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TRACKING TRENDS & PERFORMANCE IN BASIC RESEARCH

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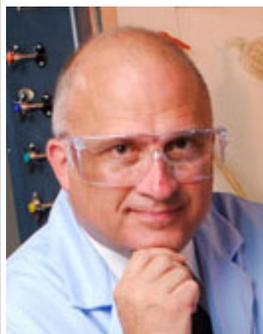
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Special Topics : Biofuels : Arthur Ragauskas

**AUTHOR COMMENTARIES - From Special Topics**
**Biofuels** - August 2008

Interview Date: October 2008



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**Professor Arthur Ragauskas**

From the Special Topic of Biofuels

According to our Special Topics analysis on Biofuels, one of the most-cited papers in the Research Front Map on *Ethanol Biofuels* is "The path forward for biofuels and biomaterials" (Ragauskas AJ, et al., *Science* 311[5760]: 484-9, 27 January 2006). In *Essential Science Indicators*<sup>SM</sup> from *Thomson Reuters*, this paper has 174 cites.

Lead author Professor Arthur Ragauskas is a Professor at the Institute of Paper Science and Technology in the School of Chemistry and Biochemistry at the Georgia Institute of Technology in Atlanta.

Professor Ragauskas is also the Fulbright Distinguished Chair in Alternative Energy at Chalmers University of Technology in Gothenburg, Sweden, as well as a Fellow of the International Academy of Wood Science and the Technical Associations of the Pulp and Paper Industry. In addition, he is the Associate Editor of several journals, including *Biofuels*, *Bioproducts* and *Biorefining* and the *Journal of Wood Chemistry and Technology*.

In the interview below, ScienceWatch.com talks with Prof. Ragauskas about this paper and recent advances in the biofuels industry.

**SW: Would you please describe the major points of your paper and why it is garnering citation attention?**

Our paper recognized that the development of sustainable, secure, and environmentally compatible energy generation would become the research challenge for our generation. Furthermore, the scope and breadth of this global challenge required a multidisciplinary approach focused on creating a sustainable world in which energy, materials, and products are derived from renewable resources in order to initially supplement and eventually replace our dwindling supply of non-renewable resources and to meet projected shortfalls.

In our paper we indicated that non-food plant biomass would be the primary resource of the future, hence the need to develop agro-energy crops that would facilitate low-recalcitrance plants that would provide bountiful low-cost access to cellulose, hemicellulose, and lignin. These bioresources would then be processed in an integrated biorefinery, which would optimize biomass-conversion processes and equipment to produce fuels, power, and chemicals from biomass. In essence, it is analogous to today's petroleum

refineries, which produce multiple fuels and products from petroleum.

Industrial biorefineries have been identified as the most promising route to the creation of a new domestic biobased industry, and our paper highlights the research challenges that need to be addressed for the efficient conversion to biomaterials, biochemicals, biofuels, and biopower.

**SW: How did you become involved in this research, and were there any particular successes or obstacles that stand out?**

This publication involved the collective efforts of key researchers at the Georgia Institute of Technology, Oak Ridge National Laboratory (ORNL), and Imperial College London (ICL). Although many of us, including myself, have spent a career studying different aspect of biomass production and conversion it was the energy crisis that brought to the forefront the magnitude of the challenge involved in developing sustainable biofuels/ biomaterials technologies that would initially supplement and then eventually replace depleted petroleum resources.

Given this challenge, one of the greatest obstacles we faced was forming a team that had the same vision and complementary skill sets. A second challenge and success was taking the time to develop a consensus for this challenge.

**SW: Where do you see your research and the broader field leading in the future?**

As discussed in our *Science* paper, we are very active in developing the next set of innovative biomass-conversion technologies that will provide a low-cost direct set of technologies for converting non-food biomass resources to biofuels, biopower, biomaterials, and biochemicals. To mention just a few examples, B. Davison, J.R. Mielenz, and T. Tschaplinski from ORNL and myself are all involved in one of the three U.S. Department of Energy-funded bioenergy centers. One center, BioEnergy Science Center (BESC) is leading the way to low-recalcitrance plant resources and improved conversion, which will provide the technology platform for widespread, low-cost cellulosic ethanol. Complementary studies involving researchers at ICL and GA Tech have identified promising pathways for the conversion of lignin into green diesel and innovative biomaterials.

Finally, I am the recipient of a Fulbright Chair in Alternative Energy at Chalmers University of Technology, which is focused on developing novel thermal and biological technologies for second- and third-generation biofuels. The broader field will continue in this "systems" approach, where individual improvements must fit into a larger renewable cycle.

**SW: What are the implications of your work for this field?**

Our ongoing studies, in partnership with other colleagues, will lead to a new set of designer engineered energy crops for specific regional and global agroecosystems, along with enhanced saccharification systems and robust fermentation processes incorporated as multiple processes in plants or microbes to accelerate and simplify the end-to-end production of biofuels, biomaterials, and biochemicals. Its impact will be as profound as the discovery and utilization of petroleum for today's society. ■

**Professor Art J. Ragauskas**  
**School of Chemistry and Biochemistry**  
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 and  
**Fulbright Distinguished Chair in Alternative Energy**  
**Forest Products and Chemical Engineering Dept Chemical and Biological Engineering**  
**Chalmers University of Technology**  
**Gothenburg, Sweden**

***Professor Arthur Ragauskas's current most-cited paper in Essential Science Indicators, with 174 cites:***

Figure 1: [+details](#)



Figure 2:



Figure 3:



Ragauskas AJ, *et al.*, "The path forward for biofuels and biomaterials," *Science* 311(5760): 484-9, 27 January 2006. Source: *Essential Science Indicators* from Thomson Reuters.

Keywords: biofuels, non-food plant biomass, agro-energy crops, biorefinery, biomass-conversion technologies, biomaterials, biochemicals.



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