

# RESEARCH OVERVIEW



## CURRENT WBC-FUNDED RESEARCH

CURRENT PROJECTS ORGANIZED PER SITE IN ALPHABETICAL ORDER.

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>AUBURN UNIVERSITY</b>					
<i><b>O-07-PE: UNDERSTANDING THE FUNDAMENTAL INFLUENCE OF WOOD EXTRACTIVES ON WOOD</b></i>					
<b>AUBURN UNIVERSITY:</b> S. Peresin S. Gururaja <b>OREGON STATE:</b> J. Nairn J. Simonsen <b>VIRGINIA TECH:</b> C. Frazier  <b>STUDENT:</b> Diego Cuartas	<b>IAB TC LEADS:</b> Bob Breyer, Bakelite Bill Leggate, DAF  <ul style="list-style-type: none"> <li>• Arclin</li> <li>• Bakelite</li> <li>• DAF</li> <li>• Hexion</li> <li>• Oxiquim</li> <li>• WVCO</li> </ul>	10/27/2022	1/1/2023	Expected 12/31/2024	<b>Year 1 / 2:</b> \$53,206 <b>Year 2 / 2:</b> \$55,000  <b>Total-to-date:</b> <b>\$108,206</b>  Expected Request: \$0
<i><b>O-02-VI: MONITORING PHENOL FORMALDEHYDE AND WAX CONTENT WITH VIS/NIR SMARTPHONE TECHNOLOGY (new)</b></i>					
<b>AUBURN UNIVERSITY:</b> B. Via  <b>STUDENT:</b> Seth Adusei	<b>IAB TC LEADS:</b> Patrick Farrell, Freres  <ul style="list-style-type: none"> <li>• Arclin</li> <li>• Bakelite</li> <li>• DAF</li> <li>• Freres</li> <li>• Hexion</li> <li>• Oxiquim</li> <li>• WVCO</li> </ul>	10/27/2022	1/1/2023	Expected 12/31/2023	<b>Year 1 / 1:</b> \$10,500 <b>Total-to-date:</b> <b>\$10,500</b>  Expected Request: \$0
<b>MICHIGAN STATE UNIVERSITY</b>					
<i><b>O-05-NE: A FUNDAMENTAL STUDY OF LIGNIN REACTION WITH FORMALDEHYDE</b></i>					
<b>MICHIGAN STATE:</b> M. Nejad & T. Wang  <b>STUDENT:</b> Debnath Debkumar	<b>IAB TC LEADS:</b> Sudip Chowdhury, WVCO  <ul style="list-style-type: none"> <li>• Arclin</li> <li>• Hexion</li> <li>• Oxiquim</li> <li>• WVCO</li> </ul>	10/27/2022	11/1/2022	Expected 12/31/2023	<b>Year 1 / 1:</b> \$30,000 <b>Total-to-date:</b> <b>\$30,000</b>  Expected Request: \$0

