Case Study: Agilent Technologies

Freedom to Operate

Stephen Laderman, Director
Molecular Tools Laboratory
Agilent Laboratories

Commercializing Innovations

To Obtain Value from Innovation, Further Investments and Decisions are Required

Some factors that are considered:

- **Nature of the innovation (breadth, utility, novelty, uniqueness, practicality, ease of duplication, ease of detection, *is it an Invention?*)**
- **Customer needs (benefits, transparency, freedom to use)**
- **Business model**
- **Infrastructure for commercialization**
- **Intellectual property landscape (freedom to operate, blocking potential, licensing requirements, cross-license value)**
- **Competitive situation**
- **Costs**

These factors influence, on a case-by-case basis:

- **Commercialization investments and timing**
- **Strategy for protection (trade secret, defensive publication, patent prosecution, copyright, trademark)**

Agilent Technologies

Addressing critical measurement challenges

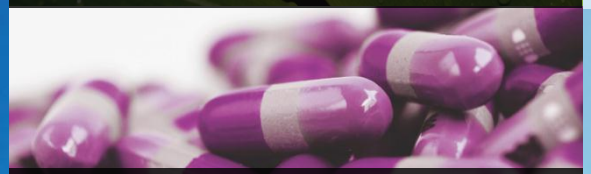
FY12 Revenue: $6.9B

Electronic Measurement Group

- Wireless technologies
- Mobile phone R&D and manufacturing
- Aerospace/defense systems and maintenance
- Computer & industrial research & manufacturing

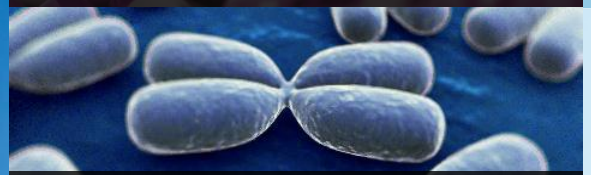
Chemical Analysis Group

- Food safety, quality
- Energy and chemical research, production
- Quality of air, water, soil
- Forensics, drugs of abuse



Life Sciences Group

- Pharmaceutical research and manufacturing
- Academic and government research



Diagnostics and Genomics Group

- Cancer diagnostics
- Cytogenetics research
- Genomics tools for molecular analysis

Agilent Manufactures, Sells and Supports Products and Related Services that Enable Our Customers in Industry, Academia, and the Government

Synthetic Biology is a Technology Wave

Synthetic Biology is (http://syntheticbiology.org/**):**
A) the design and construction of new biological parts, devices, and systems, and
B) the re-design of existing, natural biological systems for useful purposes.

Industrial Biotechnology Applications

Fuel:

Chemical:

Biopharma Manufacturing:

Food/ Agriculture:

Emerging Market Segments:

Cosmeti Cleanin Enviro
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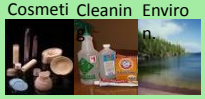
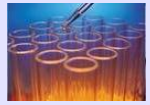


Biomedical Applications

Biopharma Discov. & Develop.

Life Science Research



Chemical & Energy Testing

Pharma/Biotech (For Profit)

Food Testing

Environ.

Pharma/Biotech (For Profit)

