



Achieving the Forest, Wood and Paper Industry Technology Agenda in the United States

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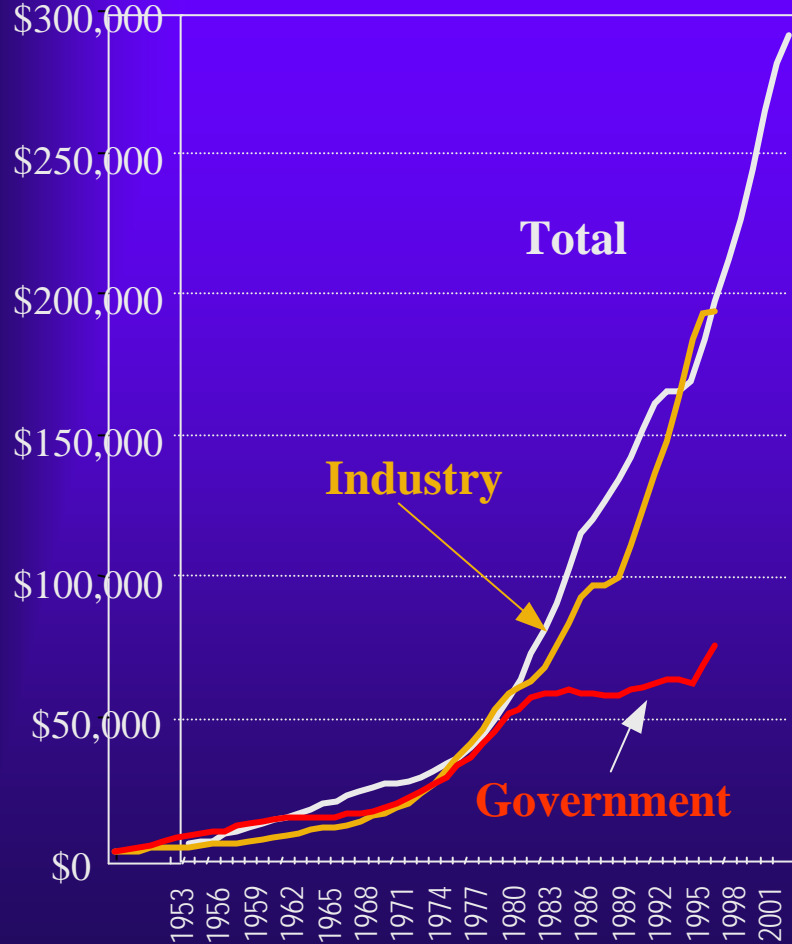
Marcus Wallenberg Prize Symposia

