

Industry/University Cooperative Research Center for  
High Pressure Plasma  
Energy, Agriculture and Biomedical Technologies

# *C-PEAB CENTER UPDATES*



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



THE GEORGE  
WASHINGTON  
UNIVERSITY  
WASHINGTON, DC



# Plasma for Energy, Agriculture and Biomedical Technologies: Science & Engineering News

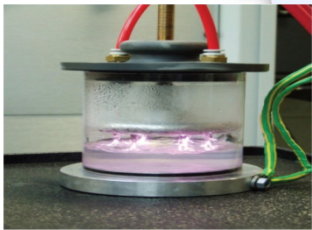
icpm<sup>7</sup>



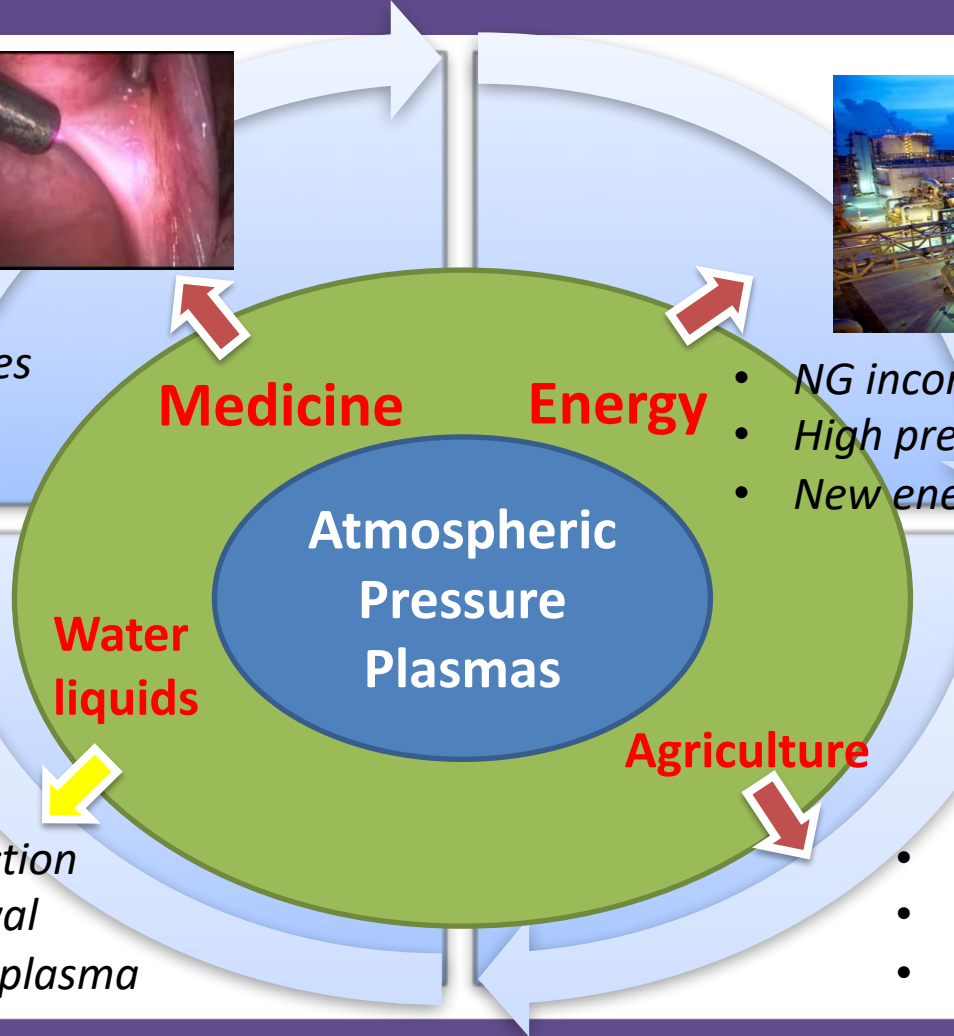
7th International Conference on Plasma Medicine  
Philadelphia, USA  
June 17th-22nd, 2018



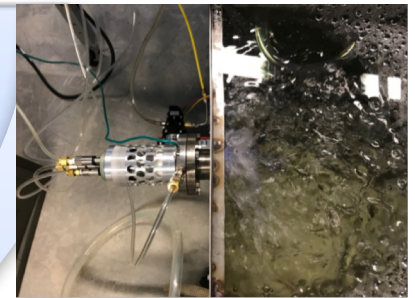
- SCC-Cancer surgeries
- AK treatment
- Immunotherapy & adaptive plasmas



