

Gail Foure Seelig
70 Reynolds Drive
Watchung, NJ 07069

908-757-9835 (voice/fax)
email:gailseelig@stonyhillsolutions.com

SUMMARY

Science education consultant with ten years experience in hands-on inquiry based approach to K-8 science studies. Research biochemist with more than 20 years experience in the determination of structure–function relationships of proteins in the areas of oncology, virology and haematology. Research consultant with experience in the preparation of patents as well as experience in assisting in the publication of pre-market agreements, IND applications, and clinical protocols.

Formal Education:

B.S.	Chemistry	University of Maryland, College Park, Maryland	1972
Ph.D.	Chemistry	University of Delaware, Newark, Delaware	1977
Post Doc	Biochemistry	National Institutes of Health, Bethesda, MD	1977-80
Post Doc	Biochemistry	Cornell University Medical College, NY, NY	1980-83

Employment Experience:

1972-73	Teaching Graduate Assistant, Univ. of Del., General Chemistry
1973-74	Teaching Graduate Assistant, Univ. of Del., Biochemistry
1974-75	Research Fellow, Univ. of Del.
1975-76	Dupont Fellow, Univ. of Del.
1977-80	U.S. Public Health Service Postdoctoral Fellow, NIH, Bethesda, MD
1980-83	Postdoctoral Fellow, Cornell Univ. Med. College, NY, NY
1983-87	Principal Scientist, Schering Pharmaceutical Corp, Bloomfield, NJ
1987-92	Section Leader, Schering Plough Res. Inst., Bloomfield, NJ
1992-97	Senior Principal Scientist, Schering Plough Res. Inst., Kenilworth, NJ
2004-present	Vice President Research, Stony Hill Solutions, LLC

Honors:

Maryland State Scholarship	1972
Alpha Lambda Delta Honor Society	1973
Dupont Fellowship	1975
Sigma Xi	1976
Joel Silver Memorial Award	1976
USPHS Postdoctoral Fellowship	1977
Schering-Plough Excellence Award	1995
Watchung School District Partners in Education Award (Watchung Board of Education & Watchung Borough Education Association)	1999

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Education-Related Activities:

- 1993-95 **Mentor to Medical Students-** Schering-Plough Summer Intern Program ('93 Rutgers University student, '94 University of Virginia student, '95 Cornell University student)
- 1996 **Mentor Schering-Plough "Partners in Technical Training"** Program at Essex County College ('96 Essex County College student)
- 1999 **NASA Lunar Rock Certification** Workshop, Georgian Court College, Lakewood, NJ
- 1999 **"Developing A New Vision of K-8 Science Teaching and Learning"** Conference , Bristol Myers Squibb, Princeton, NJ
- 2000 **Member of Leadership Team for NJSSI Standards Implementation** Grant Project for Watchung Borough District
- 2000 **Rutgers S.A.F.E.T.Y. Clinic** Sports Awareness for Educating Today's Youth
- 2000 **Member of Leadership Team for National LASER K-8** Science Education Strategic Planning
- 2000 **New Jersey Department of Education Professional Development Provider** (Registration #2185)
- 1983-2008 **Science Fair Judge** ('83-'85, NYC, NY, '84, Cranford, NJ, '06-'08, Berkeley, NJ)

Patents:

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| 1988 | US Patent 4,751,078 | Process for the Purification of Gamma Interferon |
| 1994 | US Patent 5,391,706 | Purification of Granulocyte Macrophage Colony Stimulating Factor |
| 1995 | US Patent 5,475,087 | Antagonists of GM-CSF Derived from the Carboxyl Terminus |
| 1995 | US Patent 5,358,707 | Oxidized Variants of GM-CSF |
| 1995 | US Patent 5,451,658 | Antagonists of Human Gamma Interferon |
| 2002 | US Patent 6,358,509 | Antibody Antagonists of Human Interleukin-4 |

Education Interests:

My goal is to assist the educator in providing the tools that students will need to be able to enjoy science, utilize basic science skills, and critically evaluate science in the world around them as they become responsible adults.

