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Scientific Areas of Integrated Review Groups (IRGs)

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Molecular, Cellular, and Developmental Neuroscience IRG [MDCN]

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- [Biophysics of Neural Systems Study Section \[BPNS\]](#)
- [Cellular and Molecular Biology of Glia Study Section \[CMBG\]](#)
- [Cellular and Molecular Biology of Neurodegeneration Study Section \[CMND\]](#)
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- [Neurotransmitters, Receptors, Channels and Calcium Signaling Study Section \[NTRC\]](#)
- [Synapses, Cytoskeleton and Trafficking Study Section \[SYN\]](#)
- [Drug Discovery in the Nervous System \[ZRG1 MNPS-C \(09\)\]](#)

Biophysics of Neural Systems Study Section [BPNS]

[\[BPNS Membership Roster\]](#) [\[BPNS Meeting Rosters\]](#)

The Biophysics of Neural Systems [BPNS] Study Section reviews applications dealing with basic biophysical studies of neurons, muscle and other excitable cells and their components in both normal and diseased states. Emphasis is on fundamental structure and function relationships relevant to physiology and disease processes, but also includes studies involving the biophysical integration of neural function, mathematical modeling and computational studies. Included are studies of subunit structure, molecular dynamics, gating and selectivity, second messengers, protein folding and misfolding, and assembly and aggregation of molecules. General approaches may include molecular and structural biology, pharmacology, biophysics, electrophysiology, protein chemistry, imaging and labeling techniques. Specific areas covered by BPNS:

- Structure and function relationships of signal transduction molecules and neuromodulators; coupling to second messenger pathways, including G-proteins, cyclic nucleotides, lipid metabolites, and Ca²⁺; modulatory pathways; voltage-gated and ligand-gated ion channels; voltage dependence, activation, inactivation, and ionic selectivity; gap junctions and connexins.
- Structure and function relationships in neural proteins, nucleic acids, carbohydrates, and their complexes; tomographic, crystallographic, spectroscopic, and imaging studies; three dimensional structural analysis including subunit multimerization, protein folding and misfolding, assembly and aggregation; protein dynamics; protein-protein and protein-ligand interactions; membrane interfaces and microdomains; molecular modeling.
- Biophysical integration of neural function; quantitative modeling of neural function, such as synaptic integration and spike encoding; mathematical modeling at the cellular and molecular level.

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

[Neurotransmitters, Receptors, Channels and Calcium Signaling \[NTRC\]](#)

[Biochemistry and Biophysics of Membranes Study Section \[BBM\]](#)

[Molecular Neuropharmacology and Signaling \[MNPS\]](#)

[Molecular and Integrative Signal Transduction study section \[MIST\]](#)

[Cellular and Molecular Biology of Neurodegeneration Study Section \[CMND\]](#)

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Cellular and Molecular Biology of Glia Study Section [CMBG]

[\[CMBG Membership Roster\]](#) [\[CMBG Meeting Rosters\]](#)

The CMBG Study Section reviews applications on glial-neuronal, glial-glial, and related interactions [Schwann cells, oligodendrocytes, astrocytes, and microglia]; mechanisms of glial differentiation, metabolism, and myelination; neuroinflammation and neuroimmune function across the life span. Also considered are the roles of genetic factors, trophic molecules and extrinsic influences in these processes.

Specific areas covered by CMBG:

- Basic biology of glial cells (oligodendrocytes, astrocytes, Schwann Cells, microglia), growth and differentiation of glial cells.
- Neuroglial interactions; growth factors and receptors involved in neuroglial function; role of glia in synaptic transmission; role of glia in the homeostasis of the neural environment.
- Inductive signals for the initiation, synthesis, regulation, maintenance, and degradation of myelin; mechanisms involved in demyelinating and dysmyelinating diseases and remyelination processes.
- Glial response to injury or infection; the innate immune function of glial cells; phagocytosis [microglia], role of neuroimmune molecules and the immune response in the nervous system; neuroinflammation in injury, repair processes, and/or neurodegenerative disease; secondary inflammation.
- Neuroimmune functions (and dysfunctions) across the life span; neuroimmune molecules [e.g., cytokines, chemokines, proteases] and their interactions with the nervous system.
- Primary diseases of glial cells; role of glia in disorders affecting the nervous system such as the lysosomal storage diseases.