- PFOS/PFOA destruction
- Heavy metal removal
- High volume liquid plasma

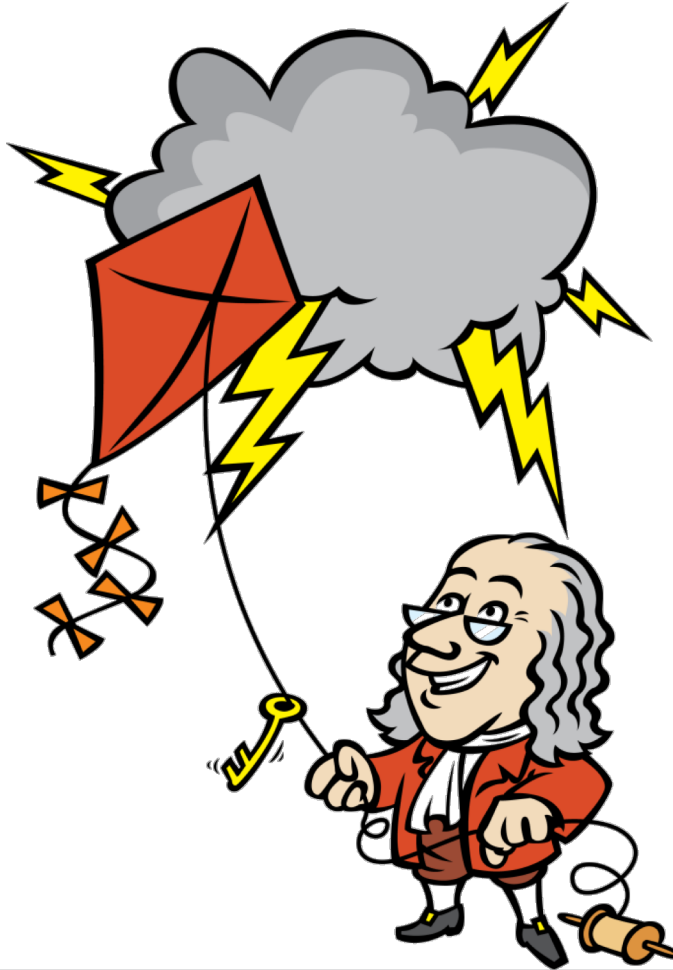


- NG incorporation in fuel
- High pressure CO<sub>2</sub> dissociation
- New energetic materials



- Plasma hydroponics
- Vaccination plants
- Large volume misting

# Industry/University Cooperative Research Center for High Pressure Plasma Energy, Agriculture and Biomedical Technologies



Membership Agreement



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



THE GEORGE WASHINGTON UNIVERSITY  
WASHINGTON, DC



# IUCRC PEAB Members:

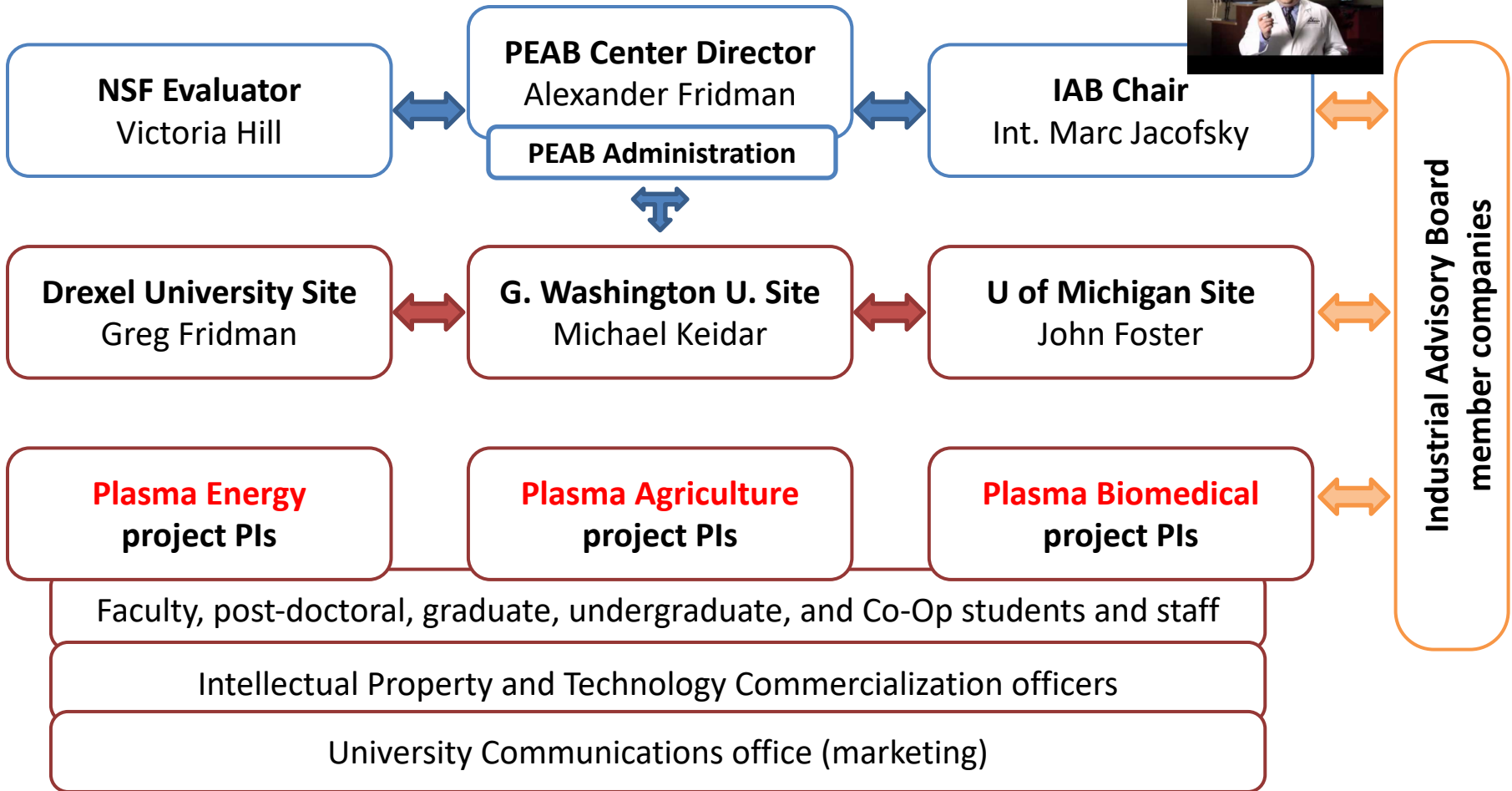
Company	Agreement signed	Member type	POC Name
<b>JM Nanotech</b>	5/18/18	full	Anna Woods
<b>AA Plasma</b>	12/1/18	full	Charles Bailey
<b>Plasmology4</b>	1/22/19	full	Marc Jacofsky
<b>PLA</b>	1/31/19	full	John Russo
<b>TechX</b>	10/23/18	full	Madhu Kundrap
<b>Bridge12</b>	8/29/18	full	Jags Sirigiri
<b>Sandia Nat Lab</b>			Matthey Hopkins
<b>Suprawater</b>		full	Felix Mallette
<b>ECCL Aero</b>		full	Larry Knauer
<b>EHT</b>		full	Tim Ziemba
<b>USDA ARS</b>	n/a	mentor	Brendan Niemira
<b>FDA CDRH</b>	n/a	mentor	Dinesh V. Patwardhan



