)
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- [Biomaterials and Biointerfaces Study Section \[BMBI\]](#)
- [Biodata Management and Analysis Study Section \[BDMA\]](#)
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Instrumentation and Systems Development Study Section [ISD]

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The Instrumentation and Systems Development Study Section (ISD) considers research applications seeking to design and develop instrumentation and systems for biological research. Applications driven by mathematical and bioengineering principles and by biological utility but not necessarily driven by hypothesis are typical.

Specific areas covered by ISD include:

- Analytical instrumentation: novel methods for improving throughput in analytical techniques; optical methods; chemical methods; spectroscopy; microfluidics; hardware and computer systems.
- Sensing devices: detection and sensing of single cells; biomarkers; environmental and toxic chemicals; biomedically relevant compounds and molecules; pre-clinical □lab-on-a-chip□ sensing technology.
- Separation technologies: improvements and variations to classical techniques such as electrophoresis and chromatography; cell separations; microfluidics; nanotechnology.
- Automation and integration: design and development of both individual instrumentation modules and integrated systems for biological research or diagnostics.
- Micro/nanofabrication: Microfabricated and/or nanostructured devices and systems for use in biological research or diagnostics.
- Development of high throughput assay systems.

Study sections with most closely related areas of similar science listed in rank order are:

[Enabling Bioanalytical and Biophysical Technologies \(EBT\)](#)
[Bioengineering, Technology, and Surgical Sciences \(BTSS\)](#)
[Microscopic Imaging \(MI\)](#)
[Nanotechnology \(NANO\)](#)
[Neurotechnology \(NT\)](#)

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Gene and Drug Delivery Systems Study Section [GDD]

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The Gene and Drug Delivery Systems (GDD) study section considers grant applications focused on the development and delivery of drugs, genes, and gene products that alter gene function or expression in the living organism. Research grant applications driven by bioengineering principle, design, or validation, but not necessarily driven by hypothesis, are expected.

Specific areas covered by GDD include:

- Delivery of nucleic acids, peptide/protein complexes, vaccines, genes, small molecules, antibiotics and other drugs and biomaterials.
- Delivery vehicles including viruses, liposomes, vesicles, nanoparticles, biomaterials, and cells.
- Delivery strategies including electroporation, ultrasound, light, and ballistic methods.
- Study of the physiological barriers to delivery (e.g., membrane, tissue, cellular, trafficking, physical).
- Studies of the interactions of delivery vehicles, devices, and/or payloads with the immune system.

Study sections with most closely related areas of similar science listed in rank order are:

[Biomaterials and Biointerfaces \(BMBI\)](#)
[Nanotechnology \(NANO\)](#)
[Developmental Therapeutics \(DT\)](#)
[Microscopic Imaging \(MI\)](#)
[Vaccines Against Microbial Diseases \(VMD\)](#)

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Biomaterials and Biointerfaces Study Section [BMBI]

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BMBI Roster The Biomaterials and Biointerfaces Study Section (BMBI) reviews applications in materials science and the closely allied field of materials surfaces and their interactions with basic biological systems. Applications driven by bioengineering principles and not necessarily driven by hypothesis are typical. The material aspects of biomaterials and surface science concern the design principles and theory and the synthesis, characterization, and optimization of new or existing materials. The biological aspects of biomaterials science concern interactions of materials with proteins, membranes, cells, and tissues.

Specific areas covered by BMBI:

- Development and characterization of biomaterials; Self-assembled materials; Design principles, material processing, and combinatorial approaches to the synthesis of new biomaterials; Biocompatibility, toxicity, structure/property relationships, and biodurability.
- New biomaterials and fabrication techniques for tissue engineering, transport and perfusion aspects of tissue engineering, and bioreactors.
- Molecular / cellular interfacial interactions; Non-fouling and bioactive surfaces; Improved understanding of the biology-biomaterials interface; Biosurface characterization and technology; Patterning; Surface characterization at the nano-scale.
- Chip- and micro-array-based microtechnologies and biosensors, with a focus on biorecognition, biocompatibility, nonfouling surfaces, and fouling mechanisms; Includes MEMS (micro-electro-mechanical-systems), lithographic and microfluidic elements.
- Drug and gene delivery systems and nanoparticles, with a focus on the carrier material, fabrication, biocompatibility, and toxicity.

Study sections with most closely related areas of similar science listed in rank order are:

[Nanotechnology \(NANO\)](#)

[Instrumentation and Systems Development \(ISD\)](#)

[Enabling Bioanalytical and Biophysical Technologies \(EBT\)](#)

[Gene and Drug Delivery Systems \(GDD\)](#)

[Bioengineering, Technology, and Surgical Sciences \(BTSS\)](#)

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Biodata Management and Analysis Study Section [BDMA]

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The Biodata Management and Analysis (BDMA) study section reviews grant applications concerned with developing technologies for the management and analysis of biological data. This includes the review of bioinformatics and computational biology applications addressing large-scale data collection and integration efforts. Research grant applications driven by bioengineering principle, design, or validation, but not necessarily driven by hypothesis, are expected.