October 10, 2003

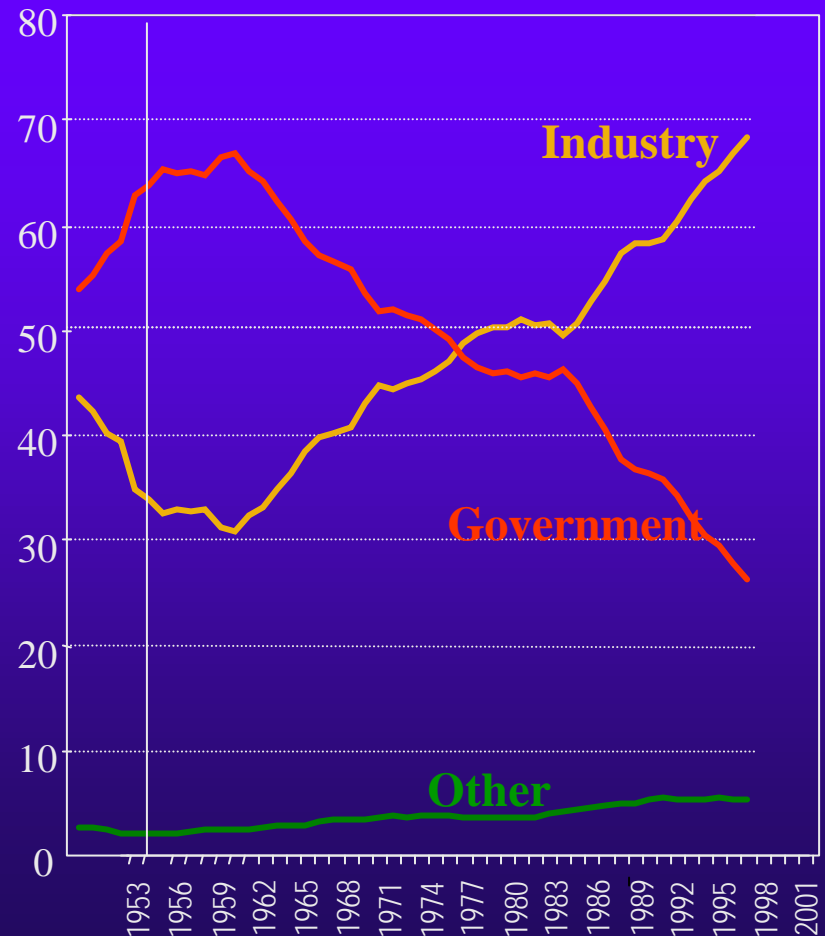
Stockholm, Sweden

National R&D Investment Trends 1953 - 2002

\$ Million U.S. R&D Expenditures



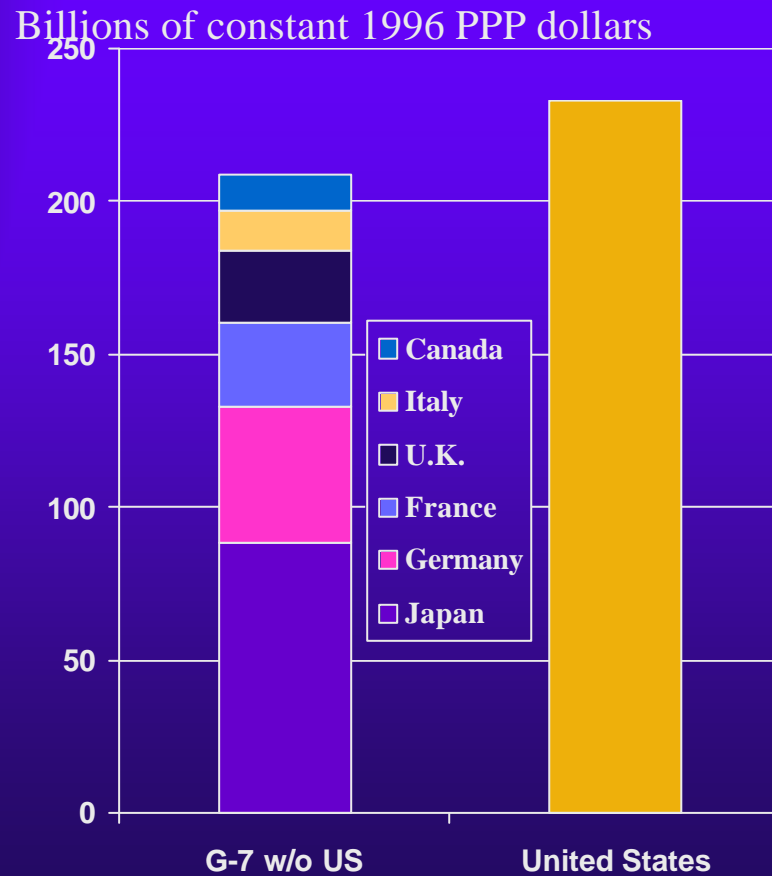