For more than ten years, I have been working within school districts to enhance the students' science experience through experimentation and to assist the teacher in providing this enhanced experience. Towards this end, I introduce a variety of inquiry-based hands-on science units tied directly to the NJCCCS, for teachers to present in their classrooms. Model lessons for a variety of activities, each of which is aligned with the New Jersey Core Curriculum Content Standards, are provided for teachers to use. In each case, the focus is to provide content knowledge and strategies for providing inquiry-based, hands-on instruction and assessment in the science classroom.

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The materials I provide are designed to assist teachers in increasing content knowledge in the area of science education so that they can help their students achieve (and exceed) The New Jersey Core Curriculum Content Standards. The materials I present are consistent with my commitment to hands-on, inquiry-based science units as an effective component of science curriculum.

In addition I have assisted k-8 school districts in the implementation of "Science Days" devoted to full day science presentations, hands-on science activities and science exploration, and establishment of k-4 "Science Fairs" directed toward the student initiated science studies involving sound scientific principles which culminate in an evening of presentation and discussion.

Research Interests:

Research and development of the structure-function relations in proteins in the areas of oncology, virology and haematology, including cytokines, lymphokines, colony stimulating factors and viruses, as well as enzymes such as gamma glutamylcysteine synthetase, blood coagulation factor XIII transglutaminase, and TPN-dependent isocitrate dehydrogenase. Direct structure function studies at the receptor, immunochemical and molecular levels in order to discover drug leads including antagonists and agonists. Use of anti-idiotypic antibodies, crystallography, transferred Nuclear Overhauser Effect spectroscopy, phage epitope and mapping techniques to identify critical receptor and ligand sites for the design of peptiomimetics.

Professional Organizations:

American Chemical Society

American Association for the Advancement of Science

Publications:

1. Seelig, Gail F. and Colman, Roberta F.: Purification and Characterization of Human Heart TPN-dependent Isocitrate Dehydrogenase. Abst. of Amer. Chem. Soc. Meeting, San Francisco, Sept. 1976.
2. Seelig, Gail F. and Colman, Roberta F.: Human Heart TPN-dependent Isocitrate Dehydrogenase: Purification by a Rapid Three-Step Procedure. **J. Biol. Chem.**, 252, 11, 3671-3678, 1977.
3. Seelig, Gail F. and Colman, Roberta F.: Characterization of the Physicochemical and Catalytic Properties of Human Heart TPN-dependent Isocitrate Dehydrogenase. **Archives Biochem. Biophys.** 188, 394-409, 1978.
4. Seelig, Gail F. and Colman, Roberta F.: Alkylation of Methionine in Human Heart TPN-dependent Isocitrate Dehydrogenase. **J. Biol. Chem.** 254, 4, 1191-1195, 1979.
5. Seelig, Gail F. and Folk, J.E.: Chemical Modification of Plasma Factor XIII Non-Catalytic Subunits. Abst. of Amer. Chem. Soc., Meeting, Washington, D.C., Sept., 1979.
6. Seelig, Gail F. and Folk, J.E.: Non-Catalytic Subunits of Human Blood Plasma Coagulation Factor XIII. **J. Biol. Chem.** 255, 18, 8881-8886, 1980.

