

1990-1991	Syracuse University, Dept. of Physics, Syracuse, N.Y., USA	Visiting Professor
1991-1993	Syracuse University, Biophysical Group, Syracuse, N.Y., USA	Research Associate
1993-1996	Duke University, Dept. of Medicine, Durham, N.C., USA	Research Associate

Specialty/Board Certification: Not Applicable

Licensure: Not Applicable

Military Service: None

Faculty Appointments:

<u>Years</u>	<u>Rank</u>	<u>Institution</u>	<u>Department</u>
1986-1989	Junior Scientific Researcher (Equivalent of Assistant Professor)	I.M.Sechenov Institute	Biochemistry
1989-1992	Scientific Researcher (Equivalent of Associate Professor)	I.M.Sechenov Institute	Biochemistry
1996-2003	Assistant Professor of Medicine	MUSC	Medicine
1999-2011	Research Health Scientist	Ralph H. Johnson VA Medical Center	
2003-present	Associate Professor of Medicine	MUSC	Medicine

Administrative Appointments:

<u>Years</u>	<u>Description</u>	<u>Institution</u>	<u>Department</u>
1988-1991	Deputy Laboratory Chief Laboratory of Molecular Basis of Sensory Reception	I.M.Sechenov Institute Russia	Biochemistry

Hospital Appointments/Privileges: Not Applicable

Membership in professional/scientific societies:

1999-present Member, American Society for Biochemistry and Molecular Biology
05/2007-present Member, American Heart Association

Extramural Grants:

As Principal Investigator			
<u>Years</u>	<u>Organization</u>	<u>Description</u>	<u>Award amount</u>

1998-2001	Department of Veterans Affairs, Washington DC (62.5% effort)	Awarded Merit Review Entry Program for proposal: <i>Signaling Pathway of the Activation of the Na⁺/H⁺ Exchanger by Osmotic Shock.</i>	\$294,400
2002-2005	Department of Veterans Affairs, Washington DC (75% effort)	Awarded Merit Review Type 1 proposal: <i>Early Regulation of the Retinoblastoma Gene Product in Vascular Smooth Muscles</i>	\$527,700
2006-2010	Department of Veterans Affairs, Washington DC (50% effort)	Awarded Merit Review Type 1 proposal: <i>Integrin and GPCR-Induced Signaling in Vascular Smooth Muscles Cells.</i>	\$837,200
2006-2008	AHA, Mid-Atlantic Affiliate (30% effort)	Awarded Grant-in Aid: <i>Metalloproteinases and Epidermal Growth Factor Receptor Transactivation by the Bradykinin B2 Receptor in Kidney Cells</i>	\$132,000

As Co-Investigator

<u>Years</u>	<u>Organization</u>	<u>Description</u>
1999-2002	Department of Veterans Affairs, Washington DC (10% effort)	Awarded Co-investigator for proposal: <i>Mechanisms of Bradykinin Inhibition of Renal Absorption</i> Merit Award (PI=Dr. D. Ploth).
2001-2006	Department of Health and Human Services (25% effort)	Awarded Co-Principal-investigator for proposal: <i>G Protein Regulation of NHE Activity</i> (PI=Dr. J. Raymond).
2005-2010	Department of Veterans Affairs, Washington DC	Awarded Co-investigator for proposal: <i>Inflammatory Mediators of Renal Diseases.</i> VA REAP (PI Raymond and Gilkeson)
2009-2013	Department of Health and Human Services (10% effort)	Awarded Co-investigator for proposal: <i>Mechanisms of regulation of NHE Activity</i> (PI=Dr. J. Raymond).

Intramural Grants:

<u>Years</u>	<u>Organization</u>	<u>Description</u>	<u>Award amount</u>
1996-1997	Medical University of South Carolina	Awarded URC grant for project: <i>Signal transduction pathways in cellular regulatory volume increase.</i>	\$18,000

Honors and Awards:

<u>Date</u>	<u>Organization</u>	<u>Description</u>
1988	I.M.Sechenov Institute Leningrad, Russia	Individual Award for Outstanding Research: 1 st Prize
1990	I.M.Sechenov Institute Leningrad, Russia	Individual Award for Outstanding Research: 2 nd Prize

Academic Committee Activities:

1999-2002	Chair of Biosafety Committee	Ralph H. Johnson VA Medical Center
2001-2002	Member of Research Service Space Subcommittee	Ralph H. Johnson VA Medical Center
2002-present	Member of Biosafety Committee	Ralph H. Johnson VA Medical Center
2007-2010	Member of Peer Review Committee Molecular Signaling Study Section	American Heart Association, Mid-Atlantic Affiliate

Major Teaching Responsibilities:

1983-1991	I.M. Sechenov Institute, Laboratory of Molecular Basis of Sensory Reception	Supervised 4 graduate students
1991-1993	Biophysical Group, Dept. of Physics Syracuse University	Trained 3 graduate students to assist with biochemical methods
1993-1996	Renal Signal Transduction Lab at Duke University Medical Center	Supervised the laboratory experience of clinical fellows
1996-present	Medical University of South Carolina Nephrology Lab	

Participating faculty member on the Glomerular Diseases training grant
Qualifying investigator in the REAP program (VA-sponsored training grant)
Supervise the laboratory training of clinical fellows, graduate students, and summer students to assist with biochemical and molecular biological methods
Supervise the day to day use of the microphysiometry shared resource at the Charleston Ralph H. Johnson VAMC. Provided assistance with microphysiometry for several Laboratories at MUSC.
Give a didactic lecture on the use of FLIPR and Microphysiometer as part of the Advanced cell Biology Course at the MUSC

Give lectures on Signal Transduction as part of the Nephrology Fellowship program

Major Research Interests:

Molecular regulation of growth signals in fibroblasts, smooth muscle, and kidney cells.
Signal transduction in cell volume regulation.
The mechanisms of regulation of sodium/proton (Na^+/H^+) exchange in different cell types.
Regulation of cell cycle in vascular smooth muscle cells – role of integrins.
Role of G protein-coupled receptors in polycystic kidney disease.

Invited Lectures: See abstract list

Publications in Refereed Journals:

1. E. Kh. Safaryan and **M. N. Garnovskaya**. Chemoreceptor structures of the catfish *Ictalurus nebulosus*: Isolation and properties of plasmatic membranes from barbles. *J. Evol. Biochem. & Physiol.* 1981; **17**:248-252.
2. **M. N. Garnovskaya**, I. L. Dumler, R. N. Etingof. The influence of nucleotide triphosphates on cyclic nucleotide phosphodiesterase: Role of protein modulators. *Biochemistry (Biokhimiya)* 1982; **47**:181-185.
3. **M. N. Garnovskaya**, I. L. Dumler, R. N. Etingof. Role of cyclic nucleotide phosphodiesterase in the action of estradiol in uterine tissue. *Bull. Exp. Biol. & Med.* 1982; **93**:831-834 .
4. R. N. Etingof, **M. N. Garnovskaya**, A. A. Usova, I. L. Dumler. Effect of 17- β -estradiol on 3',5'-AMP-phosphodiesterase activity in rat uterus: The role of hormonal receptor and guanyl nucleotide binding proteins. *Ukrains. Biokhim. Zh. (Russian)* 1983; **55**: 53-57.
5. **M. N. Garnovskaya**. The relationship between cyclic nucleotide phosphodiesterase and β -estradiol receptors in uterine tissue. *Ph. D. Thesis* I. M. Sechenov Institute, Leningrad 1983.
6. R. N. Etingof, I. L. Dumler, **M. N. Garnovskaya**, S. N. Kalinina. Estradiol receptor and cyclic nucleotide phosphodiesterase: Functional relationship, possible role of guanine nucleotide binding proteins. *Biochem. Intern.* 1984; **9**: 229-236 .
7. I. L. Dumler, **M. N. Garnovskaya**, N. O. Artem'ev, R. N. Etingof. Comparative immunochemical analysis of various cyclic nucleotide phosphodiesterases. *Biochemistry (Biokhimiya)* 1984; **49**: 1478-1482.
8. **M. N. Garnovskaya**, I. L. Dumler. Participation of the estradiol receptor in the hormonal inhibition of cyclic nucleotide phosphodiesterase in the uterus. *Ukrains. Biokhim. Zh. (Russian)* 1984; **56**: 633-638.
9. **M. N. Garnovskaya**, I. L. Dumler, G. A. Savitskii. Effect of 17- β -estradiol on 3',5'-AMP-cyclic phosphodiesterase of uterine tissue in myoma. *J. Obst. Gynecol. (Russian)* 1986; **2**: 20-22.
10. N. O. Artem'ev, **M. N. Garnovskaya**, I. L. Dumler, R. N. Etingof. Detection of a peptide activator of cyclic nucleotide phosphodiesterase in uterine tissue. *Biochemistry (Biokhimiya)* 1987; **52**: 1240-1246.
11. N. O. Artem'ev, **M. N. Garnovskaya**, I. L. Dumler. Purification and properties of cyclic nucleotide phosphodiesterase of uterine tissue. *Biochemistry (Biokhimiya)* 1988; **53**:1134-1139.
12. S. A. Shelkovnikov, L. A. Starshinova, **M. N. Garnovskaya**, N. O. Artem'ev, R. N. Etingof, I. L. Dumler. Cyclic nucleotide phosphodiesterase activator peptide: Effect on contractility of muscles. *Bull. Exp. Biol. & Med.* 1988; **106**: 1670-1673.
13. V. V. Gurevich, S. A. Zozulya, T. A. Zvyaga, M. Yu. Natochin, E. P. Shirokova, **M. N. Garnovskaya**, I. L. Dumler, B. E. Shmukler, N. V. Korotkova. Functional activity of visual rhodopsin expressed *in vitro*. *Biol. Membr. (Russian)* 1989; **6**: 647-649.
14. S. N. Korolkov, **M. N. Garnovskaya**, A. S. Basov, I. L. Dumler. The functional similarity of vertebrate rhodopsin and of a photosensitive pigment from the unicellular flagellate alga *Chlamydomonas reinhardtii*. *J. Evol. Biochem. & Physiol. (Russian)* 1989; **25**: 777-780.