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



# C-PEAB Center Structure



# IUCRC PEAB Industrial Advisory Board Bylaws

## Industrial Advisory Board Bylaws

The High Pressure Plasma for Energy, Agriculture, and Biomedical Technologies IUCRC (C-PEAB) Industrial Advisory Board (IAB) Bylaws are intended to help guide the C-PEAB site directors, project PIs, and the IAB members in terms of project presentations, calls for proposals, funding, the IAB voting process, and attendance at the C-PEAB Semi-Annual meetings.

### IAB MEMBERSHIP

All industry members who have contributed at least \$50,000 for a particular year are granted full voting rights on the IAB.

1. The IAB may also choose to accept any number of *in-kind* members as desired without voting rights. If an *in-kind* member desires a full voting position, the IAB members must, by 2/3 majority, agree that the member is providing at least \$50,000 of in-kind contribution. Absent the 2/3 majority agreement, an *in-kind* member can provide advice and can participate in the discussion associated with the voting, and can request Associate membership, as described below.
2. Associate membership—\$25,000 annually—intended for Foundations and “start-ups” (with half voting rights). If an *in-kind* member desires a half voting position, the IAB members must, by 2/3 majority, agree that the member is providing at least \$25,000 of in-kind contribution. Absent the 2/3 majority agreement, and *in-kind* member can provide advice and can participate in the discussion associated with the voting but would have no voting rights.
3. The IAB may choose to accept representatives of regulatory agencies (USDA, FDA, EPA, etc) as Mentors. IAB Mentors are unable to vote and are excused from the IAB closed-door session but are encouraged to offer regulatory guidance to the IAB and to the project PIs.

### FACULTY REQUEST FOR PROPOSALS

The process for researchers to propose projects to obtain funding from the C-PEAB is as follows:

1. The request for pre-proposals shall be sent to researchers 6-8 weeks prior to the nearest C-PEAB Semi-Annual Meeting.
2. Researchers requesting funding are expected to submit their pre-proposals using the format and timeline listed within the call for proposals.
3. Pre-proposals will be evaluated by IAB members, and IAB members working with C-PEAB site directors will select the projects to be presented during the nearest C-PEAB Semi-Annual meeting for consideration for funding.

### PROPOSALS

Projects selected for full proposals and consideration by the IAB are to be presented by a faculty member, student, or IAB member during the nearest C-PEAB Semi-Annual Meeting. Proposals and presentation guidelines, deadlines and formatting will be announced in advance of the

### IAB RESPONSIBILITIES

Each IAB member must be present or may be represented by proxy during each C-PEAB Semi-Annual meeting.

For projects with IAB members voting on funding, the IAB member's or representative's attendance during the C-PEAB Semi-Annual Meeting and closed-door IAB meeting is mandatory and a vote is expected. If an IAB member or representative is not in attendance, his/her vote will go to a pool and will be distributed evenly among other projects requesting funding.

### IAB VOTING PROCESS

IAB members who are not able to attend the meeting at which new projects will be voted, may arrange to have their votes submitted by written proxy. Alternatively, they may choose someone else who will be attending the meeting as their proxy delegate. A common choice is to use the IAB Board Chair or co-Chair as the proxy for members who cannot attend.

IAB members are encouraged to allocate their votes amongst projects offered by the university with whom they joined the consortium. In this fashion the funding is already accounted for such that the hours worked by students on selected projects already have funds in place. However, if the IAB member wishes to do so, he has the right to vote for projects from other universities reflecting those projects of greatest value to the IAB members. In these situations, funds transfers will need to be accommodated.

The recommended voting process is as follows:

After all presentations regarding all proposed projects have been completed, the IAB members will hold a voting meeting.

Each IAB member can vote for 5 projects, rank ordering the 5 most important projects where a score of 5 is the most important project, and a 1 is the least important of the 5 projects most valued by the IAB member. Projects receiving a score of 5 from one or more IAB members will definitely be selected for funding and should assume that they will provide significant interaction with corresponding one or more industrial partners.