Specific areas covered by BDMA are:

- Computer systems for data management including hardware and software.
- Database technologies and methods for data management, data representation, data capture, data integrity and validation, data standards and ontology development,
- Methods for data analysis including: Numerical, statistical, mathematical and theoretical approaches to design and interpretation of large-scale studies such as methods for pattern discovery, data mining, sequence prediction, biomarker identification, therapeutic drug design and high throughput analyses; computational methods for organizing, maintaining, and integrating biological datasets and for large scale data modeling and simulations.
- Visualization techniques including: Summary, integration, and representation of data in meaningful ways with, for example, graphical, auditory, tactile, and visual methods.

Study Sections with the most closely related areas of similar science listed in rank order are:

[Biomedical Computing and Health Informatics \(BCHI\)](#)

[Genomics, Computational Biology and Technology \(GCAT\)](#)

[Biostatistical Methods and Research Design \(BMRD\)](#)

[Modeling and Analysis of Biological Systems \(MABS\)](#)

[Macromolecular Structure and Function D \(MSFD\)](#)

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Modeling and Analysis of Biological Systems Study Section [MABS]

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The Modeling and Analysis of Biological Systems Study Section (MABS) reviews applications concerned with the development of modeling/enabling technologies for understanding the complexity of biological systems. The scope of these systems ranges from molecular, to supramolecular, to organelles, to cellular, to tissue and to organ level studies. Applications driven by mathematical and bioengineering principles and by perceived biological utility but not necessarily driven by hypothesis are typical. Tools being developed are characteristically applied to further understanding of interactions and integrations through levels and scales and the emergence of patterns that help to explain system behavior.

Specific areas covered by MABS include:

- Modeling methods: computational and analytical approaches for model construction, analysis and verification.
- Development and adaptation of mathematical methods and models: deterministic and stochastic, Boolean, discrete and continuous; dynamical systems analysis; timescale and spatial decomposition; numerical methods; statistical tools including time series analysis and Bayesian methods.

- Specific models of important processes: molecular interactions, signal transduction; biochemical networks; gene regulatory networks; metabolic networks; intracellular dynamics; cell structural dynamics; cell communication; tissue physiology; biomechanics; and biofluidics.
- Integration of modeling and experiment: experimental validation of models; high-throughput data integration; computer simulations of multiscale systems.

Study sections with most closely related areas of similar science listed in alphabetical order are:

[Biodata Management and Analysis Study Section \(BDMA\)](#)
[Cell Structure and Function Study Section \(CSF\)](#)
[Genomics, Computational Biology and Technology Study Section \(GCAT\)](#)
[Hypertension and Microcirculation Study Section \(HM\)](#)
[Macromolecular Structure and Function D Study Section \(MSFD\)](#)

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Microscopic Imaging and Spectroscopy Study Section [MIS]*

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The Microscopic Imaging and Spectroscopy study section (MIS) reviews applications that aim to develop, improve and implement instrumentation, methods, and quantitative techniques for the static and dynamic visualization of molecules, macromolecular machines and complex organelles, cells, and model systems in physiologically active states. Applications driven by mathematical and bioengineering principles and by perceived biological utility but not necessarily driven by hypothesis are typical. Imaging principles, instrumentation, or probes may be developed.

Specific areas covered by MIS:

- Development and improvement of instrumentation for microscopic imaging and microscopic spectroscopy, including optical, near-field, vibrational and Raman, electron, and transmission (soft) X-ray. Also included are automated and remote access microscopy methods.
- Development of sub-cellular and cellular imaging probes, including those for optical, electron, and NMR microscopies.
- Image acquisition and analysis, including validation of image formation theory, light propagation and scattering analysis, algorithm development, tomographic and single particle reconstruction (cryo-EM), visualization of multi-dimensional information, and high-throughput, automatic data processing at the sub-cellular and cellular level.
- Data mining techniques, including integration of information derived from complementary imaging techniques and bioinformatics to derive functional mechanisms.

Study sections with most closely related areas of similar science listed in rank order are:

[Clinical Molecular Imaging and Probe Development \(CMIP\)](#)
[Instrumentation and Systems Development \(ISD\)](#)
[Nanotechnology \(NANO\)](#)
[Biodata Management and Analysis \(BDMA\)](#)
[Enabling Bioanalytical and Biophysical Technologies \(EBT\)](#)

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Nanotechnology Study Section [NANO]

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The Nanotechnology Study Section (NANO) reviews applications focused on fundamental aspects of bioengineering and technology development based on the unique properties of materials at the nanometer scale. Nanotechnology draws from the disciplines of physics, chemistry, materials science, and bioengineering. Applications driven by mathematical and bioengineering principles and by perceived biological utility but not necessarily driven by hypothesis are typical. A premise is that basic research and early technology development, prior to specific practical use will be reviewed. Specific areas include:

- Studies of the unique properties of materials at the nanoscale.
- Design, synthesis, and development of nanostructures, nanodevices, and nanosystems.
- Nanotechnology based research in complex biological/medical problems.
- Nanotechnology in cellular imaging, sensing, and drug/gene delivery.
- Biocompatibility and toxicities associated with nanomaterials.

Study sections with most closely related areas of similar science listed in rank order are:

[Biomaterials and Biointerfaces Study Section \(BMBI\)](#)

[Gene and Drug Delivery Systems Study Section \(GDD\)](#)

[Instrumentation and Systems Development \(ISD\)](#)

[Enabling Bioanalytical and Biophysical Technologies Study Section \(EBT\)](#)

[Medical Imaging \(MEDI\)](#)

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