15. S. A. Zozulya, V. V. Gurevich, T. A. Zvyaga, I. L. Dumler, **M. N. Garnovskaya**, B. E. Shmukler, M. Yu. Natochin, E. P. Shirokova, P. R. Badalov. *In vitro* synthesis of visual rhodopsin for a protein engineering study. *J. Prot. Chem.* 1989; **8**: 380-382.
16. L. Dumler, S. N. Korolkov, **M. N. Garnovskaya**, E. V. Parfenova, R. N. Etingof. The system of photo-& pheromone signal transduction in unicellular eukaryots. *J. Prot. Chem.* 1989; **8**: 387-389.
17. **M. N. Garnovskaya**, G. A. Savitskii. Peptide-activator of cyclic nucleotide phosphodiesterases in the rat and human uterine tissue. *Ukrains. Biokhim. Zh. (Russian)* 1989; **61**: 100-103.
18. **M. N. Garnovskaya**, A. V. Tret'yakov, M. N. Maslova, R. N. Etingof. Aminobenzoic acid derivatives as specific inhibitors of cyclic nucleotide phosphodiesterase in the rat uterus. *Ukrains. Biokhim. Zh. (Russian)* 1990; **62**:97-101.
19. **M. N. Garnovskaya**, N. O. Artem'ev, I. L. Dumler, R. N. Etingof. Is the γ -subunit of 3',5'-cyclic GMP phosphodiesterase of the rod outer segments unique? A new protein with similar properties. *Biol. Membr. (Russian)* 1990; **7**:101-105.
20. S. A. Zozulya, V. V. Gurevich, T. A. Zvyaga, E. P. Shirokova, I. L. Dumler, **M. N. Garnovskaya**, M. Yu. Natochin, B. E. Shmuckler, P. R. Badalov. Functional expression *in vitro* of bovine visual rhodopsin. *Prot. Engineering* 1990; **3**:453-458.
21. V. V. Gurevich, S. A. Zozulya, E. P. Shirokova, T. A. Zvyaga, **M. N. Garnovskaya**, I. L. Dumler, P. R. Badalov, M. Yu. Natochin, I. D. Pokrovskaya, B. E. Shmukler. Synthesis of visual rhodopsin in a cell-free translation system. II. Functional properties of recombinant rhodopsin and its mutant forms. *Sov. J. Bioorg. Chem.* 1990; **16**: 303-308.
22. S. N. Korolkov, **M. N. Garnovskaya**, A. S. Basov, A. S. Chunaev, I. L. Dumler. The detection and characterization of G-proteins in the eyespot of *Chlamydomonas reinhardtii*. *FEBS Lett.* 1990; **270**: 132-134.
23. V.V.Gurevich, S.A.Zozulya, E.P.Zerf, I.D.Pokrovskaya, **M.N.Garnovskaya**, I.L. Dumler, M.P. Rychkova, T.A. Obukhova. Bovine visual rhodopsin: Amino acid substitutions asp-83-asn and glu-134-gln prevent activation of cyclic GMP phosphodiesterase. *Biomed. Sci.* 1990; **1**: 527-530.
24. L. Dumler, S. N. Korol'kov, **M. N. Garnovskaya**, E. V. Parfenova, M. G. Efimova, Yu. V. Chistyakova, R. N. Etingof. Evolutionary aspects of the molecular mechanism of the transmission of sensory signals. *J. Evol. Biochem. & Physiol.* 1991; **27**: 102-109.
25. N. O. Artem'ev, **M. N. Garnovskaya**, I. A. Ostapenko, M. P. Rychkova. A native model for function and structure studies of cyclic GMP-phosphodiesterase photoreceptor. *Biol. Membr. (Russian)* 1991; **8**:85-87.
26. V. V. Gurevich, I. D. Pokrovskaya, **M. N. Garnovskaya**, I. L. Dumler, S. A. Zozulya. Proper cotranslational insertion of visual rhodopsin into the lipid bilayer occurs in the absence of protein translation machinery. *Biomed. Sci.* 1991; **2**:187-192.
27. J. G. Milheron, S. J. Casanas, J. M. Arthur, **M. N. Garnovskaya**, T. W. Gettys, J. R. Raymond. Human 5-HT_{1A} receptor expressed in insect cells activates endogenous G α -like G-proteins. *J. Biol. Chem.* 1994; **269**:12954-12962.