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

[Neurotransmitters, Receptors, Channels and Calcium Signaling \[NTRC\]](#)

[Neurodifferentiation, Plasticity, and Regeneration \[NDPR\]](#)

[Cellular and Molecular Biology of Neurodegeneration \[CMND\]](#)

[Clinical Neuroimmunology and Brain Tumors \[CNBT\]](#)

[Innate Immunity and Inflammation \[III\]](#)

Cellular and Molecular Biology of Neurodegeneration Study Section [CMND]

[\[CMND Membership Roster\]](#) [\[CMND Meeting Rosters\]](#)

The CMND Study Section reviews applications on cellular and molecular aspects of neurodegeneration across the lifespan; mapping novel transcripts and functional analysis of cloned gene products involved in neurodegeneration and neuroprotection; as well as molecular aspects of injury, repair and neurological disorders. Also considered are the roles of genetic factors, trophic molecules and extrinsic influences in these processes.

Specific areas covered by CMND:

- Characterization of abnormal protein processing associated with neurodegenerative disorders.
- Structure-function studies of abnormal protein folding and/or aggregation and the clearance of aggregated proteins in the context of neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease, transmissible spongiform encephalopathies (prion diseases), and Amyotrophic Lateral Sclerosis.
- Delineation of physiological effects of aggregated proteins (e.g., beta amyloid, tau) on neuronal function.
- Amyloidosis in the nervous system.
- Characterization of molecular mechanisms underlying triple nucleotide repeat expansion neurodegenerative disorders such as Huntington's disease or spinocerebellar and Friedreich's ataxias.
- Studies aimed at elucidating underlying mechanisms of neuroprotection and development of neuroprotective strategies.
- Mapping novel transcripts and functional analysis of cloned gene products involve in neurodegeneration or neuroprotection, including characterization of apolipoprotein E (ApoE) and its role in neurological and neuropathological processes.

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

[Neural Oxidative Metabolism and Death \[NOMD\]](#)

[Cell Death and Injury in Neurodegeneration \[CDIN\]](#)

[Synapses, Cytoskeleton and Trafficking \[SYN\]](#)

[Clinical Neuroscience and Neurodegeneration \[CNN\]](#)

[Biophysics of Neural Systems \[BPNS\]](#)

[Cellular and Molecular Biology of Glia \[CMBG\]](#)

Molecular Neuropharmacology and Signaling Study Section [MNPS]

[\[MNPS Membership Roster\]](#) [\[MNPS Meeting Rosters\]](#)

The Molecular Neuropharmacology and Signaling [MNPS] Study Section reviews applications on neurotransmitter and receptor-mediated signal transduction with a particular focus on neurochemical, neuroendocrine and molecular neuropharmacological mechanisms. This includes studies of ligand-receptor interactions, neuromodulator and hormonal interactions, neurotransmitter uptake and metabolism, and neurotransmitter and neuropeptide synthesis. Emphasis is on fundamental cellular and molecular mechanisms, including those relevant to the mechanisms of addiction and mental disorders, neurodegenerative disorders. Specific areas covered by MNPS:

- Pharmacological and neurochemical studies of receptor activation, G-protein coupling and signal transduction cascades of G-protein coupled receptors; studies of receptor agonists and antagonists; studies of receptor modulation by interacting proteins.
- Cellular and molecular mechanisms of drugs of abuse, addiction, stress and mood disorders; cellular and molecular mechanisms underlying experimental and therapeutic approaches.
- Neuropharmacology of neurotransmitter signaling, ligand-gated ion channels, and neuromodulatory pathways; neurotransmitter and neuropeptide synthesis and regulation; genetic regulation of these events.
- Metabolic and synaptic plasticity; neurophysiology and neuropharmacology of modulatory mechanisms including electrophysiological studies; regulation of synaptic dynamics such as release, diffusion, re-uptake, inactivation.
- Modulators of synaptic function, including growth factors, neurotrophins, neuropeptides, hormones, neurotoxins and age.