Percent Shares of National R&D



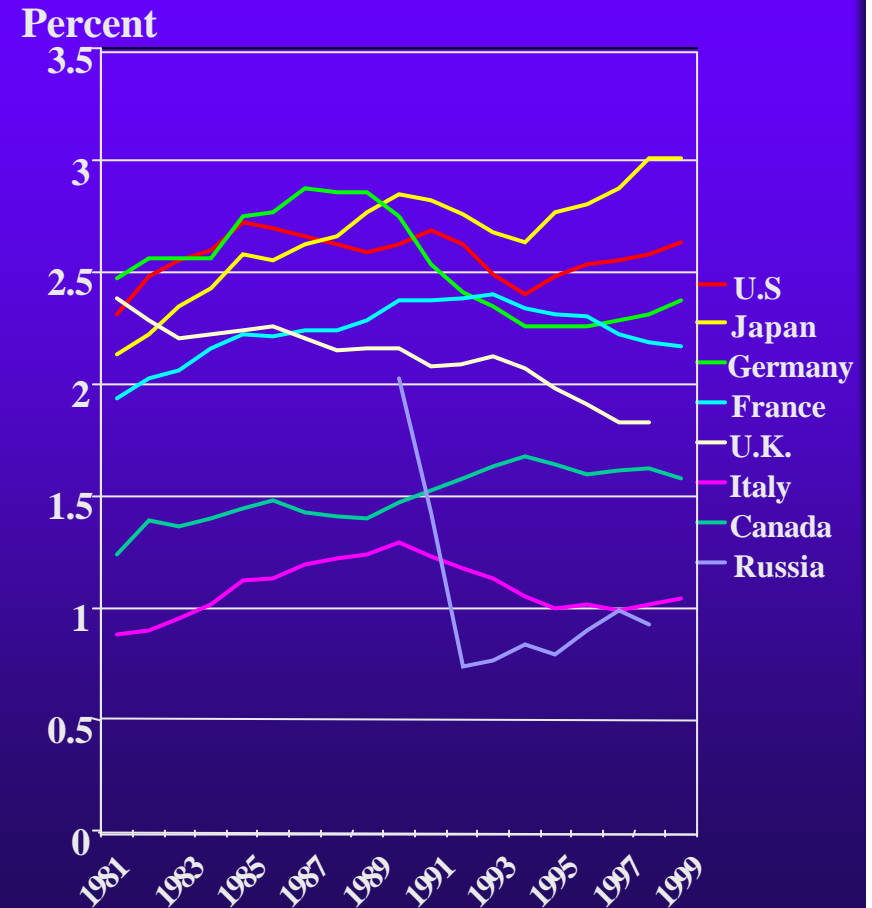
Source: NSF 2002, National Patterns of Research and Development Resources

International R&D Trends

R&D Spending by G-7 Countries (1999)