Remaining projects which did not receive one or more scores of 5, but which otherwise have strong voting support will then contend for any remaining industrial support funding. For each university with remaining industrial support funding, additional projects will be selected from the highest cumulative scores and will be recommended for support.

Following the voting, the IAB chairman and the university representatives will review the results to assure that available funds have been properly allocated. In particular, multi-university cooperative projects of larger scale may require greater levels of funding than individual projects.

Additional meetings will be held throughout the year to review progress on the selected projects and assure additional guidance as necessary. Members who are unable to attend may email their votes to the IAB chair or in writing to a selected proxy.

At this meeting votes are of the form:

- Very Interested (5)
- Interested (4)
- Interested with Change (3)
- Not Interested (2)
- Abstain (1)

All IAB members are invited to vote regarding each project, as well as to provide written guidance on how to improve the value of the project to their organization, or as a science contribution of national value.

Feedback from this meeting, may identify one or more projects for specific NSF attention, projects for multi-university cooperation etc.

### Project Selection

Following the voting procedure, the Site Directors, Center Director, and the IAB chair allocate funding to projects in the following manner:

1. Projects that received at least one rating of Very Interested (5) will be funded.
2. All ratings for all projects will be summarized and funding allocation will be proposed by the Site Directors and the Center Director to the IAB Chair for approval.
3. Projects with low ratings will be recommended for removal by the Site Directors and the Center Director to the IAB Chair.
4. IAB Chair will secure agreement of the IAB prior to announcement of project funding allocation to the Project PIs no later than 2 weeks following the IAB meeting.

### PROGRESS REPORT

Funded project researchers are required to present their progress during the C-PEAB Semi-Annual Meeting. This presentation and poster presentation should be completed by the corresponding faculty members and graduate students. Faculty attendance during this meeting is mandatory.

### COMPLETED PROJECTS REPORT

All completed projects are expected to include a written report with research results, milestones, and deliverables, and any papers and/or presentations related to the project should be delivered to the IAB. The final report is due prior to the C-PEAB Semi-Annual Meeting.

### PAPERS AND CONFERENCE PUBLICATIONS

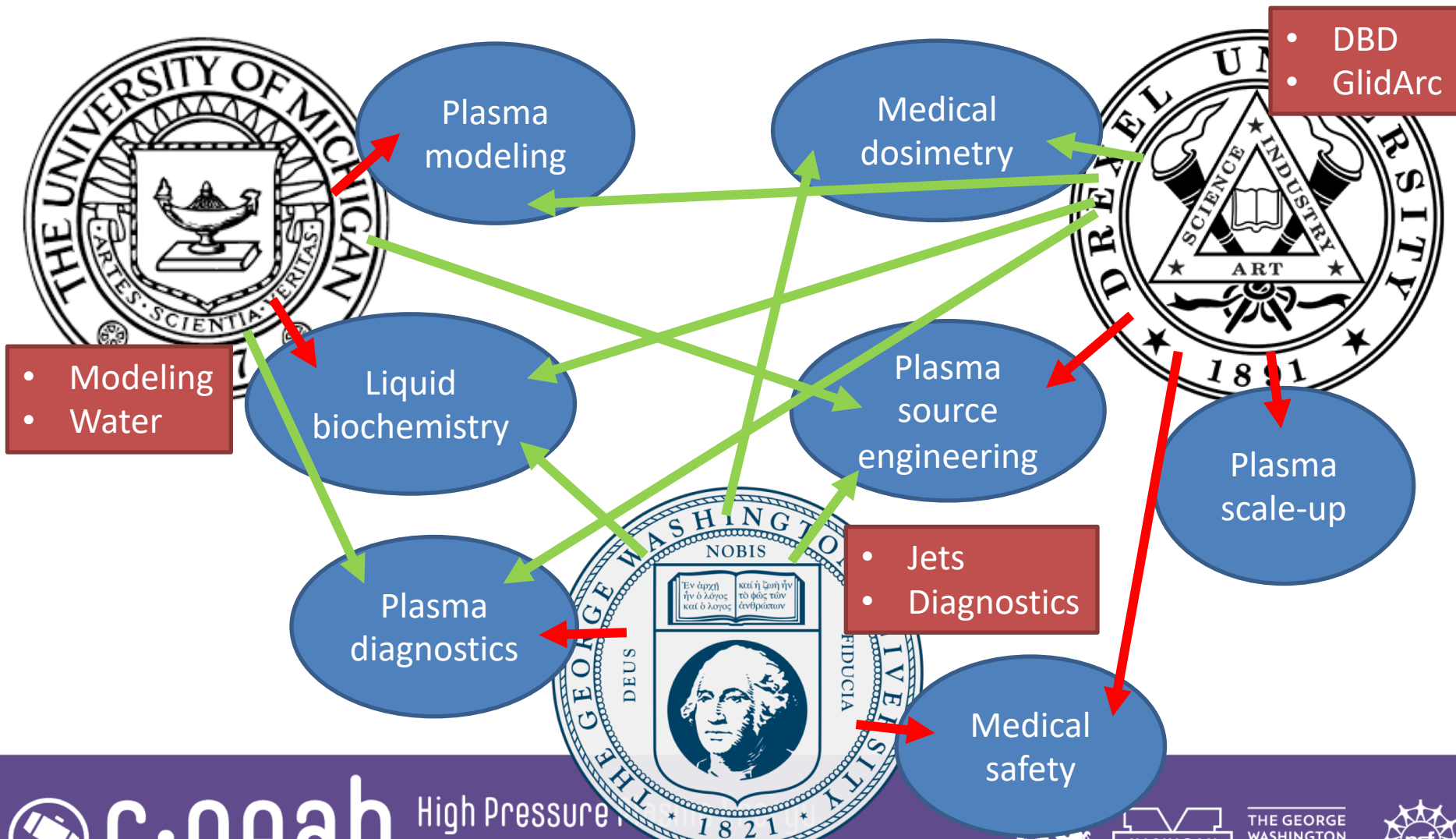
All funded researchers are expected to provide a copy of their papers and conference proceedings to IAB members. These will be securely posted on the C-PEAB website (<https://www.c-peab.org/>).