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7. Seelig, Gail F. and Folk, J.E.: Half of the Sites and All of the Sites Reactivity in Human Plasma Blood Coagulation Factor XIIIa. **J. Biol. Chem.** 255, #20, 9589-9593, 1980.
8. Seelig, Gail F.: Gamma Glutamylcysteine Synthetase; Structure and Function. Abst. Federation Proceedings #1692, 1981.
9. Seelig, Gail F. and Meister, A.: Cystamine-Sepharose: A Probe of the Active Site of Gamma Glutamylcysteine Synthetase. **J. Biol. Chem.** 257, #9, 5092-5096, 1982.
10. Seelig, Gail F. and Meister, A.: Reversible Dissociation of Gamma Glutamylcysteine Synthetase. Abst. of Amer. Chem. Soc. Meeting, Kansas City, Sept., 1982.
11. Seelig, Gail F. and Meister, A.: Gamma Glutamylcysteine Synthetase: Subunit and Immunological Studies. Abst. Federation Proceedings #1688, 1983.
12. Seelig, Gail F. and Meister, A.: Gamma Glutamylcysteine Synthetase: Interactions of an Essential Sulfhydryl Group. **J. Biol. Chem.** 259, 3534-3538, 1984.
13. Seelig, Gail F. and Meister, A.: Gamma Glutamylcysteine Synthetase. **Methods in Enzymology** 113, 47, 379-390, 1985.
14. Seelig, Gail F. and Meister, A.: Gamma Glutamylcysteine Synthetase from Erythrocytes. **Methods in Enzymology** 113, 47, 390-392, 1985.
15. Seelig, Gail F., Simonsen, Royce P., and Meister, A.: Reversible Dissociation of Gamma Glutamylcysteine Synthetase into Two Subunits. **J. Biol. Chem.** 259, #15, 9345-9347, 1984.
16. Seelig, Gail F. and Meister, A.: Gamma Glutamylcysteine Synthetase from Erythrocytes. **Anal Biochem.** 141, 510-514, 1984.
17. Seelig, G.F., Schwartz, J., Le, H., Smith, S., Nagabhushan, T.L., and Trotta, P.P.: Evidence of Similarities between Alpha 4 and Alpha 2 Interferon Including Receptor Overlap. **Antiviral Res.** 4, 60, 1985.
18. Lydon, N.B., Favre, C., Bove, S., Neyret, O., Benreau, S., Levine, A.M., Seelig, G.F., Nagabhushan, T.L. and Trotta, P.P.: Immunochemical Mapping of Alpha-2 Interferon. **Biochemistry** 24, 4131-4141, 1985.
19. Trotta, P.P., Seelig, G.F., Le, H.V. and Nagabhushan, T.L.: Structure-Function Relations in Recombinant Gamma Interferons. **J. Cellular Biochemistry** 10, 1986.
20. Seelig, G.F., Prosser, W.W., Ramanathan, L., Nagabhushan, T.L. and Trotta, P.P.: Characterization of Structure-Function Relations in Recombinant Human Alpha and Gamma Interferon By Chemical Modification. **Journal of Interferon Research** 6, 84, 1986.
21. Trotta, P.P., Seelig, G.F., Le, H.V., and Nagabhushan, T.L.: Structure-Function Relations in Recombinant Gamma Interferons. Friedman, R., Merigan, T., and Sveevalson, T. (eds). **in Interferons as Cell Growth Inhibitors and Antitumor Factors**, Alan R. Liss, Inc., New York, p. 497-507, 1986.
22. Seelig, G.F., Wijdenes, J., Nagabhushan, T.L. and Trotta, P.P.: Evidence for a Polypeptide Segment at the Carboxyl Terminus of Recombinant Human Gamma Interferon Involved in Expression of Biological Activity. **Biochemistry** 27, 1981-1987, 1988.