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>OREGON STATE UNIVERSITY</b>					
<b>P-02-MU: Modeling of Edge Bending for Mass Timber Products (new)</b>					
<b>OREGON STATE:</b> Lech Muszynski John Nairn  <b>STUDENT:</b> TBD	<b>IAB TC LEAD:</b> Danny Way, Boise  <ul style="list-style-type: none"> <li>• Boise</li> <li>• Hexion</li> <li>• Roseburg</li> <li>• Freres</li> <li>• Bakelite</li> </ul>	4/27/23	10/1/2023	Expected 12/31/25	<b>Year 1 / 2:</b> \$60,565 <b>Total-to-date:</b> <b>\$60,565</b>  Expected Request: <b>Year 2 / 2: \$70,000</b> <b>(Spring 2024)</b>
<b>P-03-PR: Identifying maximum tolerance and mechanisms of interaction for two common resins systems and two fire retardant treatments (new)</b>					
<b>OREGON STATE:</b> Gerald Presley John Simonsen John Nairn  <b>STUDENT:</b> Shane Johnson, MS	<b>IAB TC LEAD:</b> Tim Zattau, Roseburg  <ul style="list-style-type: none"> <li>• Arclin</li> <li>• Bakelite</li> <li>• Hexion</li> <li>• Roseburg</li> <li>• WVCO</li> </ul>	4/27/23	10/1/2023	Expected 12/31/24	<b>Year 1 / 1:</b> \$37,127 <b>Total-to-date:</b> <b>\$37,127</b>  Expected Request: \$0
<b>BOISE-22: USING NOTCH DELAMINATION TO STUDY MOISTURE-ADHESIVE INTERACTIONS</b>					
<b>OREGON STATE:</b> A. Sinha J. Nairn  <b>STUDENT:</b> Samuel Ayeni, MS. Elizabeth Israel, MS.	<b>IAB TC LEAD:</b> Danny Way, Boise  <ul style="list-style-type: none"> <li>• Boise</li> <li>• Freres</li> </ul>	10/27/2022	11/1/2022	Expected 2024	<b>Year 1 / 2:</b> \$56,000 <b>Year 2/2:</b> \$51,000 <b>Total-to-date:</b> <b>\$107,000</b>  Expected Request: \$0
<b>O-09-SC: NEAR-INFRARED HYPERSPECTRAL IMAGING AND CHEMOMETRIC TECHNIQUES FOR ESTIMATION OF PERCENT WOOD FAILURE (PWF) IN ADHESIVE BONDS</b>					
<b>OREGON STATE:</b> L. Schimleck L. Muszynski  <b>STUDENT:</b> TBD	<b>IAB TC LEAD:</b> Darren Riedlinger, Arclin  <ul style="list-style-type: none"> <li>• Arclin</li> <li>• Bakelite</li> <li>• Boise</li> <li>• Freres</li> <li>• DAF</li> <li>• Hexion</li> <li>• Oxiquim</li> </ul>	10/27/2022	11/1/2022	Expected 2023	<b>Year 1 / 1:</b> \$7,108 <b>Total-to-date:</b> <b>\$7,108</b>  Expected Request: \$0

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>N-02-MU: LONG-TERM RESPONSE OF WOOD-BASED COMPOSITES IN VARIABLE CLIMATE CONDITIONS</b>					
<b>OREGON STATE:</b> L. Muszynski J. Nairn M. Riggio  <b>STUDENT:</b> Oluwafunbi Adeleye, MS	<b>IAB TC LEAD:</b> Patrick Farrell, Freres  <ul style="list-style-type: none"> <li>LP</li> <li>Freres</li> <li>WVCO</li> <li>Bakelite</li> <li>Oxiquim</li> </ul>	10/14/2021	11/1/2021	Expected 10/31/2023	<b>Year 1 / 2:</b> \$55,000 <b>Year 2/2:</b> \$55,000 <b>Total-to-date:</b> <b>\$110,000</b>  Expected Request \$0
<b>M-03-PR: PRELIMINARY INVESTIGATION OF DMDHEU-TREATED STRAND BOARD</b>					
<b>OREGON STATE:</b> F. Kamke G. Presley  <b>STUDENT:</b> Hanna Gired, BS Shane Johnson, BS	<b>IAB TC LEAD:</b> Jesse Paris, WVCO  <ul style="list-style-type: none"> <li>LP</li> <li>WVCO</li> </ul>	8/27/2020	08/01/2021 <del>11/1/2020</del> <b>PAUSED</b>	Expected 06/31/2022 <del>7/31/2021</del>	<b>Year 1 / 1:</b> \$12,468 <b>Total-to-date:</b> <b>\$12,468</b>  Expected Request: \$0
<b>M-02-PR: IN-DEPTH CHARACTERIZATION OF BONDLINES IN CLT MADE WITH PRESERVATIVE-TREATED LUMBER</b>					
<b>OREGON STATE:</b> G. Presley J. Cappellazzi  <b>STUDENT:</b> Cody Wainscott	<b>IAB TC LEAD:</b> Bob Breyer, Bakelite  <ul style="list-style-type: none"> <li>Freres</li> <li>Bakelite</li> <li>WVCO</li> </ul>	8/27/20	<del>11/1/20</del> 3/1/2021	Expected 9/30/2022	<b>Year 1 / 1:</b> \$20,000 <b>Total-to-date:</b> <b>\$20,000</b>  Expected Request: \$0
<b>VIRGINIA TECH</b>					
<b>M-04-FR: WAX MIGRATION</b>					
<b>VIRGINIA TECH:</b> C. Frazier  <b>STUDENT:</b> JC Stant	<b>IAB TC LEAD:</b> Jesse Paris, WVCO  <ul style="list-style-type: none"> <li>Bakelite</li> <li>LP</li> <li>WVCO</li> </ul>	8/27/20	TBD	2 years after start	<b>Year 1 / 2:</b> \$51,372* <b>Year 2 / 2:</b> \$48,372 <b>Total-to-date:</b> <b>\$102,744</b>  Expected Request: \$0
<b>I-29-FR: FUNDAMENTALS IN RESOLE FORMULATION</b>					
<b>VIRGINIA TECH:</b> C. Frazier  <b>STUDENT:</b> Ryan Gray, PhD	<b>IAB TC LEAD:</b> Todd Miller, Hexion  <ul style="list-style-type: none"> <li>Arclin</li> <li>Bakelite</li> <li>Hexion</li> <li>Oxiquim</li> <li>WVCO</li> </ul>	5/17/17	1/5/18	Expected 1/4/22	<b>Year 1:</b> \$45,558 <b>Year 2:</b> \$45,558 <b>Year 3:</b> \$45,558 <b>Year 4:</b> \$52,965 <b>Total-to-date:</b> <b>\$189,639</b>  Expected Request: \$0