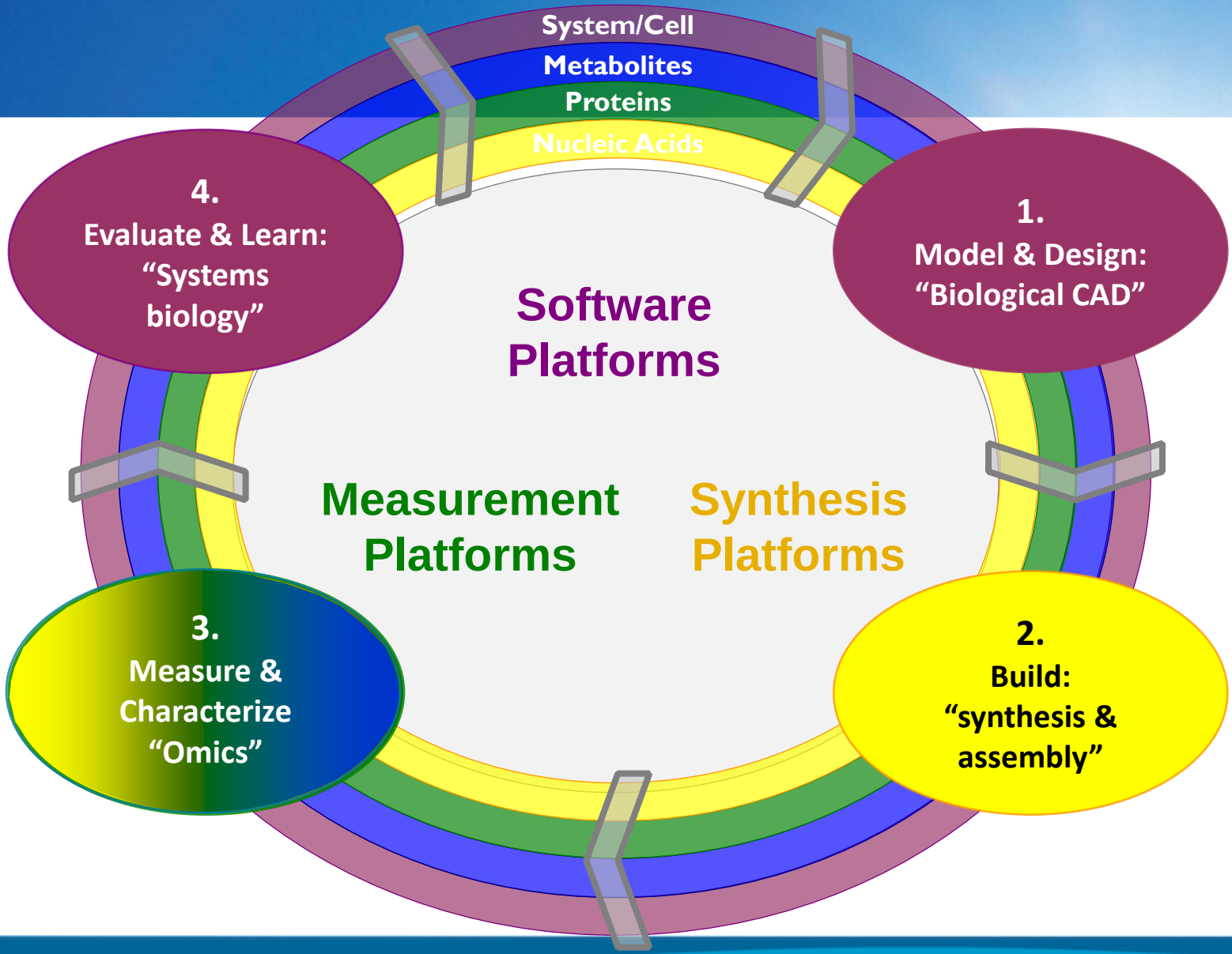
Acad./Govern (Not-For-Profit)

Agilent Market Overlap

Synthetic Biology methods have the potential to significantly change manufacturing processes, research practices, and the associated measurements in market segments accounting for many of Agilent's customers

Agilent's Core Values Include Innovation

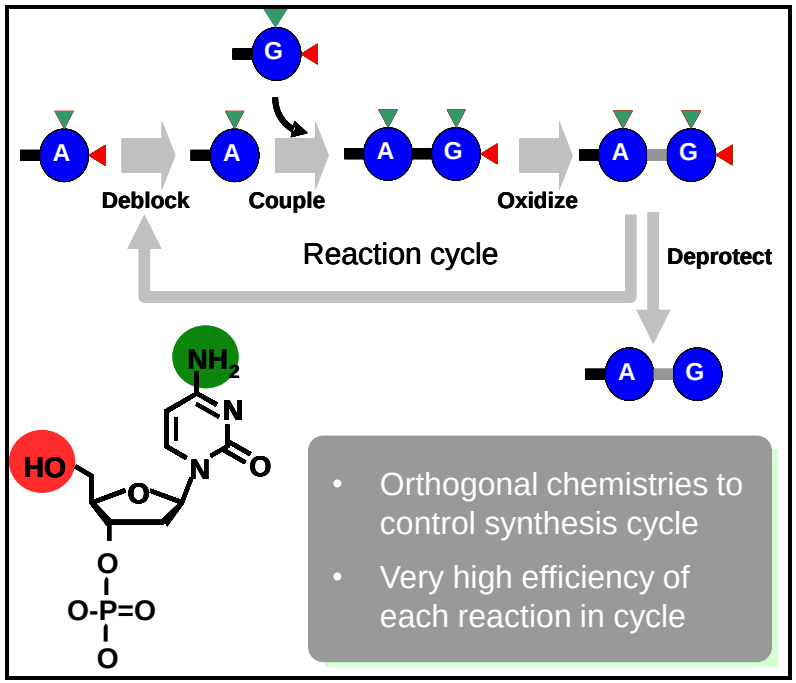
Opportunities for Agilent in Synthetic Biology