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23. Seelig, G.F., Fleissner, L.C., Prosise, W.W., Nagabhushan, T.L. and Trotta, P.P.: Characterization of Recombinant Murine GM-CSF. Abst. Federation Proceedings #4152, 1988. **FASEB J.** 2, #5 10011.
24. Sharma, B., Abrams, J., Trotta, P.P., Nagabhushan, T.L. and Seelig, G.F.: Immunoaffinity Purification of Recombinant Human GM-CSF. Abst. Federation Proceedings #4153, 1988. **FASEB J.** 2, #5 1010.
25. Scheffler, J.E., Fleissner, L.C., Seelig, G.F., Nagabhushan, T.L. and Trotta, P.P.: Characterization of the Human GM-CSF Receptor From Placenta. Abst. UCLA **J. Cellular Biochemistry** 13c, 30, 1989.
26. Scheffler, J.E., Fleissner, L.C., Seelig, G.F., Nagabhushan, T.L. and Trotta, P.P. (1989) Characterization of the Human GM-CSF Receptor from Placenta. Golde, D., and Clark, S. (eds) in **Hematopoiesis**, Alan R. Liss Inc., New York, Vol 20.
27. Trotta, P.P., Luther, M.A., Seelig, G.F., Ramanathan, L., and Windsor, W.T., (1989) Characterization of the Human Gamma Interferon Receptor and its Interaction with Ligand. Abst 7th International Congress of Immunology (Berlin) 1989.
28. Seelig, G.F., White, G., Prosise, W.W., Pennington, M.W., Windsor, W.T., Nagabhushan, T.L. and Trotta, P.P.: Evidence for Discontinuous Epitopes in Human Gamma Interferon Derived from N- and C-Terminal Domains. **Journal of Interferon Research** 9, 184, 1989.
29. Seelig, G.F., Prosise, W.W., Scheffler, J.E., Nagabhushan, T.L., and Trotta, P.P.: Evidence for a Direct Involvement of the Carboxyl Terminus of Human Granulocyte-Macrophage Colony-Stimulating Factor in Receptor Binding. Abst. UCLA **J. Cellular Biochemistry** 22, 1990.
30. Kanakura, Y., Cannistra, S.A., Brown, C.B., Nakamura, M., Seelig, G.F., Prosise, W.W., Hawkins, J.C., Trotta, P.P., Kaushansky, K., and Griffen, J.D.: Identification of Functionally Distinct Domains of Human Granulocyte-Macrophage Colony-Stimulating Factor Using Monoclonal Antibodies. **Blood** 77, #5 1033-1043, 1991.
31. Seelig, G.F., and Prosise, W.W.: Juxtaposed Amino And Carboxyl Terminal Domains of Human Gamma Interferon: Their Role in Receptor-Ligand Interactions. Abstr. Keystone Symposium **J. of Cellular Biochemistry** 16C, p101, 1992.
32. Le, H.V., Seelig, G.F., Zahran, J., Syto, R., Ramanathan, L., Windsor, W.T., Borkowski, D. and Trotta, P.P.: Selective Proteolytic Cleavage of Human Interleukin 4. **Biochemistry** 30, 9576-9582, 1991.
33. Taremi, S.S., Prosise, W.W., Rajan, N., Seelig, G.F., Trotta, P.P., Le, H.V.: Stoichiometry of IL4-IL4 Receptor Interaction. **Protein Science** 2, p 114, 1993.
34. Rajan, N., O'Donnell, R., Taremi, S.S., Baldwin, S., Seelig, G.F., Nagabhushan, T.L., Trotta, P.P., and Le, H.V.: Deglycosylation of the extracellular domain of recombinant human interleukin 4 receptor. **Protein Science** 2, p 114, 1993.
35. Seelig, G.F., Prosise, W.W. and Taremi, S.S. :Synthetic Mimics of Juxtaposed Amino and Carboxyl Terminal Peptide Domains of Human Gamma Interferon Block Ligand Binding to Human Gamma Interferon Receptor. **J. Biol Chem** 269, #1, 358-363, 1994.
36. Seelig, G.F., Prosise, W.W. and Scheffler, J.E.: A Role for the Carboxyl Terminus of Human Granulocyte-Macrophage Colony-Stimulating Factor in the Binding of Ligand to the Alpha Subunit of the High Affinity Receptor. **J. Biol Chem** 269, #8, 5548-5553, 1994.