28. C. G. Nebigil, **M. N. Garnovskaya**, R. F. Spurney, J. R. Raymond. Identification of a rat glomerular mesangial cell mitogenic 5-HT_{2A} receptor. *Am. J. Physiol.* 1995; **268**:F122-F127.
29. C. G. Nebigil, **M. N. Garnovskaya**, S. J. Casanas, J. G. Mulheron, E. M. Parker, T. W. Gettys, J. R. Raymond. Agonist-induced desensitization and phosphorylation of human 5-HT_{1A} receptor expressed in Sf9 insect cells. *Biochemistry* 1995; **34**: 11954-11962.*
30. **M. N. Garnovskaya**, C. G. Nebigil, J. M. Artur, R. F. Spurney, J. R. Raymond. 5-Hydroxytryptamine_{2A} receptors expressed in rat renal mesangial cells inhibit cyclic AMP accumulation. *Mol. Pharmacol.* 1995; **48**: 230-237.
31. **M. N. Garnovskaya**, T. van Biesen, B. E. Hawes, S. G. Casanas-Ramos, R. J. Lefkowitz, J. R. Raymond. Ras-dependent activation of fibroblast mitogen-activated protein kinase by 5-HT_{1A} receptor via a G protein $\beta\gamma$ -subunit-initiated pathway. *Biochemistry* 1996; **35**: 13716-13722.
32. **M. N. Garnovskaya**, T.W. Gettys, T. van Biesen, J.K. Chuprin, V.Prpic, J. R. Raymond. G-protein-coupled 5-HT_{1A} receptor activates Na⁺/H⁺ exchange in CHO-K1 cells through Gi α 2 and Gi α 3. *J. Biol. Chem.* 1997; **272**:7770-7776.
33. **M. N. Garnovskaya**, Y. V. Mukhin, J. R. Raymond. Rapid activation of sodium-proton exchange and extracellular signal-regulated protein kinase in fibroblasts by G protein-coupled 5-HT_{1A} receptor involves distinct signaling cascades. *Biochemical J.* 1998; **330**:489-495.
34. V. Prpic, G.J. Fitz, Yu Wang, J.R. Raymond, **M.N. Garnovskaya**, R.A. Liddle. Inhibition of Na⁺/H⁺ exchange stimulates cholecystokinin secretion in STC-1 cells. *Am. J. Physiol.* 1998; **275**: G689-G695.
35. Della Rocca, G.J., Mukhin, Y.V., **Garnovskaya, M.N.**, Daaka, Y., Clark, G., Luttrell, L.M., Lefkowitz, R.J., and Raymond, J.R. Serotonin 5-HT_{1A} receptor-mediated Erk activation requires calcium/calmodulin-mediated receptor endocytosis. *J. Biol. Chem.* 1999; **274**: 4749-4753.
36. R. Chen, E.L. Greene, G. Collinsworth, J. Grewal, O. Houghton, H. Zeng, **M.N. Garnovskaya**, R.V. Paul, and J.R. Raymond. Enrichment of transiently transfected mesangial cells by cell sorting after cotransfection with green fluorescent protein. *Am. J. Physiol.* 1999; **276**: F777-F785.
37. J.S.Grewal, Y.V. Mukhin, **M.N. Garnovskaya**, J.R. Raymond, and E.L. Greene. Serotonin 5HT_{2A} receptor induces TGF- β 1 mRNA and protein in rat mesangial cells via ERK: proliferative and fibrotic signals. *Am. J. Physiol.* 1999; **276**: F922-F930.
38. K.P. Becker, **M.N. Garnovskaya**, T.W. Gettys, P.V. Halushka. Coupling of TXA₂ receptor isoforms to G α 13: Effects on ligand binding and signalling. *Biochimica et Biophysica Acta* 1999; **1450**:288-296.
39. J.R. Raymond, Y.V. Mukhin, T.W. Gettys, and **M.N. Garnovskaya**. The recombinant 5-HT_{1A} receptor: G protein coupling and signalling pathways. *British J. of Pharmacology* 1999; **127**:1751-1764.
40. **M. N. Garnovskaya**, Y. V. Mukhin and J. R. Raymond. Role for janus kinase in the activation of sodium-hydrogen exchange by osmotic shock. *Miami Nature Biotechnology Short Reports* **10**, 37 (1999).
41. Y.V. Mukhin, **M.N. Garnovskaya**, G. Collinsworth, DK.Pendergrass, T. Nagai, S. Pinckney, J.S.Grewal, E.L. Greene, and J.R. Raymond. 5-HT_{1A} receptor/ G $\beta\gamma$