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



# IUCRC PEAB Capabilities: Synergy & Complementarity



# IUCRC PEAB:

## Common *Fundamentals & Engineering Challenges*



### Medicine:

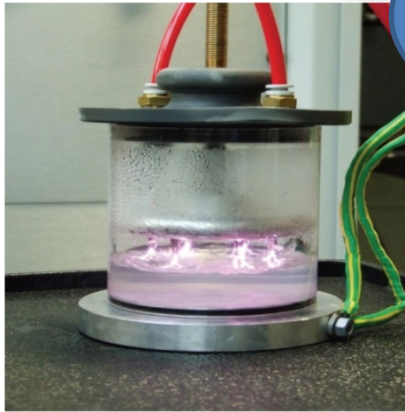
40+ successful cancer surgeries



### Energy:

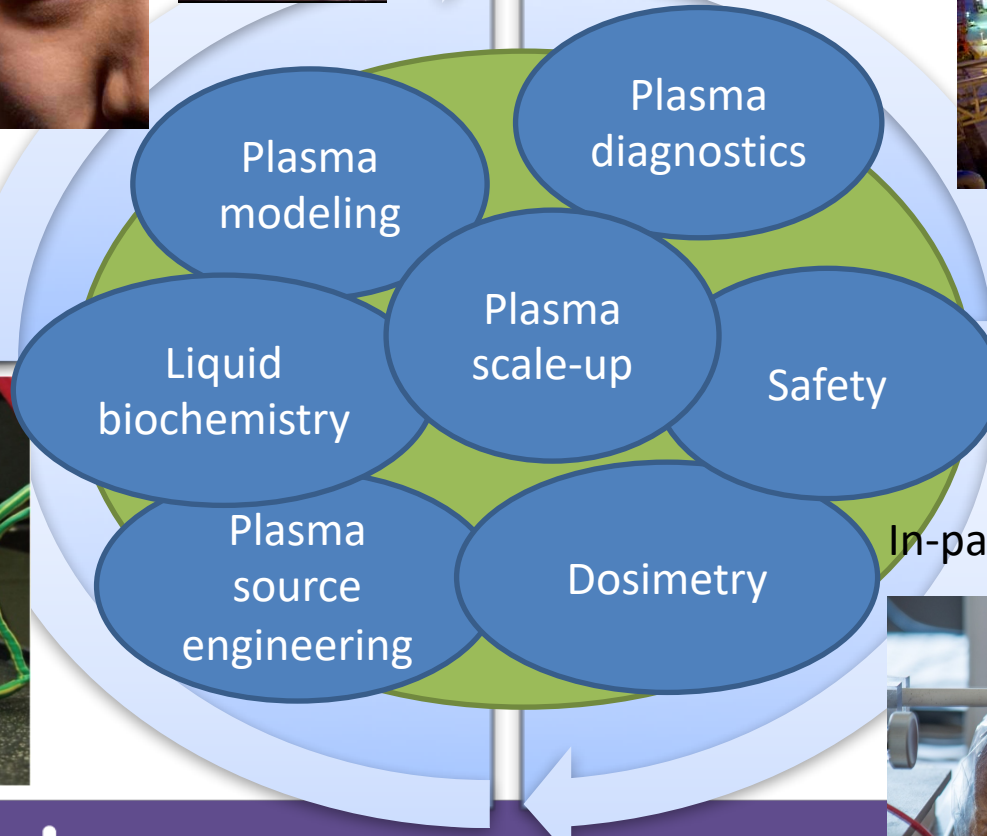
Natural gas liquefaction  
CO<sub>2</sub> sequestration

### Water / liquids



### Agriculture:

In-package food disinfection



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



# IUCRC PEAB PROJECTS

- **Project 1:** Plasma chemistry of water and other liquids, **DU**, PI: Greg Fridman
- **Project 2:** Waste-to-Energy and Water Treatment: Scaling Up to Industrial Size Gliding Arc Plasma, **DU**, PI: Alexander Rabinovich
- **Project 3:** Planar plasma jet: characterization, diagnostics and surface interaction, **DU**, PI: Danil Dobrynin
- **Project 4:** Adaptive plasmas and plasma mechanism, **GWU**, PI: Michael Keidar, Taeyoung Lee
- **Project 5:** Plasma simulation validations, **GWU**, PI: Carles Corbella
- **Project 6:** Discharge initiation, **GWU**, PI: Michael Keidar
- **Project 7:** Adjustable pH plasma based water purification system, **UM**, PI: John Foster
- **Project 8:** Efficacy of Plasma Removal of Oil Molecules in Water, **UM**, PI: John Foster/Mark Kushner
- **Project 9:** Addressing impedance matching and noise generation in pulsed power plasma reactors, **UM**, PI: John Foster / Mark Kushner
- **Project 10:** Water Treatment and Waste-to-Energy Conversion by Plasma and Nanoparticles, **DU**, PI: Anatoly Maltsev