The study sections with most closely related areas of science listed in rank order are:

[Pathophysiological Basis of Mental Disorders and Addictions \[PMDA\]](#)
[Neurotransporters, Receptors, Channels and Calcium Signaling \[NTRC\]](#)
[Neural Oxidative Metabolism and Cell Death \[NOMD\]](#)
[Synapses, Cytoskeleton and Trafficking \[SYN\]](#)
[Biophysics of Neural Systems \[BPNS\]](#)

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Neurogenesis and Cell Fate Study Section [NCF]

[\[NCF Membership Roster\]](#) [\[NCF Meeting Rosters\]](#)

The Neurogenesis and Cell Fate [NCF] Study Section reviews applications concerned with the initial formation of cells in the developing nervous system, as well as neural progenitor proliferation, specification, determination, and differentiation. Also included are studies involving the initiation and regulation of cell cycle and circadian or oscillatory processes in the nervous system. Emphasis is on fundamental mechanisms underlying these processes in normal development and in responses to disease, injury, and extrinsic factors. Specific areas covered by NCF:

- Regulation of the cell cycle in neurons and glia; mechanisms of growth arrest and re-initiation of cell division and differentiation.
- Fundamental cellular and molecular mechanisms of neural induction in normal development, including transcriptional and translational regulation and signaling pathways.
- Cellular and molecular mechanisms through which the embryonic neural ectoderm acquires the characteristics of adult brain regions, including regionalization of gene transcription, cell-cell interactions, migration and signals or extrinsic factors that influence these events.
- Cellular and molecular mechanisms of neural and glial stem cell and progenitor cell induction, proliferation, migration, and phenotypic restriction; utilization of neural and glial stem cells for repair following developmental and degenerative disease and injury.
- Initiation and regulation of circadian and oscillatory processes; signals and extrinsic factors that influence circadian rhythmicity.

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

[Neurodifferentiation, Plasticity, and Regeneration \[NDPR\]](#)
[Development-2 \[DEV2\]](#)
[Developmental Brain Disorders \[DBD\]](#)
[Clinical Neurophysiology and Neurotransmitters \[CNNT\]](#)

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Neurodifferentiation, Plasticity, and Regeneration Study Section [NDPR]

[\[NDPR Membership Roster\]](#) [\[NDPR Meeting Rosters\]](#)

The Neural Differentiation, Plasticity, and Regeneration [NDPR] Study Section reviews applications focused on differentiation, plasticity, aging, and regeneration of neuronal connectivity. Emphasis is on fundamental cellular and molecular mechanisms, including changes in gene expression and regulation, underlying normal development and aging, as well as recovery from injury, disease, and pathological insults. Specific areas covered by NDPR:

- Substrates for neuronal and glial cell migration; permissive, inhibitory, and directional cues; mechanisms controlling cell motility, directional migration, and growth cone extension.
- Axonal outgrowth, fasciculation, branching, and guidance; cell polarity; dendrites and dendritic spines; selection of synaptic partners, including formation of topographic and laminar-specific projections.
- Synapse formation and plasticity; initial formation and maturation of pre- and postsynaptic elements; factors regulating the elaboration and retraction of arbors, processes and synapses, including neurotrophins, cytokines, cell adhesion molecules, localized translation and physiological activity; synaptic changes in response to activity, hormonal environment, and experience.

- Regeneration of connections; factors that promote or direct axon or dendritic sprouting, axon or dendritic re-growth, re-formation of dendritic spines, and re-establishment of synaptic connections following injury; factors that inhibit these processes; development of cellular and molecular tools and strategies to overcome inhibitory factors and to promote regeneration.