42. E.L.Greene, O. Houghton, G. Collinsworth, **M.N. Garnovskaya**, T. Nagai, T. Sajjad, V. Bheemanathini, J. Grewal, R.V.Paul, and J.R. Raymond. 5HT_{2A} receptor stimulate mitogen-activated protein kinase *via* hydrogen peroxide generation in rat renal mesangial cells. *Am. J. Physiol.* 2000; **278**: F650-F658.
43. R. Chen, Y. Mukhin, **M. Garnovskaya**, T. Thielen, Y. Iijima, C. Huang, J.R. Raymond, M.E. Ullian, R.V. Paul. A Fully Functional Angiotensin II Type 1A Receptor-GFP Fusion Protein: Evidence for Agonist-Dependent Nuclear Translocation. *Am. J. Physiol.* 2000; **279**, F440-F448.
44. Y.V. Mukhin, T. Vlasova, A.A. Jaffa, G. Collinsworth, J.L. Bell, B.G. Tholanikunnel, T. Pettus, W. Fitzgibbon, D.W. Ploth, J.R. Raymond, and **M.N. Garnovskaya**. Bradykinin B₂ receptors activate Na⁺/H⁺ exchange in mIMCD-3 cells *via* Janus kinase 2 and Ca²⁺/calmodulin. *J. Biol. Chem.* **276**, 17339-17346 (2001).
45. J.R. Raymond, Y.V. Mukhin, A. Gelasco, J. Turner, G. Collinsworth, T.W. Gettys, J.S. Grewal, and **M.N. Garnovskaya**. Multiplicity of mechanisms of serotonin receptor signal transduction. *Pharmacol. Ther.* **92**, 179-212 (2001).
46. Mukhin YV, Garnovsky, E.A., Ullian, M.E., and **Garnovskaya MN**. Bradykinin B₂ receptor activates extra-cellular signal regulated protein kinase in mIMCD-3 cells *via* epidermal growth factor receptor transactivation. *JPET* **304**, 968-977 (2003).
47. **Garnovskaya MN**, Mukhin YV, Vlasova T, and Raymond JR. Hypertonicity activates Na⁺/H⁺ exchange through Janus kinase 2 and Calmodulin *J. Biol. Chem.* **278**,16908-16915 (2003).
48. D. Lefler, Y.V. Mukhin, T. Pettus, L.M. Fredrik Leeb-Lundberd, **M.N. Garnovskaya**, and J.R. Raymond. Jak2 and Ca²⁺/calmodulin are key intermediates for bradykinin B₂ receptor-mediated activation of Na⁺/H⁺ exchange in KNRK and CHO cells. *ASSAY and Drug Development Technologies* **1**, 281-289 (2003).
49. **Garnovskaya MN**, Mukhin YV, Turner, J.H., Vlasova T, Ullian, M.E., and Raymond JR. Mitogen-induced activation of Na⁺/H⁺ exchange in vascular smooth muscle cells involves Janus kinase 2 and calmodulin. *Biochemistry* **42**, 7178-7187 (2003).
50. Y.V. Mukhin, **M.N. Garnovskaya**, M.E. Ullian, and J.R. Raymond. ERK is regulated by sodium-proton exchanger in rat aortic vascular smooth muscle cells. *J. Biol. Chem.* **279**, 1845-1852 (2004).
51. **M.N. Garnovskaya**, Y.V. Mukhin, M.E. Ullian, B.G. Tholanikunnel, J.S.Grewal, and J.R. Raymond. Mitogen-Induced Rapid Phosphorylation of Serine⁷⁹⁵ of the Retinoblastoma Gene Product in Vascular Smooth Muscle Cells Involves ERK Activation. *J. Biol. Chem.* **279**; 24899-24905 (2004).
52. Scholz D, McDermott P, **Garnovskaya M**, Gallien TN, Huettelmaier S, DeRienzo C, Cooper G. Microtubule-associated protein-4 (MAP-4) inhibits microtubule-dependent distribution of mRNA in isolated neonatal cardiocytes. *Cardiovascular Research* **71**; 506-516 (2006)
53. Y.V. Mukhin, M. Gooz, and J.R. Raymond, and **M.N. Garnovskaya**. Collagenases 2 and 3 Mediate Epidermal Growth Factor Receptor Transactivation by Bradykinin B₂ receptor in Kidney Cells. *JPET* **318**; 1033-1043 (2006).
54. Turner JH, **Garnovskaya MN**, Coaxum SD, Vlasova TM, Yakutovich MD, Lefler DM, and Raymond JR, Sr. Ca²⁺-calmodulin and Jak2 are Required for Activation of