Nucleic Acid Synthesis

One chemistry platform, multiple addressable markets

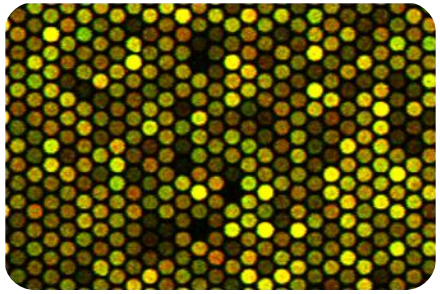
Synthesis chemistry



- Orthogonal chemistries to control synthesis cycle
- Very high efficiency of each reaction in cycle

World class proprietary technology enables quality, length and cost:

- DNA oligo synthesis
- RNA oligo synthesis



Microarrays

Oligo Library Synthesis (OLS)

RNA for Therapeutics

Advances in RNA Synthesis

Ongoing Research Advancing the State of Nucleic Acid Synthesis

JACS
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

ARTICLE

pubs.acs.org/JACS

Streamlined Process for the Chemical Synthesis of RNA Using 2′-*O*-Thionocarbamate-Protected Nucleoside Phosphoramidites in the Solid Phase

Douglas J. Dellinger,[*,†] Zoltán Timár,[†,‡] Joel Myerson,[†,‡] Agnieszka B. Sierzchala,[§,‡] John Turner,[†,¶] Fernando Ferreira,[†] Zoltán Kupihár,[#,⊥] Geraldine Dellinger,[†] Kenneth W. Hill,[§] James A. Powell,[§] Jeffrey R. Sampson,[†] and Marvin H. Caruthers[#]

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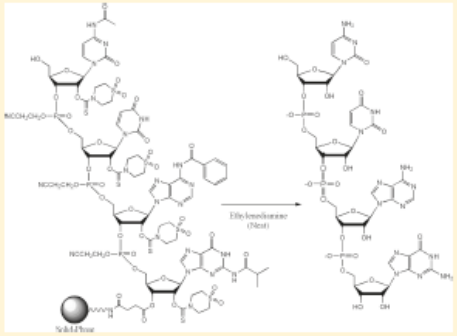
ABSTRACT: An improved method for the chemical synthesis of RNA was developed utilizing a streamlined method for the preparation of phosphoramidite monomers and a single-step deprotection of the resulting oligoribonucleotide product using 1,2-diamines under anhydrous conditions. The process is compatible with most standard heterobase protection and employs a 2′-*O*-(1,1-dioxo-1λ^6-thiomorpholine-4-carbothioate) as a unique 2′-hydroxyl protective group. Using this approach, it was demonstrated that the chemical synthesis of RNA can be as simple and robust as the chemical synthesis of DNA.



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Bioinformatics Software

Integrate data and results from multiple applications

GeneSpring 12.0 includes:

Support for Multi-omics analysis has been added. This allows experiments of different technologies to be used to look for significant pathways.

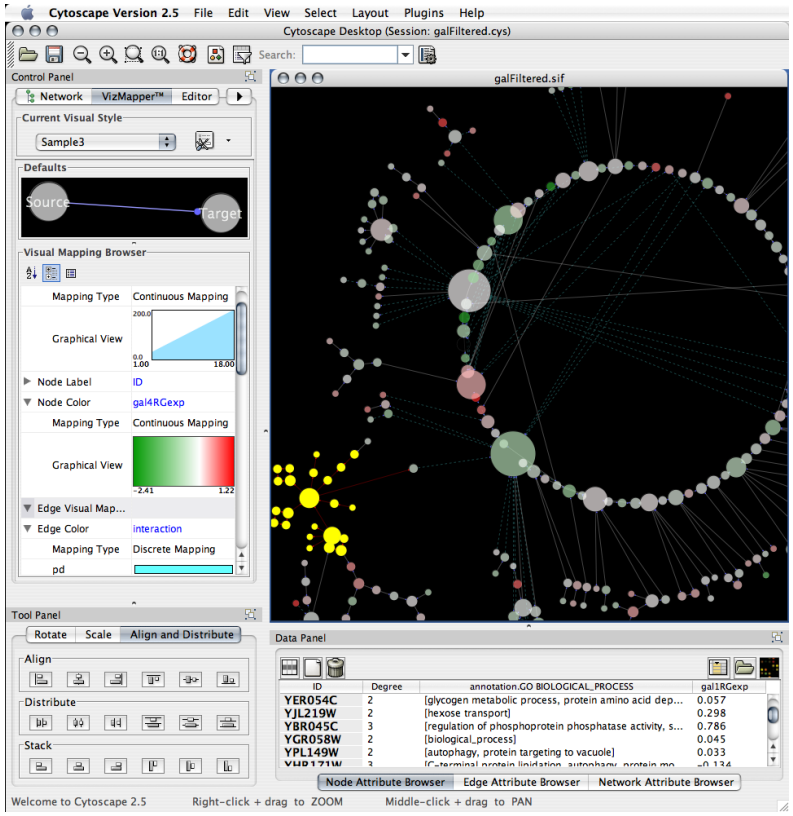
Support for importing pathways from WikiPathways (http://www.wikipathways.org) has been added. Pathways from WikiPathways can now be imported and used for Multi-omic analysis (MOA) and Single experiment (SEA) analysis.

