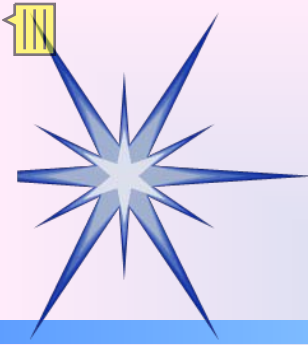


# **The Future of Glass Strength and It's Potential Impact on Society**

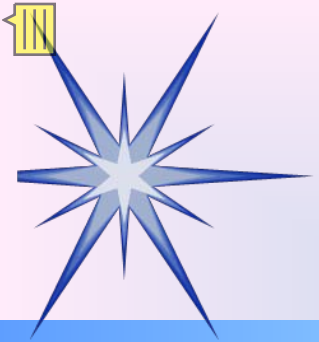
**Interagency/Stakeholder  
Conference  
Washington, DC  
January 21, 2010**

**Michael Greenman  
Glass Manufacturing Industry  
Council  
Executive Director**



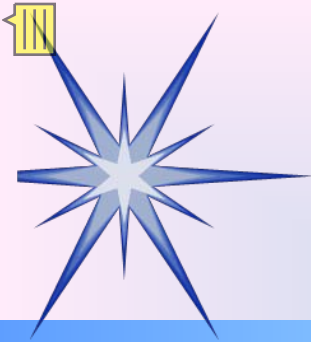
# Strength of Glass

<u>Condition of Glass</u>	<u>lb/Square Inch</u>
➤ Surfaces ground and sandblasted	< 4,000
➤ Pressed Articles	3,000 – 8,000
➤ Blown Ware:	
➤ Hot Iron Molds	4,000 – 9,000
➤ Paste Molds	5,000 – 1,500 10,000
➤ Inner Surfaces	15,000 – 40,000
➤ Drawn tubing or rod	6,000 – 15,000
➤ Window Glass	8,000 – 20,000
➤ <i>LCD (0.65 mm)</i>	<i>~45,000</i>
➤ Annealed fibers	
➤ Annealed	10,000 – 40,000
➤ Freshly drawn	30,000 – 400,000
➤ Gorilla Glass (Samsung – Mobile Phone)	100,000-200,000
➤ <i>Telecommunications Fiber</i>	<i>750,000</i>
➤ <b><i>THEORETICAL/DEMONSTRATED</i></b>	<b><i>2,000,000</i></b>



# Glass Strength Research

- Neglected area of study
  - New technologies have yet to be applied
- Theoretical basis moderately understood
  - Still considerable knowledge needed
  - Practical application technology lacking
- Industry not well funded – low profitability
  - Limited academic research
- Potential for breakthrough success is high!



# Activities To Date

- Two University-Level Contests – 2005, 2007
- Meetings/Conferences
  - “Towards Ultrastrong Glass (Germany) – September 2008
  - “Roadmap Brainstorming” conference (Europe) – Spring 2009
  - Global Conference – at PacRim/GOMD/ICG (Vancouver) – June 2009
  - Later 2009 – Creation of CRT and SST
- Brain Trust
  - Identify experts around the world with interest/knowledge in glass strength.
  - <http://glass-fracture.org>



# Glass Strength Contest

4,000 feet above the Colorado River, you'll find

## Strength in *G* LASS

**So, What would  
you do with  
stronger glass?**

All glass Skywalk at the Grand Canyon  
allows visitors to look straight down at  
the Colorado River 4,000 feet below.

Details and updates at  
[www.materialadvantage.org](http://www.materialadvantage.org)

**1<sup>st</sup> Prize: \$20,000**  
**2<sup>nd</sup> Prize: \$10,000**  
**3<sup>rd</sup> Prize: \$5,000**

Please contact the contest administrator at [glasscontest@materialadvantage.org](mailto:glasscontest@materialadvantage.org)

Submit your best ideas of the desirable physical properties and suitable qualities of glass that could support 10X higher strength.

- \* What new applications can you imagine for this stronger glass?
- \* What degree of cost reduction do you expect per functional unit? (weight, strength)
- \* What about energy savings?
- \* What about environmental impact?
- \* How might such a discovery change our lives?

The Glass Manufacturing Industry Council, the Glass & Critical Minerals Division of The American Ceramic Society, the Center for Glass Research, and the NIST International Materials Institute are here to help you. (Contact with award \$50,000 for the best ideas submitted by students for new, innovative applications for glass based on a 10X improvement in the strength of manufactured glass. We are NOT asking for a description of HOW you would achieve the 10X strength enhancement. We rather what new products, engineering capabilities or cost savings would emerge if a stronger glass were available.)

**With a little help from:**

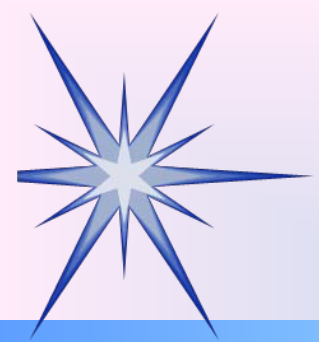
We want your innovative, creative... ideas... ideas... ideas. In addition to the money prizes, monetary honoraria winners may also will be awarded.

**Deadline for Entries: May 6, 2010**



# Realistic Applications

- Structural Glass – (Northwestern U.)
- Stronger Solar Panels (U. of Notre Dame)
- Thin Solar Panels (Friederich Alexander U. – Erlangen, German )
- Skyscraper Agriculture (Alfred U.)
- Glass Roofs (New Mexico I.T.)
- “Everspheres” (MST)



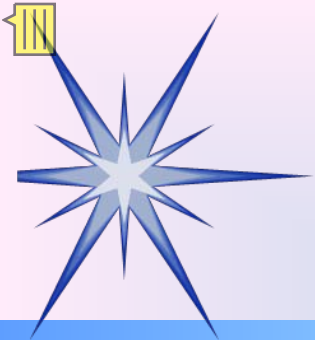
# Future applications can change the way we live

- Aeronautics, transportation, buildings, energy storage, light pipes, Food and drink containers, telecommunications, etc.
- Theoretical strength stronger than steel  
With one third the weight
- Corrosion proof, attractive appearance
  - Engineered transparency and color
  - Refractive index variable within limits



# Glass Strength – Next Steps

- **Glass Strength Support Group** – 50+ (and growing) list of international interested parties – started at Vancouver Conference
- **Core Research Team** – Developing theoretical focus for understanding and then addressing glass weakness and breakage modes.
- **Interagency/Stakeholder Group** – Today – Discussion of agency and stakeholder goals that could be impacted by glass strength
- **Strategic Strength Team** – Taking work of CRT and the needs of agencies and stakeholders to develop “white papers” and proposals to obtain support of glass companies, users and then government agencies to move forward.
- **Strength Workshop** - May 20, 2010 – Corning, New York – Bring together technical factors with agency/stakeholder needs to generate roadmap leading to desired outcomes.
- **Beyond** – We’ll determine together.



[www.gmic.org](http://www.gmic.org)

614-818-9423