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

[Synapses, Cytoskeleton and Trafficking \[SYN\]](#)
[Clinical Neuroplasticity and Neurotransmitters \[CNNT\]](#)
[Neurobiology of Learning and Memory Study Section \[LAM\]](#)
[Neurogenesis and Cell Fate \[NCF\]](#)
[Developmental Brain Disorders \[DBD\]](#)

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Neural Oxidative Metabolism and Death Study Section [NOMD]

[\[NOMD Membership Roster\]](#) [\[NOMD Meeting Rosters\]](#)

The NOMD Study Section reviews applications studying programmed cell death, necrosis and excitotoxicity; analysis of cloned gene products involved in cell survival or death; reactive oxygen species and oxidative stress associated with neural injury; and mitochondrial biology of neurons and glia in healthy and diseased states across the life span. Also considered are the roles of genetic factors, trophic molecules and extrinsic influences [including toxins, hormones, and addictive or environmental substances] in these processes, as well as basic aspects of disease, injury, repair and interventional strategies. Specific areas covered by NOMD:

- Regulation of neuronal cell death and cell survival; functions and mechanisms of action of signaling molecules [such as neurotrophic factors, growth factors, cytokines, glutamate] and electrical activity in regulating cell survival. Intracellular signaling pathways leading to apoptosis, necrosis and excitotoxicity, and their intersection with the signal transduction pathways of survival factors.
- Oxidative stress; special metabolic and energy demands of neurons and glia; relevant aspects of mitochondrial function and localization; aspects of mitochondrial dysfunction in disease states including Alzheimer's disease, Parkinson's disease and stroke.
- Mechanisms of neuronal cell death due to aging, disease, injury and environmental or genetic factors. This could include excitotoxins, glutamate, free radicals, metals, and neurodegenerative disease genes, as well as elucidation of excitotoxic, necrotic, and apoptotic mechanisms.
- Studies of mechanisms relevant to the development of neuroprotective or cell survival strategies, such as the administration of exogenous growth factors, or antioxidants.
- Molecular mechanisms underlying neural injury associated with ischemia, reperfusion injury, traumatic brain injury, hypoxia, hypoglycemia, and excitotoxicity.

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

[Cellular and Molecular Biology of Neurodegeneration Study Section \[CMND\]](#)
[Cell Death in Neurodegeneration Study Section \[CDIN\]](#)
[Clinical Neuroscience and Neurodegeneration Study Section \[CNN\]](#)
[Cellular Mechanisms in Aging and Development Study Section \[CMAD\]](#)
[Cellular and Molecular Biology of Glia Study Section \[CMBG\]](#)

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Neurotransporters, Receptors, Channels and Calcium Signaling Study Section [NTRC]

[\[NTRC Membership Roster\]](#) [\[NTRC Meeting Rosters\]](#)

The Neurotransporters, Receptors, Channels and Calcium Signaling [NTRC] Study Section reviews studies of signal transduction pathways in neurons, muscles, and other excitable cells with particular emphasis on cellular and molecular regulation, physiology and functional consequences. This includes studies of calcium physiology; regulation of ionic gradients, ion pumps and molecular transporters; ion channels; ligand-gated channels; receptors; and transduction molecules. Studies may employ molecular, cellular, biochemical, electrophysiological, and imaging approaches. Emphasis is on fundamental cellular mechanisms, including those relevant to disease processes. Specific areas covered by NTRC:

- Intracellular regulation of calcium and calcium signaling; calcium channels, calcium storage, homeostasis, and buffering; calcium as a second messenger.
- Ion pumps, ion exchangers, and neurotransmitter transporters; electrochemical coupling; maintenance of ionic gradients; membrane properties and electrostatics.
- Ion channels and neurotransmitter receptors; gap junctions; electrophysiological and imaging studies involving integration and propagation of electrical signals within the context of cellular physiology; interactions with second messenger systems; regulation and modulation of ion channels and receptors, including ionotropic and metabotropic receptors; mechanisms underlying synaptic plasticity such as long term potentiation, long term depression and paired pulse facilitation.
- Synthesis, genetic regulation, transcription, translation and post-translational modification of transduction molecules; genetic regulation, transcription/translation, post-translational modification; localization, assembly, trafficking, turnover, and degradation of receptors, channels, transporters, and transduction machinery.

