I. Your Name, School, Department, Date of Submission

Annual Report February 28, 2007
Matthew John Goeckner,
Erik Jonsson School of Engineering and Computer Science,
Electrical Engineering

II. I received the Ph.D. in Physics from the University of Iowa in Dec. 1990 under the direction of J. A. Goree. I have held positions at The University of Wisconsin (Postdoc - Plasma Engineering Research Center) Princeton University (Research Physicist - Low-temperature plasmas) and Varian Associates (Research Engineer - Commercial applications of plasmas). I have been a faculty member at the University of Texas at Dallas since Sept. 1999, at the rank of Associate Professor in Electrical Engineering. My primary interest is in the science of low-temperature plasmas. These plasmas are used in a wide range of industrial applications from the production of semiconductor devices and architectural glass to high efficiency lighting applications. In each of these environments, the output is determined by a number of interlocking physical/chemical systems. My research is aimed at understanding these interlocking systems and how they can be used to our advantage. Thus, I am working toward the development of both basic science studies (funded by Federal/State monies) and specific industrial projects (funded by industry).

III. Scholarly and Creative Activities.

a) Authored books.

b) Edited books.

c) Refereed journal publications.


60 E.A. Joseph, S.P. Sant, L.J. Overzet and M.J. Goeckner, The Role of Chamber Dimension in Fluorocarbon Based Etching of Silicon Dioxide and its Effects on Gas and Surface-Phase Chemistry, Journal of Vacuum Science and Technology A 26, Accepted with minor revisions (2008)


d) Complete articles in edited volumes.

e) Refereed conference presentations or Abstracts.
f) Juried exhibitions.

g) Invited performances, lectures, colloquia presentations or exhibitions.

77 M.J. Goeckner, CT Nelson, SP Sant, AK Jindal, EA Joseph, BS Zhou, G Pardon-Wells, B Jarvis, R Pierce and LJ Overzet (INVITED – PLAN TO ATTEND)
Title Plasma-Surface interactions.

76 M.J. Goeckner,
Unraveling the Complex Process Known as 'Plasma Chemistry'.
Applied Materials, Sunnyvale, CA, June 25, 2007

75 M.J. Goeckner, G. Pardon-Wells, B Jarvis, A.K. Jindal
Controlling gas chemistry in process tools for control of surface processes,
5th International Symposium on Advanced Plasma Processes and Diagnostics,
Suwon, Korea, April. 6-7, 2007

74 M.J. Goeckner, S. Sant, C. Nelson, E. Joseph, B. Zhou and L.J. Overzet
Unraveling the Complex Process Known as 'Plasma Chemistry'.
Baylor University, Waco, TX, Feb 9, 2007

h) Non-refereed publications.

i) Non-refereed abstracts.


79 M.J. Goeckner, G. Pardon-Wells, B Jarvis, A.K. Jindal
Controlling gas chemistry in process tools for control of surface processes,
Proceedings of the 5th International Symposium on Advanced Plasma Processes and Diagnostics, Suwon, Korea, April. 6-7, 2007
Note the final 3 authors were accidentally dropped from the final manuscript by the publisher

80 M. Mandra, R. Dussart, J.-B. Lee, M.J. Goeckner, T. Dufour, P. Lefaucheux, P. Ranson, L. Overzet
Fabrication process and electrical characterization of direct current parallel micro-discharges in helium,
Paper: FTP1.0008
60th Gaseous Electronics Conference, Arlington, VA, October 2007

81 D. Ogawa , M. Goeckner, A. Sra, R. Timmons , L. Overzet
Direct liquid droplet injection for PECVD,
Paper: SRP1.00008
60th Gaseous Electronics Conference, Arlington, VA, October 2007

82 I. Saraf, M. Goeckner , L. Overzet
Modeling the direct injection of liquid droplets into low-pressure environments and plasmas,
Paper: SRP1.00009
60th Gaseous Electronics Conference, Arlington, VA, October 2007

Comparison of gas-phase chemistry during deposition of amorphous carbon films using capacitive and inductive discharges,
Paper: ET1.00006
60th Gaseous Electronics Conference, Arlington, VA, October 2007

84 M.J. Goeckner.
The fundamentals of surface deposition and etch for flexible materials.
2007 Trans-Pacific Workshop on Flexible Electronics, The University of Texas at Dallas, Richardson, Texas, December 3, 2007

85 Gabriel Padron-Wells, Brandon Jarvis and M.J. Goeckner
Development of films for bio-compatible electronics
2007 Trans-Pacific Workshop on Flexible Electronics, The University of Texas at Dallas, Richardson, Texas, December 3, 2007

86 D. Ogawa, I. Saraf, M.J. Goeckner, A. Sra and L.J. Overzet
Direct liquid droplet injection for PECVD of flexible thin films.
2007 Trans-Pacific Workshop on Flexible Electronics, The University of Texas at Dallas, Richardson, Texas, December 3, 2007