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>I-28-FR: Wood Thermochemistry*</b>					
<b>VIRGINIA TECH:</b> C. Frazier  <b>STUDENT:</b> Sara Yazdi, PhD TBD  <i>*Project suspended until further notice</i>	<b>IAB TC LEAD:</b> Darren Riedlinger, Arclin  <ul style="list-style-type: none"> <li>Arclin</li> <li>Bakelite</li> <li>WVCO</li> </ul>	10/24/17	1/15/19	Expected 12/2022	<b>Year 1 / 4:</b> \$46,558 <b>Year 2 / 4:</b> \$46,558 <b>Year 3 / 4:</b> \$53,965 <b>Year 4 / 4:</b> \$53,966 <b>Total-to-date:</b> <b>\$201,047</b>  Expected Request: \$0
<b>I-10-FR: CARBON ISOTOPE RATIOS: NOVEL VIEW OF CH2O EMISSIONS</b>					
<b>VIRGINIA TECH:</b> C. Frazier  <b>STUDENT:</b> <del>Niloofer Shivyari, MS</del> Mark Cashman, PhD	<b>IAB TC LEAD:</b> Todd Miller, Hexion  <ul style="list-style-type: none"> <li>Arclin</li> <li>freres</li> <li>Bakelite</li> <li>Hexion</li> <li>Oxiquim</li> <li>WVCO</li> </ul>	10/13/16	1/10/17	Expected 5/14/22	<b>Part A (Shivyari):</b> <b>Year 1:</b> \$45,180 <b>Year 2:</b> \$45,180 <b>Year 3:</b> \$45,180 <b>Year 4:</b> \$45,180 <b>Part B (Cashman):</b> <b>Year 5:</b> \$0 <b>Year 6:</b> \$33,145 <b>Total-to-date: \$213,865</b>  Expected Request: \$0