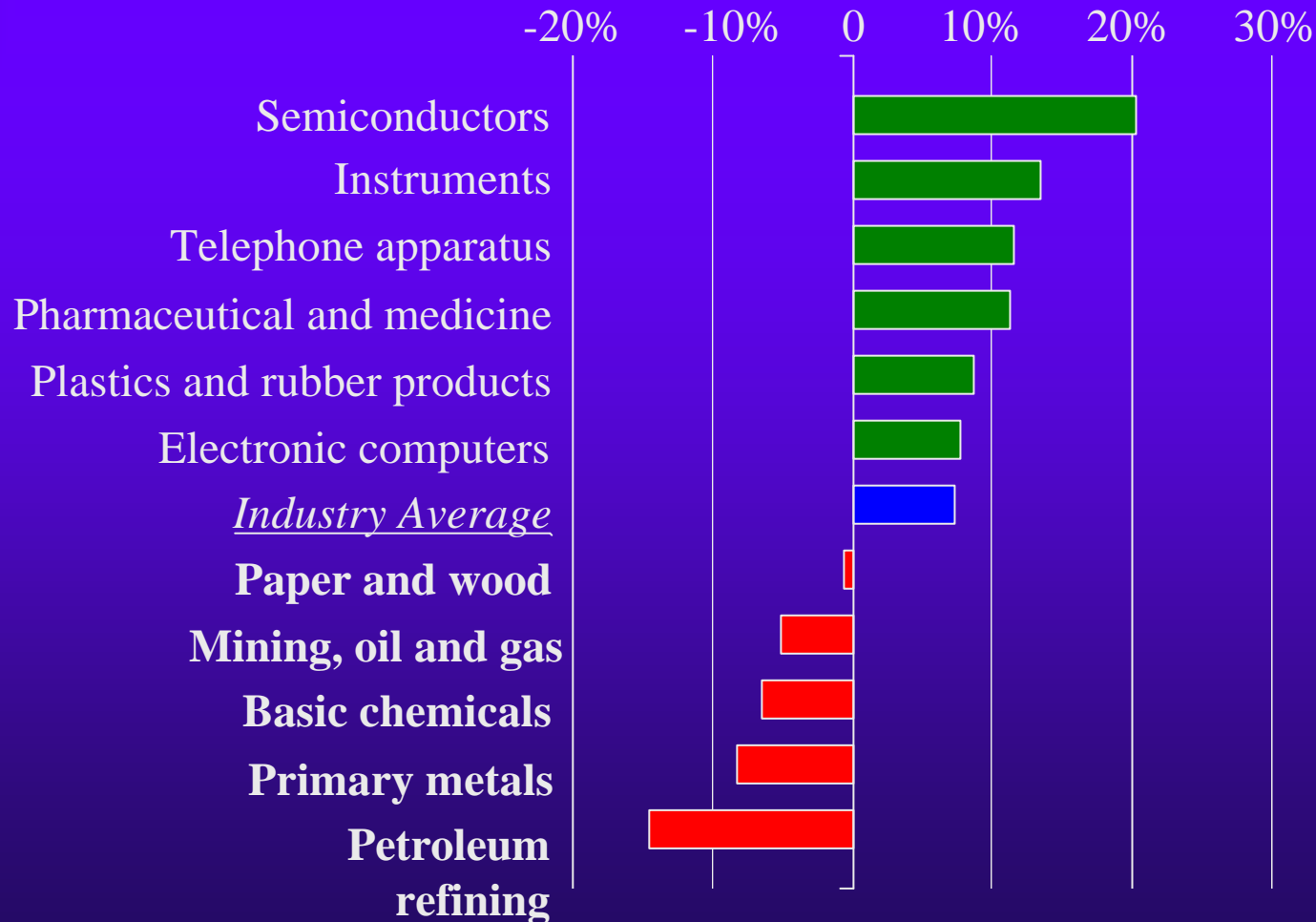


R&D/GDP



Source: NSF 2002., Science and Engineering Indicators

R&D Spending: Annual Growth 1998-2000



Source: DOC 2002. *Corporate R&D Investments, 1994-2000*



The Life Cycle of a Paper Mill

- ✍ Phase 1 – Starting Out
 - high capital, low cost, low returns
- ✍ Phase 2 – Maturing
 - depreciated capital, low cost, high cash flow
- ✍ Phase 3 – Aging
 - needs new investment, higher costs, favorable return, asset at risk
- ✍ Phase 4 – Failed