87 Gabriel Padron-Wells, Brandon Jarvis, Ashish K. Jindal, Matthew Goeckner
Development of Films for Bio-Compatible Electronics
UT Metroplex Day, UT Southwestern, Dallas TX February 15, 2008

88 Richard Pierce, Gabriel Padron-Wells, Brandon Jarvis, Matthew Goeckner
Preliminary Results From A Pulsed Hexane Plasma
UT Metroplex Day, UT Southwestern, Dallas TX February 15, 2008

Direct liquid droplet injection for PECVD of organic thin films.
UT Metroplex Day, UT Southwestern, Dallas TX February 15, 2008

j) Self-initiated exhibitions, lectures or performances.
k) Submitted manuscripts, including when submitted and to whom.
M.J. Goeckner, G. Burnham, C. Ledbetter,
A method for coordinated undergraduate curriculum improvement in Electrical Engineering and other programs
Submitted Nov 07 to: Advances in Engineering Education

61 MJ Goeckner, C.T. Nelson and L.J. Overzet,
Electronegative plasma structure,
IEEE Trans on Plasma Science 36, Accepted (estimated publication date June 2008)

60 E.A. Joseph, S.P. Sant, L.J. Overzet and M.J. Goeckner,
The Role of Chamber Dimension in Fluorocarbon Based Etching of Silicon Dioxide and its Effects on Gas and Surface-Phase Chemistry,
Journal of Vacuum Science and Technology A 26, Accepted with minor revisions (2008)

59 C.T. Nelson, S.P. Sant, L.J. Overzet, and M.J. Goeckner,
Surface kinetics with low ion energy bombardment in fluorocarbon plasmas,
Plasma Sources Science & Technology 16, 813-821 (2007)

l) Other activities.
Patent disclosures
Liquid Injection plasmas
IV. Proposal and Grant Activity:

1) Proposals Submitted:

Title: LITERATURE AND PATENT SEARCH OF PLASMA EXCITER TECHNOLOGIES FOR VERITY INSTRUMENTS  
PI: Matthew Goeckner,  
Funding agent: Verity Instruments (Dr. Jimmy Hosch)  
3/07-6/07: $20,100 (Additional support: $6,700 from UTD.)

Title: DEVELOPMENT OF A PLASMA EXCITER PRODUCT FOR VERITY INSTRUMENTS  
PI: Matthew Goeckner,  
Funding agent: Verity Instruments (Dr. Jimmy Hosch)  
7/07-8/08: $126,570 (Additional support: $42,000 from UTD.)

Title: Micro-Misted Plasmas  
PI: LJ Overzet and Matthew Goeckner,  
Funding agent: NSF/DoE  
7/08-8/11: $ 

Title: Understanding plasma-wall interactions in higher frequency Capacitively Coupled (CC) etch plasmas  
PI: Matthew Goeckner  
Funding Agent: Applied Materials  
6/08-9/09: $130,720 (Became gift of $74,800)

Title: Development of DMS Dry Etcher  
PI: Matthew Goeckner, Gil Lee and LJ Overzet  
Funding Agent: KOSAR  
6/08-9/11: $642,337

Title: Development of embedded ceramic passive components  
PI: Matthew Goeckner, and LJ Overzet  
Funding Agent: NIST ATP (Thru Composite Ceramic Technologies, LLC)  
01/08-12/09: $287,812 (UTD portion)

m) Grants/contracts Received:

Title: LITERATURE AND PATENT SEARCH OF PLASMA EXCITER TECHNOLOGIES FOR VERITY INSTRUMENTS  
PI: Matthew Goeckner,  
Funding agent: Verity Instruments (Dr. Jimmy Hosch)  
3/07-6/07: $20,100 (Additional support: $6,700 from UTD.)  
Level of effort: 8.6%

Title: DEVELOPMENT OF A PLASMA EXCITER PRODUCT FOR VERITY INSTRUMENTS  
PI: Matthew Goeckner,  
Funding agent: Verity Instruments (Dr. Jimmy Hosch)  
7/07-8/08: $126,570 (Additional support: $42,000 from UTD.)  
Level of effort: 8.6%

n) Donations Received

o) Active Grants/contracts:

Title: DEVELOPMENT OF A PLASMA EXCITER PRODUCT FOR VERITY INSTRUMENTS  
PI: Matthew Goeckner,
Funding agent: Verity Instruments (Dr. Jimmy Hosch)
7/07-8/08: $126,570 (Additional support: $42,000 from UTD.)