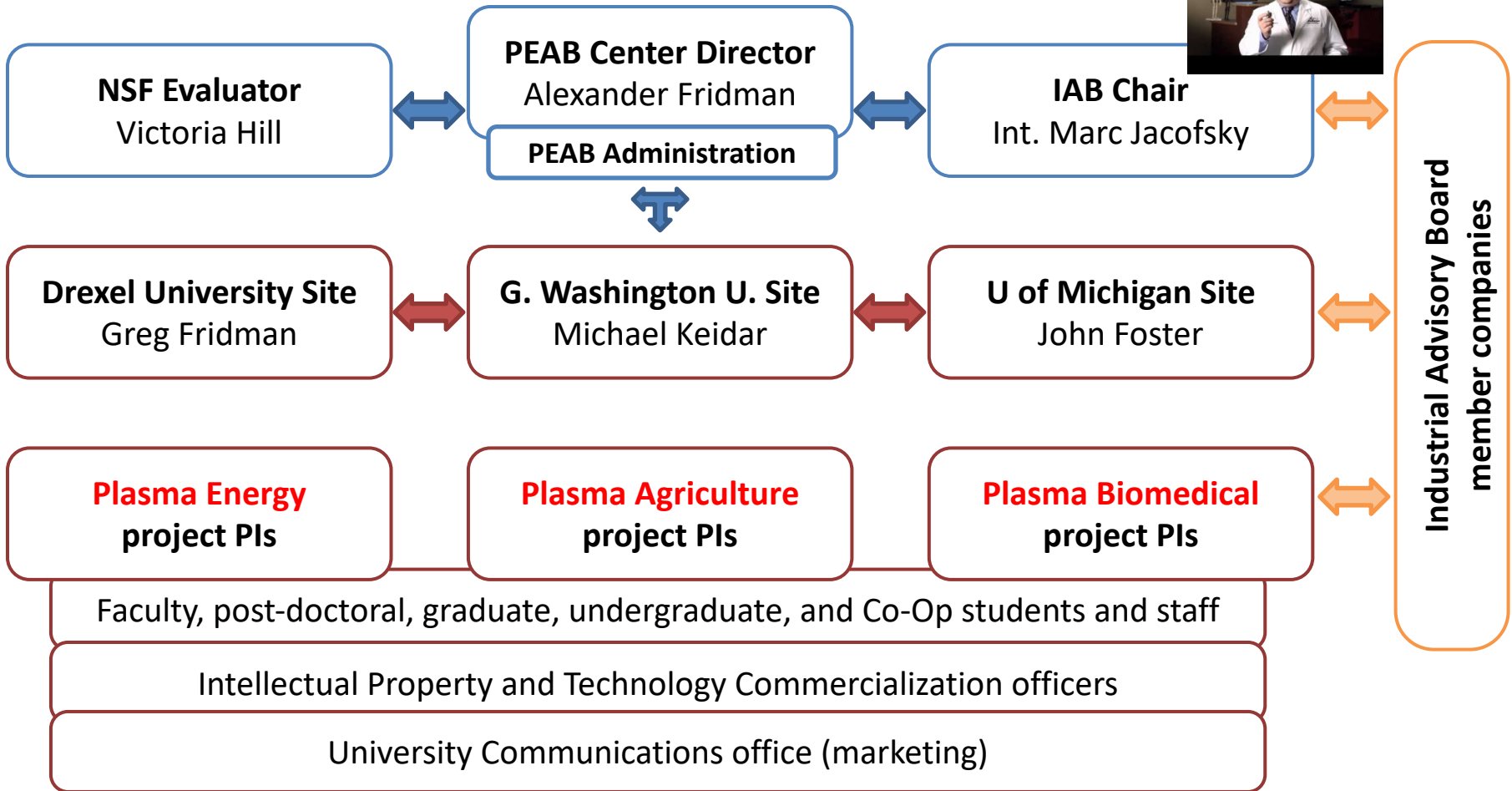
High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



THE GEORGE  
WASHINGTON  
UNIVERSITY  
WASHINGTON, DC



# C-PEAB Center Structure



# IUCRC PEAB Industrial Advisory Board Bylaws

## Industrial Advisory Board Bylaws

The High Pressure Plasma for Energy, Agriculture, and Biomedical Technologies IUCRC (C-PEAB) Industrial Advisory Board (IAB) Bylaws are intended to help guide the C-PEAB site directors, project PIs, and the IAB members in terms of project presentations, calls for proposals, funding, the IAB voting process, and attendance at the C-PEAB Semi-Annual meetings.

### IAB MEMBERSHIP

All industry members who have contributed at least \$50,000 for a particular year are granted full voting rights on the IAB.