Support for sending gene expression and metabolomics data to Cytoscape using Agilent's Cytoscape Biological Pathway Analysis Plug-in.

New pathway viewer with integrated heat-map

Network Biology and Informatics

Pathway Visualization and Analysis



Cytoscape is a collaboration between

- University of California, San Diego
- Institute for Systems Biology
- Memorial Sloan-Kettering Cancer Center
- Institute Pasteur
- Agilent Technologies
- University of Toronto
- Gladstone Institute for Cardiovascular Disease
- University of California, San Francisco
- Unilever
- National Center for Integrative Biomedical Informatics

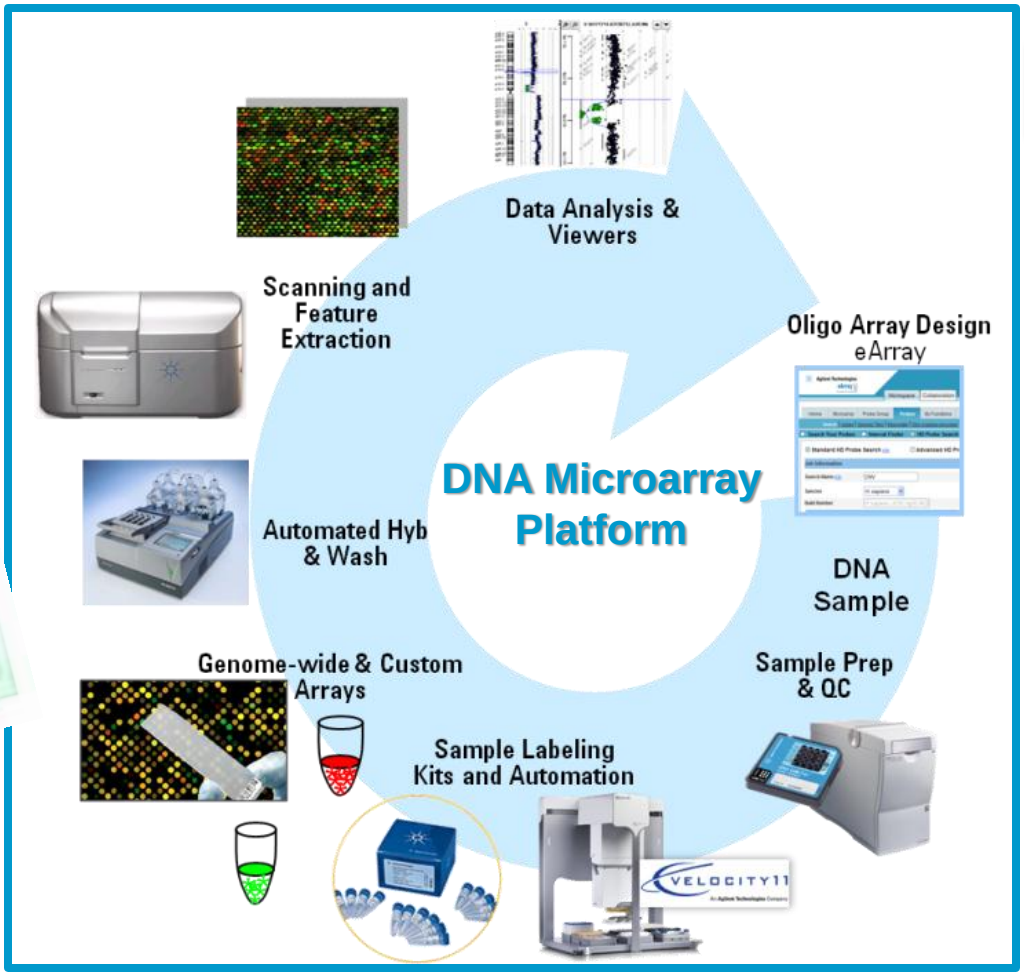
freely available at http://www.cytoscape.org

Cytoscape is an open source software platform for *integrating, analyzing,* and *visualizing* measurement data in their biological context.