V. Teaching activities:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course number and name</th>
<th>enrollment</th>
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<tbody>
<tr>
<td>i)</td>
<td>Spring 07 EE4301</td>
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<td>Spring 07 EE8V70</td>
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<td>m)</td>
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<td>o)</td>
<td>MSEE students advised</td>
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<tr>
<td></td>
<td>1. Diasuke Ogawa</td>
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<td>2. Caleb Nelson</td>
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<td>3. Gabriel Pardon-Wells</td>
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<td>4. Iqbal Sharif</td>
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<td>p)</td>
<td>Ph.D. Students Advised</td>
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<td></td>
<td>1. Caleb Nelson</td>
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<td>2. Erica Thronberg</td>
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<td>3. Ashish Jindal (Graduated May 07)</td>
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<td>q)</td>
<td>M.S. Thesis Committees</td>
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<td></td>
<td>1. Chuck Sanna (Defended Jan 07) (Frensley Advisor)</td>
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<td>2. Daisuke Ogawa (Defend Febraury 08)</td>
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<td>r)</td>
<td>Ph.D. Dissertation Committees</td>
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<td>1. Drew Hartman (Mar 07) (G Earle Advisor)</td>
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<td>2. Karthik Colinivadi (Nov 07) (JB Lee Advisor)</td>
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VI. Learning Assessment Activities:

a) Narrative of assessment activities

I became the Chair of the EE UG curriculum committee in Jan 2006. Since that time in this committee we have done: 1) a broad comparison to about 12 EE departments at other universities. We found that our program is probably one of the more complete. 2) Created a “Concept Map” for all of the courses at the BSEE level. We are beginning to understand the how all of the class are truly linked and what really is needed in the
program. We will use this to improve the overall UG curriculum and we will also use the mapping to help our students understand why they are taught specific subjects.

I wrote/created a class on how people learn from which you can find ways in which teaching can occur and from that leadership. I have taught the class 3 times off campus (2 X Boy Scouts – 1X Graduate students at SKKU) and I am trying bring it into UTD

Because of these items – and my interest in actually being a good professor – the Math and Science Education Department made me an affiliated faculty member. I am now working with them to actively improve education through education research tied to standard engineering research grants. I am convinced that this in the end will make my students much better then the average graduate student at UTD. (Look at what I a building with the group from SKKU for an example.)

b) Influencing factors

The bottom line is that for UTD to be a “Tier One” university we need to teach at a Tier one university level. This requires understanding the learning process. If this can be implemented into the basic structure of the university then a number of things will happen. 1) We will get better students. 2) We will end up spending less time teaching – with better results. 3) This will result in better graduate students. 4) Our research will be better. 5) We will get more research money.

c) Actions taken to close the loop

This is a work in progress. The concept map will be made available to EE students soon. We are also using it tighten up what is taught in each class and create a sensible prerequisite list for each class. The reasons for the above are: 1) If the student understand the ‘big picture’ they will do better. 2) If the faculty understand the big picture they can plan classes better. During the summer of 07 we went through the complete map – looking for and fixing inconsistencies.

VII. Professional service activities.

l) UTD administrative duties:

m) School committees:

1. Chair UG Education committee 2006 -

In this committee we have done: 1) a broad comparison to about 12 EE departments at other universities. We found that our program is probably one of the more complete. 2) Created a “Concept Map” for all of the courses at the BSEE level. We are beginning to understand the how all of the class are truly linked and what really is needed in the program. We will use this to improve the overall UG curriculum and we will also use the mapping to help our students understand why they are taught specific subjects. This mapping concept is being taken across the university as part of GEMS

n) University wide:

1. QEP/GEMS committee 2007-

o) Special Service Contributions to Program, School or University:
1. See QEP/GEMS committee

p) Service contributions external to UTD:
   2. Reviewed submissions for Plasma Sources Science and Technology.
   3. Reviewed submissions for RSI.
   4. Reviewed submissions for a couple of other journals but I don’t remember the names.
   5. Reviewed proposals to NSF program in Plasma Science (Twice!)
   6. Chair of Organizing Committee – Trans Pacific Workshop on Flexible Electronics.
   7. Program Committee Gaseous Electronic Conference (2007 and 2008 conference)
   8. Applied for and was accepted as an ABET evaluator. (Training will occur during May 08)

q) Consultant activities:
   1. None

VIII. Special professional recognition.
   1. Chair of Organizing Committee – Trans Pacific Workshop on Flexible Electronics.
   2. Program Committee Gaseous Electronic Conference (2007 and 2008 conference)
   3. Received The Erik Jonnson School of Engineering and Computer Science Outstanding Service Award Sept 21, 2007.
   4. Asked to co-chair committee for “Plasma 2010-Low Temperature Plasma Science Workshop Science Challenges for the Next Decade”
This workshop is to set into place “National Research Council (NRC) recently released the final report of the Plasma 2010 Committee titled Plasma Science: Advancing Knowledge in the National Interest.” Specifically I will chair the section “Interaction of plasmas with complex surfaces including organic materials and living tissue.”