55. Turner JH, **Garnovskaya MN**, Raymond JR, Serotonin 5-HT_{1A} receptor stimulates c-Jun N-terminal kinase and induces apoptosis in Chinese hamster ovary fibroblasts. *Biochimica et Biophysica Acta (BBA) - Molecular Cell Research* **1773**; 391-399 (2007).
56. Kramarenko II, Bunni MA, Morinelli TA, Raymond JR, and **Garnovskaya MN**. Identification of a Functional Bradykinin B₂ Receptors Endogenously Expressed in HEK293 Cells. *Biochem Pharmacology* **77**; 269-276 (2009).
57. Coaxum S, Gooz M, Baldys A, **Garnovskaya M**, and Raymond J Epidermal Growth Factor Activates Na⁺/H⁺ Exchange in Podocytes through a Mechanism that Involves Janus Kinase and Calmodulin. *Biochimica et Biophysica Acta (BBA) - Molecular Cell Research* **1793** (7): 1174-1181 (2009).
58. Kramarenko II, Bunni MA, Raymond JR, and **Garnovskaya MN**. Bradykinin B₂ Receptor Interacts with Integrin $\alpha 5/\beta 1$ to Transactivate Epidermal Growth Factor Receptor in Kidney Cells. *Mol. Pharmacol.* **78** (1): 126-134 (2010).
59. Bunni MA, Kramarenko II, Walker LP, Raymond JR, and **Garnovskaya MN**. Role of Integrins in Angiotensin II-induced Proliferation of Vascular Smooth Muscle Cells. *Am J Physiol Cell Physiol.* **300**(3):C647-56 (2011)

Chapters in Books:

1. Dumler I.L., **Garnovskaya M.N.**, Korolkov S.N., Parfenova E.V., and Etingof R.N. Molecular mechanisms of sensory signal transduction. *In Intracellular Signalling (Russian)*. Kostyuk P.G. and Ostrovsky M.A. eds., 1990 Science Press, Moscow.
2. Raymond JR, Turner, J.H., Gelasco, A, Ayiku, H., Coaxum, S., Arthur, J.M., and **Garnovskaya, M.N.** (2006) 5-HT Receptor Signal Transduction Pathways. In: *The Serotonin Receptors: From Molecular Pharmacology to Human Therapeutics*. (Roth, B. Ed.), pp 143-206. The Humana Press, Inc., Totowa, NJ
3. Turner JH, Coaxum SD, Gelasco AK, **Garnovskaya MN**, Raymond JR. Calmodulin is a 5-HT Receptor Interacting and Regulatory Protein In: *Frontiers in Neuroscience. Serotonin Receptors in Neurobiology*. (Chattopadhyay, A. Ed.), (Nicoletis, M. and Simon, S. Series Eds.), 2007 CRC Press, Boca Raton, FLA, pp.61-80.
4. **Garnovskaya MN**, Raymond JR. Serotonin 5-HT_{2C} Receptor Signal Transduction. In: *"5-HT_{2C} Receptors in the Pathophysiology of CNS Disease"* (Drs G. Di Giovanni, E. Esposito & V. Di Matteo Editors), (K. A. Neve, The Receptors Series Ed), pp 75-96. 2011, Humana Press, c/o Springer Science+Business Media, LLC, New York, NY