Agilent's DNA Microarray Platform

Measurement Solutions with Multiple Applications for Research and Diagnostics

up to 1,000,000 features on a standard slide



Applications (Catalog and Custom)

- aCGH
- GE(mRNA, lncRNA)
- miRNA
- CHIP on chip
- CH_3 profiling

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Oligonucleotide Array CGH

PNAS

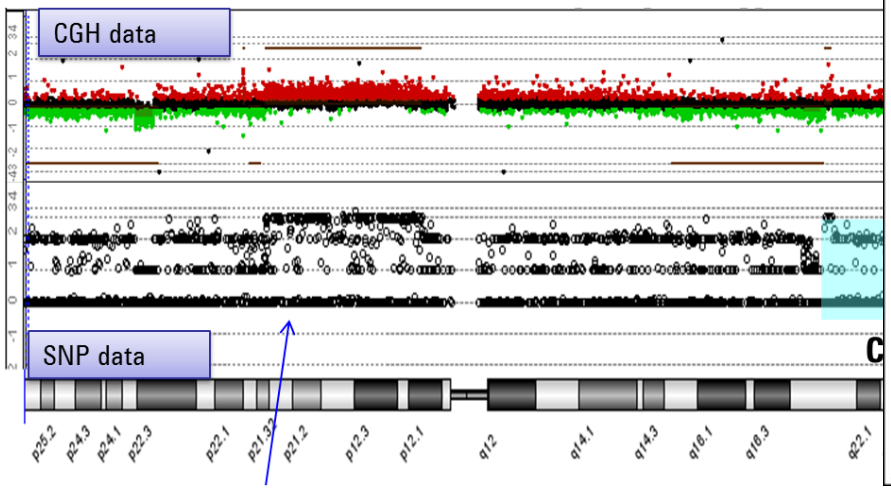
Comparative genomic hybridization using oligonucleotide microarrays and total genomic DNA

Michael T. Barrett*†¶, Alicia Scheffer*†¶, Amir Ben-Dor*†, Nick Sampas*†, Doron Lipson*†§, Robert Kincaid*†, Peter Tsang*†, Bo Curry*†, Kristin Baird¶, Paul S. Meltzer¶, Zohar Yakhini*†, Laurakay Bruhn*†, and Stephen Laderman*†‖

*Agilent Technologies, 3500 Deer Creek Road, Palo Alto, CA 94304; and ¶Cancer Genetics Branch, National Human Genome Research Institute, Bethesda, MD 20892

Communicated by Marvin H. Caruthers, University of Colorado, Boulder, CO, October 29, 2004 (received for review June 29, 2004)

DNA from breast tumor tissue shows amplification, deletion and copy neutral LOH on ChrX:



US008232055B2

(12) **United States Patent**
Bruhn et al.

(10) **Patent No.: US 8,232,055 B2**
(45) **Date of Patent: Jul. 31, 2012**

(54) **COMPARATIVE GENOMIC HYBRIDIZATION ASSAYS USING IMMOBILIZED OLIGONUCLEOTIDE FEATURES AND COMPOSITIONS FOR PRACTICING THE SAME**

(75) Inventors: **Laurakay Bruhn**, Mountain View, CA (US); **Alicia F. Scheffer**, Redwood City, CA (US); **Michael T. Barrett**, Mountain View, CA (US); **Douglas A. Amorese**, Los Altos, CA (US); **Stephen S. Laderman**, Menlo Park, CA (US)

(73) Assignee: **Agilent Technologies, Inc.**, Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 256 days.

(21) Appl. No.: **10/744,595**
(22) Filed: **Dec. 22, 2003**

(65) **Prior Publication Data**

US 2004/0101813 A1 Sep. 30, 2004

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Case Study Summary

- It is worthwhile to pursue innovation
- Without freedom to operate, products would not be available
- Several types of intellectual property protection are consistent with an entity's freedom to operate

- ***In this context, businesses, or other owners, choose to pursue particular options on a case-by-case basis according to a range of considerations***

- Extrapolation to multiple institutions adds further diversity through additional variations of business models, assets, infrastructures, and market models.

Acknowledgements

Agilent Legal:

- **Dick Evans, Senior Counsel**
- **Ping Hwang, Senior Counsel**