Facilities in developed countries approaching Phase 3



Forest, Wood and Paper Industry – Challenges

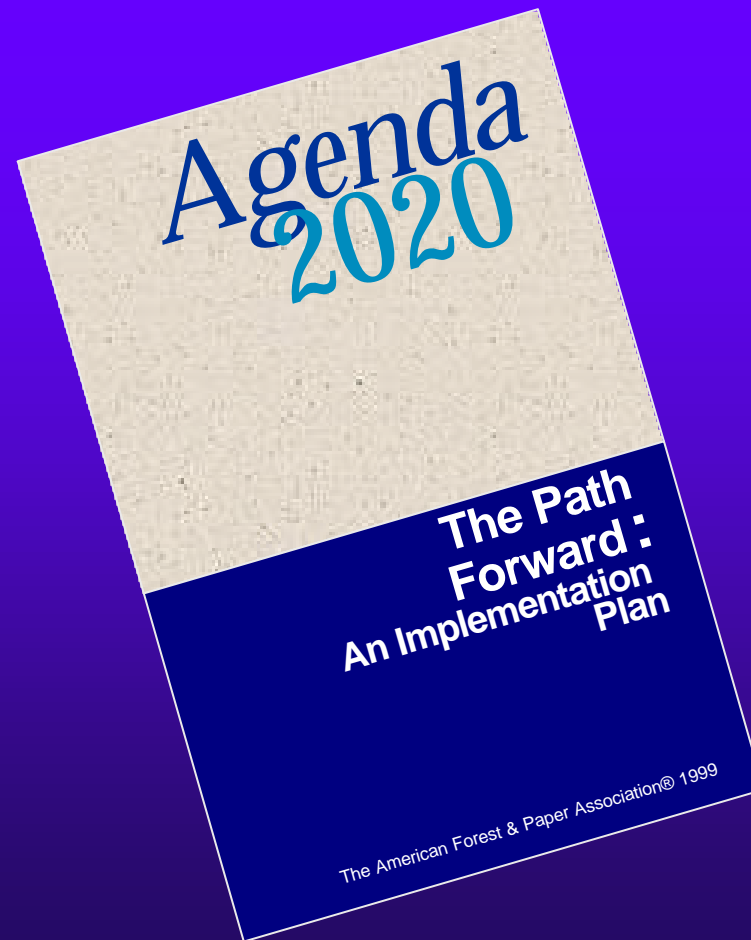
- ✍ Impact of:
 - Consolidation
 - Downsizing R&D
 - Closings
- ✍ Increasing product focus
- ✍ Shorter time horizons
- ✍ Regulation
- ✍ Public opinion
- ✍ Consumer preferences
- ✍ Attracting capital
- ✍ Enabling and basic science increasingly neglected
- ✍ Suppliers unable to fill the gap



Forest, Wood and Paper Industry – Challenges

- ✍ Technology is increasingly important at a time when internal attention to RD&D is diminishing
- ✍ A commitment to innovation is needed
- ✍ Leveraging and focusing must become a priority
- ✍ Time from concept to commercialization must be improved
- ✍ Industry image to investors and to the public must be improved

Agenda 2020 – Aligning Technology Strategy





The New Focus Areas

- ✍ Advancing the Forest “Bio-refinery”
 - Sustainable Forest Productivity
 - New Forest-Based Materials
 - Conversion to new value streams
- ✍ Next Generation Fiber Recycling and Utilization
- ✍ Breakthrough Manufacturing Technologies
- ✍ Energy Self Sufficiency
- ✍ Positively Impacting the Environment
- ✍ Technologically Advanced Workforce
- ✍ Advancing the Wood Products Revolution



Advancing the Forest “Bio-refinery”

- ✎ Evolving existing chemical pulp mills into forest bio-refineries that produce new forest-based products and export substantial amounts of renewable energy, while continuing to meet growing demand for traditional pulp and paper products.

Example result – Clonal propagation of softwoods is arguably the most important currently emerging forest technology with initial benefits of more than 10% reduction in energy required to produce chemical pulp and a 10% reduction in wood production cost



Next Generation Fiber Recycling and Utilization

- ✍ Make recycled fiber interchangeable with virgin fiber with respect to product quality and economics allowing competition with virgin fiber on all metrics: availability, strength potential, quality, processing performance and cost.

Example result – H.B. Fuller and Boise will commercialize an environmentally benign PSA label product this summer. Broad application will save over 1.5 million barrels oil equivalent per year, reduce landfill and increase fiber recovery



Breakthrough Manufacturing Technologies

- ✍ Utilize new/emerging knowledge and technologies to achieve - a 50% reduction in manufacturing cost through a focus on significant process change - a 50% reduction in capital intensity through a focus on simplifying or eliminating process steps - 50% increase in fiber/product properties through better understanding of chemistry, biochemistry and physics.


Example result – A new, innovative paper drying technology with greater than 7 times more heat transfer capability demonstrated at pilot scale and ready for commercial trials could eliminate drying as a bottleneck in many facilities

Energy Self Sufficiency

- 
- ✍ Maintain a high visibility and focus on energy in order that the industry's manufacturing operations will achieve a 50% reduction in thermal and electrical utilization and a greater than 100% increase in power production from renewable fuels — or over 40 million gallons/day of liquid fuels through application and integration of gasification technologies.