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37. Seelig, G.F., Prorise, W.W. Hawkins, J.C. and Senior, M.: Development of a Receptor Peptide Antagonist to Human Gamma Interferon and Characterization of its Ligand-Bound Conformation Using Transferred Nuclear Overhauser Effect (TRNOE) Spectroscopy. **J. Biol Chem** 270, #16, 9241-9249, 1995.
38. Seelig, G., Prorise, W., Hawkins, J., Lunn, C., Lundell, D., and Senior, M. Characterization of the Bound Conformation of a Receptor Peptide Antagonist to Interferon-gamma and Mutants of Interferon Gamma using Transferred Nuclear Overhauser Enhancement Spectroscopy. "NMR as a Tool" Symposium, Indianapolis, Ind. October, 1994.
39. Rajan, N., Tsarbopoulos, A., Kumarasamy, R., O'Donnell, R., Taremi, S.S., Baldwin, S.W., Seelig, G.F., and Le, H.V. Carbohydrate Characterization of Recombinant Human Interleukin 4 Receptor from CHO Cells: Role of N-Linked Oligosaccharides. **Biochem. Biophys. Res. Commun.** 206,#2, 694-702, 1995.
40. Seelig, G., Prorise, W. Hawkins, J., Lunn, C., Lundell, D., and Senior, M., Characterization of Mutants of Interferon Gamma using Transferred Nuclear Overhauser Enhancement Spectroscopy. Abst. Eastern Analytical Symposium, Somerset, NJ November, 1994.
41. Kwong, A.D., Wright-Minaogue, J., Chase, R., Risano, C., Seelig, G., Ferrari, E., and Hong, Z. Enzymatic Characterization of the HCV NS3/4A Complex Expressed in Mammalian Cells Using the Herpes Simplex Virus (HSV) Amplicon System. Abst. International Conference on Therapies for Viral Hepatitis, Kauai, Hawaii, December, 1995.
42. Hong, Z., Ferrari, E., Wright-Minogue, J., Chase, R., Risano, C., Seelig, G., Lee, C.-G., and Kwong, A. Enzymatic Characterization of the HCV NS3/4A Complex Expressed in Mammalian Cells Using the Herpes Simplex Virus (HSV) Amplicon System, Abst. IX Triennial International Symposium on Viral Hepatitis and Liver Disease, Rome, Italy, April, 1996.
43. Hong, Z., Ferrari, E., Wright-Minogue, J., Chase, R., Risano, C., Seelig, G., Lee, C.-G., and Kwong, A. Enzymatic Characterization of the HCV NS3/4A Complex Expressed in Mammalian Cells Using the Herpes Simplex Virus (HSV) Amplicon System. **Journal of Virology** 70, #7, 4261-4268 1996.
44. Seelig, G.F., Murgolo, N., Scheri, T.D., Genatt, N., Lunn, C., Lundell, D. and Senior, M. Transferred Nuclear Overhauser Effect (TRNOE) of a Peptide Antagonist to Human Gamma Interferon bound to Amino and Carboxyl Terminal Mutants of Gamma Interferon..
45. Taremi, S.S., Prongay, A., Hruza, A, Prorise, W., Seelig, G.F., Pawlyk, D., Butkiewicz, N., Pichardo, J., Das Mahapatra, B., Cable, M., Le, H.V., and Weber, P. Human Cytomegalovirus Protease Catalytic Domain: Purification, Kinetic Properties and Crystallization of Autoproteolysis Resistant Forms of Protease. Presented at the Gordon Conference on Proteolytic Enzymes and their Inhibitors, New Hampshire, July 21-26,1996.
46. Wright-Minogue, Ferrari, E, Beudet-Miller, M., Risano, C., Seelig, G., Hong, Z., and Kwong, A. Over-Expression of the Catalytic Domain of the HSV-1 Protease in E. coli By Chemical Synthesis of the Gene with Optimized Codon Usage. Abst. 21st International Herpesvirus Workshop, Chicago, Ill., July, 1996.
47. Kwong, A.D., Ferrari, E., Wright-Minogue, J., Chase, R., Risano, C., Seelig, G., Lee, C.-G., and Hong, Z. Characterization of the HCV NS3/4A Complex Expressed in Mammalian Cells Using the Herpes Simplex Virus (HSV) Amplicon System. **Antiviral Therapy** 1(suppl 4):25-32,1996.