## COMPLETED RESEARCH

PROJECTS HAVE PRESENTED FINAL REPORT. ORGANIZED PER SITE IN ALPHABETICAL ORDER

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>AUBURN UNIVERSITY</b>					
<b>K-03-PE: EFFECT OF NANOFIBRILLATED CELLULOSE (CNF) AT THE WOOD-BASED MATRIX/RESIN INTERFACE</b>					
<p>Auburn: M. Soledad Peresin Brian Via</p> <p>STUDENT: M. Celeste Iglesias, PhD Philip McMichael, BS</p>	<p><b>IAB TC LEAD:</b> Bob Breyer, G-P Chemicals</p> <ul style="list-style-type: none"> <li>Arauco</li> <li>Arclin</li> <li>G-P Chemicals</li> <li>Hexion</li> <li>LP</li> <li>Roseburg</li> <li>WVCO</li> </ul>	9/27/18	2/10/19	Expected 12/31/20	<p>Year 1: \$33,219 <b>Total-to-date: \$33,219</b></p> <p>Expected Future Request: \$0</p>
<b>MICHIGAN STATE UNIVERSITY</b>					
<b>SWEETWATER-21: Investigating Lignin Consistency from Batch-to-Batch</b>					
<p><b>MICHIGAN STATE:</b> M. Nejad</p> <p><b>STUDENT:</b> Mohsen Siahkamari</p>	<p><b>IAB TC LEAD:</b> Scott Tudman, Sweetwater*</p> <ul style="list-style-type: none"> <li>Sweetwater*</li> <li>Hexion</li> <li>WVCO</li> </ul> <p>*Former member</p>	10/14/2021	11/1/2021	Expected 10/31/2022	<p><b>Year 1 / 1:</b> \$35,000 <b>Total-to-date:</b> <b>\$35,000</b></p> <p>Expected Request: \$0</p>
<b>M-05-NE: Improving Durability of Wood Products by Reducing Lignin Degradation</b>					
<p><b>MICHIGAN STATE:</b> M. Nejad</p> <p><b>STUDENT:</b> Saeid Nikafshar, PhD Dyllan Nelson, B.S. Mariia Bespalova, Ph.D.</p>	<p><b>IAB TC LEAD:</b> Sudip Chowdhury, WVCO</p> <ul style="list-style-type: none"> <li>LP</li> <li>Oxiquim</li> </ul> <p>WVCO</p>	8/27/20	11/1/20	Expected 11/30/22	<p><b>Year 1 / 2:</b> \$20,000 <b>Year 2 / 2:</b> \$20,000 <b>Total-to-date:</b> <b>\$40,000</b></p> <p>Expected Request: \$0</p>

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>SWEETWATER-20: Evaluating Suitability of Steam-Explosion Lignin for Different Polymeric Resin Applications</b>					
<b>MICHIGAN STATE:</b> M. Nejad  <b>STUDENTS:</b> Saeid Nikafshar, PhD Mohsen Siahkamari, PhD Mona Alinejad, PhD	<b>IAB TC LEAD:</b> Scott Tudman, Sweetwater  <ul style="list-style-type: none"> <li>• SWEETWATER</li> <li>• HEXION</li> <li>• WVCO</li> </ul>	11/1/2020	11/1/20	10/31/21	<b>Year 1 / 1: \$35,000</b> <b>Total-to-date: \$0</b>  Expected Request: \$0
<b>I-19-NE: Suitability of different lignins as polyol replacement in PU adhesive formulation</b>					
Michigan State: M. Nejad  (Mona Alinejad, PhD) <b>(IAB TC LEAD: Robert Breyer, G-P Chem)</b>	<ul style="list-style-type: none"> <li>• G-P Chemicals</li> <li>• Hexion</li> <li>• Oxiquim</li> <li>• Roseburg</li> <li>• WVCO</li> </ul>	10/24/17	1/1/18	12/31/19	Year 1: \$21,652 Year 2: \$21,848 <b>Total WBC Funding: \$43,500</b>
<b>H-16-NE: Comparative analysis of different lignins as phenol substitutes</b>					
Michigan State: Mojgan Nejad  (Isal Kalami, PhD, Christian Henry, PhD)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• GP Chemicals</li> <li>• Henkel</li> <li>• Hexion</li> <li>• Oxiquim</li> <li>• WVCO</li> </ul>	4/6/16	6/1/16	5/31/17	Year 1 : \$14,00 <b>Total WBC Funding: \$14,000</b>
<b>NORTH CAROLINA STATE UNIVERSITY</b>					
<b>I-02-VE: Understanding the machinability of MDF and HDF</b>					
N. Carolina State: G. Velarde D. Saloni <b>OREGON STATE:</b> F. Kamke  (Carlos Leca, MS)	<b>(IAB TC LEAD: Darren Riedlinger, Arclin)</b>  <ul style="list-style-type: none"> <li>• Arauco</li> <li>• Arclin</li> <li>• Hexion</li> <li>• Roseburg</li> </ul>	10/13/16	3/8/18	4/7/19 (Final report delivered Oct 2020)	Year 1: \$46,000 <b>Total WBC Funding: \$46,000</b>
<b>J-05-SA: Investigating the use of biopolymers for additive manufacturing</b>					
NC State: D. Saloni G. Velarde Auburn: M.S. Peresin  (Christina Verdi, BS)	<b>(IAB TC LEAD: Bob Breyer, GP Chemicals)</b>  <ul style="list-style-type: none"> <li>• Arauco</li> <li>• G-P Chemicals</li> <li>• Hexion</li> <li>• INVISTA</li> <li>• Oxiquim</li> </ul>	10/24/17	1/15/18	5/31/19	Year 1: \$16,000 <b>Total WBC Funding: \$16,000</b>