1. The IAB may also choose to accept any number of *in-kind* members as desired without voting rights. If an *in-kind* member desires a full voting position, the IAB members must, by 2/3 majority, agree that the member is providing at least \$50,000 of in-kind contribution. Absent the 2/3 majority agreement, an *in-kind* member can provide advice and can participate in the discussion associated with the voting, and can request Association membership, as described below.
2. Associate membership—\$25,000 annually—intended for Foundations and “start-ups” (with half voting rights). If an *in-kind* member desires a half voting position, the IAB members must, by 2/3 majority, agree that the member is providing at least \$25,000 of in-kind contribution. Absent the 2/3 majority agreement, and *in-kind* member can provide advice and can participate in the discussion associated with the voting but would have no voting rights.
3. The IAB may choose to accept representatives of regulatory agencies (USDA, FDA, EPA, etc) as Mentors. IAB Mentors are unable to vote and are excused from the IAB closed-door session but are encouraged to offer regulatory guidance to the IAB and to the project PIs.

### FACULTY REQUEST FOR PROPOSALS

The process for researchers to propose projects to obtain funding from the C-PEAB is as follows:

1. The request for pre-proposals shall be sent to researchers 6-8 weeks prior to the nearest C-PEAB Semi-Annual Meeting.
2. Researchers requesting funding are expected to submit their pre-proposals using the format and timeline listed within the call for proposals.
3. Pre-proposals will be evaluated by IAB members, and IAB members working with C-PEAB site directors will select the projects to be presented during the nearest C-PEAB Semi-Annual meeting for consideration for funding.

### PROPOSALS

Projects selected for full proposals and consideration by the IAB are to be presented by a faculty member, student, or IAB member during the nearest C-PEAB Semi-Annual Meeting. Proposals and presentation guidelines, deadlines and formatting will be announced in advance of the

### IAB RESPONSIBILITIES

Each IAB member must be present or may be represented by proxy during each C-PEAB Semi-Annual meeting.

For projects with IAB members voting on funding, the IAB member's or representative's attendance during the C-PEAB Semi-Annual Meeting and closed-door IAB meeting is mandatory and a vote is expected. If an IAB member or representative is not in attendance, his/her vote will go to a pool and will be distributed evenly among other projects requesting funding.

### IAB VOTING PROCESS

IAB members who are not able to attend the meeting at which new projects will be voted, may arrange to have their votes submitted by written proxy. Alternatively, they may choose someone else who will be attending the meeting as their proxy delegate. A common choice is to use the IAB Board Chair or co-Chair as the proxy for members who cannot attend.

IAB members are encouraged to allocate their votes amongst projects offered by the university with whom they joined the consortium. In this fashion the funding is already accounted for such that the hours worked by students on selected projects already have funds in place. However, if the IAB member wishes to do so, he has the right to vote for projects from other universities reflecting those projects of greatest value to the IAB members. In these situations, funds transfers will need to be accommodated.

The recommended voting process is as follows:

After all presentations regarding all proposed projects have been completed, the IAB members will hold a voting meeting.

Each IAB member can vote for 5 projects, rank ordering the 5 most important projects where a score of 5 is the most important project, and a 1 is the least important of the 5 projects most valued by the IAB member. Projects receiving a score of 5 from one or more IAB members will definitely be selected for funding and should assume that they will provide significant interaction with corresponding one or more industrial partners.

Remaining projects which did not receive one or more scores of 5, but which otherwise have strong voting support will then contend for any remaining industrial support funding. For each university with remaining industrial support funding, additional projects will be selected from the highest cumulative scores and will be recommended for support.

Following the voting, the IAB chairman and the university representatives will review the results to assure that available funds have been properly allocated. In particular, multi-university cooperative projects of larger scale may require greater levels of funding than individual projects.

Additional meetings will be held throughout the year to review progress on the selected projects and assure additional guidance as necessary. Members who are unable to attend may email their votes to the IAB chair or in writing to a selected proxy.

At this meeting votes are of the form:

- Very Interested (5)
- Interested (4)
- Interested with Change (3)
- Not Interested (2)
- Abstain (1)

All IAB members are invited to vote regarding each project, as well as to provide written guidance on how to improve the value of the project to their organization, or as a science contribution of national value.

Feedback from this meeting, may identify one or more projects for specific NSF attention, projects for multi-university cooperation etc.

### Project Selection

Following the voting procedure, the Site Directors, Center Director, and the IAB chair allocate funding to projects in the following manner:

1. Projects that received at least one rating of Very Interested (5) will be funded.
2. All ratings for all projects will be summarized and funding allocation will be proposed by the Site Directors and the Center Director to the IAB Chair for approval.
3. Projects with low ratings will be recommended for removal by the Site Directors and the Center Director to the IAB Chair.
4. IAB Chair will secure agreement of the IAB prior to announcement of project funding allocation to the Project PIs no later than 2 weeks following the IAB meeting.

### PROGRESS REPORT

Funded project researchers are required to present their progress during the C-PEAB Semi-Annual Meeting. This presentation and poster presentation should be completed by the corresponding faculty members and graduate students. Faculty attendance during this meeting is mandatory.

### COMPLETED PROJECTS REPORT

All completed projects are expected to include a written report with research results, milestones, and deliverables, and any papers and/or presentations related to the project should be delivered to the IAB. The final report is due prior to the C-PEAB Semi-Annual Meeting.