Example result – commercial demonstrations of both high and low temperature black liquor gasification in the U.S. by 2004

Environmental Performance

- 
- A vertical image on the left side of the slide shows a dark, weathered key with a circular handle, resting on a light-colored, granular surface like sand or gravel.
- ✍ Build in environmental improvements as a key benefit to new products and processes - ensure emissions and discharge limits are focused on appropriate environmental and human health endpoints - document scientifically defensible approaches for quantifying, characterizing and improving the industry's sustainability - understand and improve the industry's ability to impact the global carbon cycle.

Example result – low temperature plasma destruction of VOC emissions will soon be demonstrated at the GP Port Hudson mill



Technologically Advanced Workforce

- ✍ Training and education to ensure that the technologies chosen to create the forest products industry of the future are operated and managed by a technically superior workforce resulting in a 25% increase in industry profitability.

Example result – National network for operator training, consisting of regional government-industry-university-college partnerships established and funded by the National Science Foundation



Advancing the Wood Products Revolution

- ✍ Through the creation of superior, low-cost, high-value, sustainable wood products and systems, ensure that the two million annual housing starts expected in the US by 2040 will have increased durability, disaster resistance, energy efficiency and reduced environmental impact.

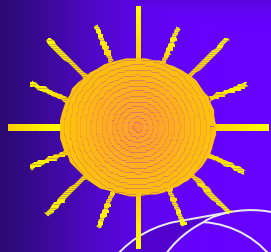
Example result - A new but highly active focus of Agenda 2020 that is enabling the coordination, prioritization and expansion of support for technologies that can revolutionize housing and construction

Growing the Industry's Future through Technology



Agenda 2020 Focus for the Future

Meeting the Challenge of Deployment



Positively Impacting the Environment

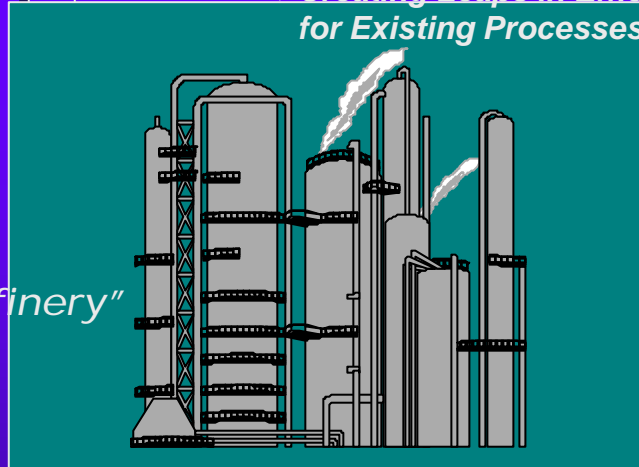
- ↳ Significant Reduction in Greenhouse Gases
- ↳ Decreased Ecological Footprint

Energy Self-Sufficiency

- ↳ Creating Leaps in Efficiency for Existing Processes

Next Generation Fiber Recycling and Utilization

- ↳ Recycled Fiber Indistinguishable from Virgin Fiber



Advancing the Forest "Bio-refinery"

- ↳ Sustainable Forest Productivity
- ↳ New Forest-Based Materials
- ↳ Conversion to New Value Streams

Breakthrough Mfg. Technologies

- ↳ Major Manufacturing Cost/Capital Reduction
- ↳ Significant Increase in Product Properties with Existing Assets



Technologically Advanced Workforce
↳ From Workforce to Knowledge Workers in 7 years

Advancing the Wood Products Revolution

- ↳ Breakthrough Technologies for Revolutionary Wood Structural Systems

Keys to Successful Partnering



- ✍ **Need** that is shared and significant
- ✍ **Importance** (it has to be a priority)
- ✍ **Benefit** for all parties (industry and society)
- ✍ **Business case** compelling enough to sustain success
- ✍ **People** that are knowledgeable, committed and patient with the political process
- ✍ **Willingness** to be flexible
- ✍ **Resources** sufficient to make success possible
- ✍ **Leadership** that is professional, focused, motivated and funded for success