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>I-13-SA: Novel adhesives from soybean proteins and biopolymer blends</b>					
N. Carolina State: D. Saloni G. Velarde  (no student)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• CFP</li> <li>• Evertree</li> <li>• GP Chemicals</li> <li>• Hexion</li> <li>• WVCO</li> </ul>	10/13/16	3/1/17	4/30/18	Year 1: \$14,250 <b>Total WBC Funding: \$14,250</b>
<b>H-07-VE: Determination of tool life during CNC machining operations for four panel products</b>					
N. Carolina State: Guillermo Velarde Rick Lemaster  (Conrad Michael, BS)	<ul style="list-style-type: none"> <li>• Arauco</li> <li>• Columbia FP</li> </ul>	10/15/15	1/1/16	12/15/16	Year 1 : \$19,136 <b>Total WBC Funding: \$19,136</b>
<b>H-04-LEM: The use of acoustic emission to classify wood chips/particles</b>					
N. Carolina State: Rick Lemaster Guillermo Velarde (Lyndsey Campbell, BS, Kamila Edwards, BS)	<ul style="list-style-type: none"> <li>• Arauco</li> <li>• LP</li> <li>• Oxiquim</li> </ul>	10/15/15	1/1/16	12/15/16	Year 1 : \$14,676 <b>Total WBC Funding: \$14,676</b>
<b>OREGON STATE UNIVERSITY</b>					
<b>M-01-KA: REPEATABLE MEASUREMENT METHOD FOR PERCENT WOOD FAILURE</b>					
<b>OREGON STATE:</b> F. Kamke L. Muszynski  STUDENT: Talbot Rueppel, MS	<b>IAB TC LEAD:</b> Sarath Vega, LP  <ul style="list-style-type: none"> <li>• ARCLIN</li> <li>• FRERES LUMBER</li> <li>• G-P CHEMICALS</li> <li>• LP</li> <li>• OXIQUIM</li> <li>• WVCO</li> </ul>	8/27/20	10/1/20	Expected 9/30/22	Year 1 / 2: \$54,053 Year 2 / 2: \$6,709* <b>Total-to-date: \$60,762</b>  Expected Request: \$0  *\$47,862 deducted
<b>K-04-SI: ELUCIDATING THE MECHANISM OF CNF REINFORCEMENT IN WOOD ADHESIVES AND COMPOSITES</b>					