### PAPERS AND CONFERENCE PUBLICATIONS

All funded researchers are expected to provide a copy of their papers and conference proceedings to IAB members. These will be securely posted on the C-PEAB website (<https://www.c-peab.org/>).



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



# IUCRC PEAB

## Industrial Advisory Board Bylaws



IAB members are encouraged to allocate their votes amongst projects offered by the university with whom they joined the consortium. In this fashion the funding is already accounted for such that the hours worked by students on selected projects already have funds in place. However, if the IAB member wishes to do so, he has the right to vote for projects from other universities reflecting those projects of greatest value to the IAB members. In these situations, funds transfers will need to be accommodated.



Each IAB member can vote for 5 projects, rank ordering the 5 most important projects where a score of 5 is the most important project, and a 1 is the least important of the 5 projects most valued by the IAB member. Projects receiving a score of 5 from one or more IAB members will definitely be selected for funding and should assume that they will provide significant interaction with corresponding one or more industrial partners.

Following the voting procedure, the Site Directors, Center Director, and the IAB chair allocate funding to projects in the following manner:



1. Projects that received at least one rating of Very Interested (5) will be funded.
2. All ratings for all projects will be summarized and funding allocation will be proposed by the Site Directors and the Center Director to the IAB Chair for approval.
3. Projects with low ratings will be recommended for removal by the Site Directors and the Center Director to the IAB Chair.
4. IAB Chair will secure agreement of the IAB prior to announcement of project funding allocation to the Project PIs no later than 2 weeks following the IAB meeting.

# IUCRC PEAB PROJECTS

- **Project 1:** Plasma chemistry of water and other liquids, **DU**, PI: Greg Fridman
- **Project 2:** Waste-to-Energy and Water Treatment: Scaling Up to Industrial Size Gliding Arc Plasma, **DU**, PI: Alexander Rabinovich
- **Project 3:** Planar plasma jet: characterization, diagnostics and surface interaction, **DU**, PI: Danil Dobrynin
- **Project 4:** Adaptive plasmas and plasma mechanism, **GWU**, PI: Michael Keidar, Taeyoung Lee
- **Project 5:** Plasma simulation validations, **GWU**, PI: Carles Corbella
- **Project 6:** Discharge initiation, **GWU**, PI: Michael Keidar
- **Project 7:** Adjustable pH plasma based water purification system, **UM**, PI: John Foster
- **Project 8:** Efficacy of Plasma Removal of Oil Molecules in Water, **UM**, PI: John Foster/Mark Kushner
- **Project 9:** Addressing impedance matching and noise generation in pulsed power plasma reactors, **UM**, PI: John Foster / Mark Kushner
- **Project 10:** Water Treatment and Waste-to-Energy Conversion by Plasma and Nanoparticles, **DU**, PI: Anatoly Maltsev



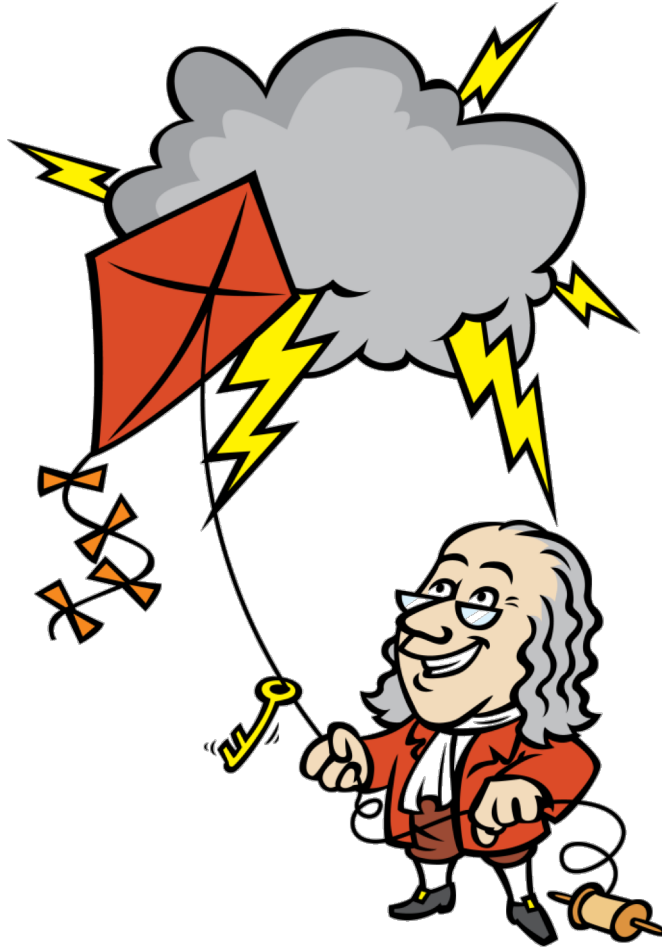
High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



THE GEORGE  
WASHINGTON  
UNIVERSITY  
WASHINGTON, DC



# Industry/University Cooperative Research Center for High Pressure Plasma Energy, Agriculture and Biomedical Technologies



High Pressure Plasma Energy,  
Agriculture, and Biomedical Technologies



THE GEORGE  
WASHINGTON  
UNIVERSITY  
WASHINGTON, DC