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

[Biophysics of Neural Systems \[BPNS\]](#)

[Synapses, Cytoskeleton and Trafficking \[SYN\]](#)

[Molecular Neuropharmacology and Signaling \[MNPS\]](#)

[Clinical Neuroplasticity and Neurotransmitters \[CNNT\]](#)

[Neurobiology of Learning and Memory \[LAM\]](#)

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Synapses, Cytoskeleton and Trafficking Study Section [SYN]

[\[SYN Membership Roster\]](#) [\[SYN Meeting Rosters\]](#)

The Synapses, Cytoskeleton and Trafficking [SYN] Study Section reviews applications on the basic cell biology of nerve, muscle and other excitable cells, including synaptic plasticity, protein and organelle trafficking, cell surface and extracellular matrix molecules in cell recognition and function, and cytoskeletal functions across the life span. Emphasis is on fundamental mechanisms of excitable cell function, including those relevant to disease processes.

- Formation, regulation, maintenance, and dynamics of synaptic structure and function in the central and peripheral nervous systems.
- Molecular neuronal mechanisms of endocytosis, exocytosis and membrane recycling; protein assembly, folding and targeting; organelle, protein, and mRNA localization and trafficking.
- Transcriptional and translational regulation as they relate to synaptic function and plasticity.
- Structure, function, modification, assembly and regulation of cytoskeletal proteins and molecular motors; axonal and dendritic transport; neuronal polarity, growth cones, and structural plasticity; cytoskeletal pathology; the regulation and role of the proteasome/ubiquitin system in these processes.
- Cell surface, extracellular matrix, transmembrane components, and their function; cell recognition as it relates to synaptic assembly and function.

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

[Neurodifferentiation, Plasticity and Regeneration \[NDPR\]](#)

[Neurotransporters, Receptors, Channels and Calcium Signaling \[NTRC\]](#)

[Cellular and Molecular Biology of Neurodegeneration \[CMND\]](#)

[Biophysics of Neuronal Systems \[BPNS\]](#)

[Molecular Neuropharmacology and Signaling \[MNPS\]](#)

Drug Discovery in the Nervous System [ZRG1 MNPS-C (09)]

The Drug Discovery for the Nervous System Special Emphasis Panel [ZRG1 MNPS-C (09)F] reviews pre-clinical applications with the ultimate goal of discovering new pharmacotherapeutic and immunotherapeutic agents for treating or preventing disorders of the nervous system, including drug abuse, that will eventually lead to clinical trials and approval by FDA. Specific areas covered by ZRG1 MNPS-C (09)F include:

- Medicinal chemistry focusing on the discovery and refinement of molecules as a prelude to clinical use; the design and synthesis of receptor agonists or antagonists and modulators of enzyme activity, second messenger systems, ion channels or the blood brain barrier, combined with biological evaluation to determine their potential as therapeutics.
- Development of protein-based therapies including drug specific metabolizing enzymes, drug-protein conjugate vaccines, and drug-specific antibodies.
- Isolation, characterization and refinement of promising natural products to identify potential uses for disorders of the nervous system.
- Development of screening assays and preclinical animal models or their use to evaluate candidate therapeutic compounds for future drug development.
- Development of delivery systems that target compounds to the brain, including gene vectors, stem cells, protein and peptide delivery systems, and nanoparticle delivery systems.
- Pharmacokinetic approaches in drug discovery, including the determination of blood brain barrier permeability of candidate compounds, pro drugs, pharmacokinetic modifications and new formulations including controlled release dosage forms.

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

[Molecular Pharmacology and Signaling \[MNPS\]](#)

[Cellular and Molecular Biology of Neurodegeneration \[CMND\]](#)

[Neural Oxidative Metabolism and Death Study Section \[NOMD\]](#)

[Biophysics of Neural Systems \[BPNS\]](#)

[Neurobiology of Motivated Behavior Study Section \[NMB\]](#)