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>OREGON STATE:</b> J. Simonsen J. Nairn  <b>STUDENT:</b> Maria Muñoz, MS	<b>IAB TC LEAD:</b> TBD  <ul style="list-style-type: none"> <li>• ARCLIN</li> <li>• HEXION</li> <li>• OXIQUM</li> <li>• WVCO</li> </ul>	9/27/18	9/10/19	Expected 9/30/22	Year 1 / 3: \$45,557 Year 2 / 3: \$57,270 Year 3 / 3: \$15,462 <b>Total-to-date:</b> <b>\$118,289</b>  Expected Request: \$0
<b>J-01-SIN: UNDERSTANDING ELEVATED TEMPERATURE PERFORMANCE OF WOOD COMPOSITES</b>					
<b>OREGON STATE:</b> A. Sinha  <b>STUDENT:</b> Byrne Miyamoto, PhD	<b>IAB TC LEAD:</b> Patrick Farrell, Freres Lumber  <ul style="list-style-type: none"> <li>• ARCLIN</li> <li>• FRERES LUMBER</li> <li>• HEXION</li> <li>• LP</li> </ul>	10/24/17	4/1/18	Expected 9/30/21	Year 1 / 2: \$54,705 Year 2 / 2: \$53,074 <b>Total-to-date:</b> <b>\$107,779</b>  Expected Request: \$0
<b>K-05-KA: ANALYSIS OF ADHESIVE ATOMIZATION ON COMPOSITE BOND PERFORMANCE</b>					
<b>OREGON STATE:</b> F. Kamke J. Nairn  <b>STUDENT:</b> Dylan Willard, MS  <b>IAB TC LEAD:</b> Jesse Paris, WVCO	<ul style="list-style-type: none"> <li>• Arauco</li> <li>• Arclin</li> <li>• Boise</li> <li>• G-P Chemicals</li> <li>• Hexion</li> <li>• LP Building Solu</li> <li>• WVCO</li> </ul>	9/27/18	7/1/19	Expected 3/31/21	Year 1: \$39,989 Year 2: \$51,001 <b>Total-to-date: \$90,990</b> Expected Future Request: \$0
<b>FRERES-19: MASS PLYWOOD PANELS: PERFORMANCE, DESIGN AND APPLICATION</b>					
<b>OREGON STATE:</b> F. Kamke – Part I A. Sinha – Part II  <b>STUDENT:</b> Matthias Wind, PhD Micah Sutfin, MS	<b>IAB TC LEAD:</b> Patrick Farrell, Freres Lumber  <ul style="list-style-type: none"> <li>• Freres Lumber</li> <li>• G-P Chemicals</li> <li>• Hexion</li> <li>• LP Building Solu</li> <li>• WVCO</li> </ul>	8/1/19	10/1/19	Expected 9/30/21	Year 1: \$35,000 Year 2: \$35,000 <b>Total-to-date: \$70,000</b> Expected Future Request: \$0
<b>J-04-SIN: USING CRACK GROWTH EXPERIMENTS TO UNDERSTAND MOISTURE AND THERMAL DURABILITY OF WBCS</b>					



FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>OREGON STATE:</b> A. Sinha J. Nairn  STUDENT: Sweta Mahapatra, MS	<b>IAB TC LEAD:</b> Sudip Chowdhury, WVCO <ul style="list-style-type: none"> <li>Arclin</li> <li>G-P Chemicals</li> <li>LP Building Solu</li> <li>Oxiquim</li> <li>WVCO</li> </ul>	10/24/17	4/1/18	9/30/20	Year 1: \$52,205 Year 2: \$52,074 <b>Total-to-date:</b> <b>\$104,279</b> Expected Future Request: \$0
<b>INVISTA-18: Moisture resistance of wood-based composite materials</b>					
<b>OREGON STATE:</b> F. Kamke S. Leavengood  (Luis Molina, MS)	<b>(IAB TC LEAD: Mohan Rao, INVISTA)</b> <ul style="list-style-type: none"> <li>Arclin</li> <li>Boise</li> <li>G-P Chemicals</li> <li>Hexion</li> <li>INVISTA</li> <li>LP Building Solu</li> <li>Oxiquim</li> <li>Roseburg</li> </ul>	9/27/18	10/1/18	6/30/20	Year 1: \$54,302 Year 2: \$42,569 <b>Total WBC Funding:</b> <b>\$96,871</b>
<b>I-26-KA: Characterizing accelerated weathering conditions (continuation of H-13-KA)</b>					
<b>OREGON STATE:</b> F. Kamke  (Micah Sutfin, MS)	<b>(IAB TC LEAD: Curtis Burton, WVCO)</b> <ul style="list-style-type: none"> <li>Arclin</li> <li>Boise</li> <li>WVCO</li> </ul>	5/17/17	1/1/18	9/29/19	Year 1: \$46,038 Year 2: \$1951 <b>Total WBC Funding:</b> <b>\$47,989</b>
<b>I-06-SIN: Understanding moisture gradients during accelerated weathering through numerical modeling</b>					
<b>OREGON STATE:</b> A. Sinha F. Kamke  (Danny Way, PhD)	<ul style="list-style-type: none"> <li>Ashland</li> <li>Boise</li> <li>Fraunhofer</li> <li>LP</li> <li>Weyerhaeuser</li> </ul>	10/13/16	4/1/17	8/15/18	Year 1: \$56,000 <b>Total WBC Funding:</b> <b>\$56,000</b>
<b>A-11-SM: Improving blending efficiency and resin distribution of the rotary drum blending process using discrete element modeling</b>					
UBC: G. Smith  (Ying-Li Tsai, PhD)	<ul style="list-style-type: none"> <li>Arclin</li> <li>GP Chemicals</li> </ul>	9/15/10	4/1/11	Expected Spring 2017 (3/10/17 defense) 10/17: Delayed indefinitely.	Year 1: \$44,000 Year 2: \$25,206 Year 3: \$36,634 Year 4: \$20,817 <b>Total WBC Funding:</b> <b>\$126,657</b>
<b>F-02-LE: Checking in maple plywood</b>					