Selected Published Abstracts:

- 1a. **Garnovskaya M.N.**, Dumler I.L., Etingof R.N. The pole of protein modulators in ATP and GTP influence on the cyclic nucleotide phosphodiesterase. *Proceedings of the 6th Joint symposium of the Biochemical societies of the GDR and the USSR*. Tallinn, p.52 (1981).
- 2a. **Garnovskaya M.N.**, Dumler I.L., Etingof R.N. Cyclic nucleotide phosphodiesterase and steroid hormon reception. *Proceedings of the 16th Meeting of the Federation of Experimental Biological Scientists*. Moscow, p.168 (1984).
- 3a. **Garnovskaya M.N.**, Artemyev N.O., Dumler I.L. The detection in the uterus of a new peptide-activator of cyclic nucleotide phosphodiesterase. *Proceedings of the 7th All-Union Meeting, "Chemistry of Proteins and Peptides."* Tallinn, p.44 (1987).
- 4a. **Garnovskaya M.N.** The peptide activator of cyclic nucleotide phosphodiesterases: possible physiological role. *Proceedings of the 7th All-Union Meeting 'Cyclic Nucleotides and other second messengers in enzyme regulation.'* Petrozavodsk, (1988).
- 5a. Dumler I.L., **Garnovskaya M.N.**, Artemyev N.O., Etingof R.N. The new protein inhibitor of cyclic GMP phosphodiesterase. *Proceedings of the Conference "Purine Nucleosides and Nucleotides in Cell Signalling: Targets for New Drugs."* Bethesda, MD, U.S.A., G-1 (1989).
- 6a. Gurevich V.V., Zozulya S.A., Zvyaga T.A., Dumler I.L., **Garnovskaya M.N.**, Shmucler B.E., Natochin M., Shirokova E.P., Badalov P.R. Functional analysis of site-directed mutations in visual rhodopsin. *Proceedings of the 3rd International Conference of Young Scientists from Socialist Countries*. Prieros, GDR, p.24. (1989).
- 7a. **Garnovskaya M.N.** the role of the cyclic nucleotide phosphodiesterases in steroid hormone action. *Proceedings of the 9th All-Union Meeting "Mechanism of Action of Mediators and Hormones on Effector Cells."* Suzdal, p.84 (1989).
- 8a. Korolkov S.N., **Garnovskaya M.N.** Dumler I.L. Biochemical evolution of photo-sensory systems: functional similarity of vertebrate rhodopsin and photosensory pigment of *Chlamydomonas reinhardtii*. *Proceedings of the 9th All-Union Meeting "Mechanism of Action of Mediators and Hormones on Effector Cells."* Suzdal, p.84 (1989).
- 9a. Zozulya S.A., Gurevich V.V., Zvyaga T.A., Dumler I.L., **Garnovskaya M.N.**, Shmucler B.E., Natochin M., Shirokova E.P., Badalov P.R. *In vitro* synthesis of visual rhodopsin for a protein engineering study. *Proceedings of the Bilateral Symposium of the USSR -West Berlin: "Receptors and Ion Channels"*, West Berlin (1989).
- 10a. Dumler I.L., Korolkov S.N., **Garnovskaya M.N.**, Parfenova E.V., Etingof R.N. The systems of photo- and pheromone signal transduction in unicellular eukaryotes. *Proceedings of the Bilateral Symposium of the USSR - West Berlin: "Receptors and Ion Channels"*, West Berlin (1989).
- 11a. **Garnovskaya M.N.**, Korolkov S.N., Gurevich V.V., Zozulya S.A., Pokrovskaya I.D., Dumler I.L. Structural and functional analysis of visual rhodopsin: identification of domains interacting with transducin in the process of

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