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>OREGON STATE:</b>					
S. Leavengood L. Muszynski  (Elijah Wilson, MS)	<ul style="list-style-type: none"> <li>• Columbia FP</li> <li>• Henkel</li> <li>• Weyerhaeuser</li> </ul>	10/16/14	1/1/16	3/31/18	Year 1: \$15,529 Year 2: \$31,515 Year 3: \$24,236 <b>Total WBC Funding: \$70,280</b>
<b>I-20-KA: Comparison of accelerated weathering test protocols – Part B (continuation of H-13-KA)</b>					
<b>OREGON STATE:</b>					
F. Kamke  (Luis Molina, BS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Ashland</li> <li>• Boise</li> <li>• WVCO</li> </ul>	5/17/17	8/1/17	1/23/18	Year 1: \$6625 <b>Total WBC Funding: \$6625</b>
<b>Fraunhofer-16: Wood composite performance assessment and certification needs for Western U.S.</b>					
<b>OREGON STATE:</b>					
F. Kamke P.F. Laleicke	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Fraunhofer</li> <li>• WVCO</li> </ul>	4/6/16	6/1/16	12/31/17	Year 1: \$105,736 Year 2: \$68,527 Year 3: \$59,422 <b>Total WBC Funding: \$233,685</b>
<b>I-08-LI: Lignin-based polymers with enhanced adhesive and elastomeric properties</b>					
<b>OREGON STATE:</b>					
Z. Glen Li  (Dylan Packard, BS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• GP Chemicals</li> <li>• Hexion</li> <li>• Oxiquim</li> <li>• WVCO</li> </ul>	10/13/16	11/1/16	10/31/17	Year 1: \$16,650 <b>Total WBC Funding: \$16,650</b>
<b>I-15-NA: Numerical simulations of adhesive penetration in various wood species</b>					
<b>OREGON STATE:</b>					
J. Nairn  (Chad Hammerquist, PhD)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• GP Chemicals</li> <li>• Hexion</li> <li>• WVCO</li> </ul>	10/13/16	10/1/16	10/1/17	Year 1: \$28,166 <b>Total WBC Funding: \$28,166</b>
<b>F-08-KA (OSU only): Wetting and diffusion associated with selected liquid/wood interfaces</b>					
<b>OREGON STATE:</b>					
F. Kamke (Balkis Bakar, Elizabeth Mills)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Hexion</li> <li>• WVCO</li> </ul>	10/16/14	4/1/15 (OSU)	1/1/17	Year 1: \$21,670 Year 2: \$45,694 Year 3: \$11,227 <b>Total WBC Funding: \$78,591</b>
<b>VIRGINIA TECH:</b>					
C. Frazier (Christa Stables, MS)			6/15/15 (VT)	9/6/17	
<b>F-01-KA: Multi-scale accelerated weathering of wood composite materials</b>					

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>OREGON STATE:</b> F. Kamke A. Sinha  (Danny Way, MS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Ashland</li> <li>• Boise</li> <li>• Fraunhofer</li> <li>• LP</li> </ul>	10/16/14	4/1/15	3/31/17	Year 1: \$55,857 Year 2: \$44,904 <b>Total WBC Funding:</b> <b>\$100,761</b>
<b>H-13-KA: Comparison of accelerated weathering test protocols</b>					
<b>OREGON STATE:</b> F. Kamke  (Valeria Luna, BS, Tomas Lasserre, BS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Ashland</li> <li>• Hexion</li> </ul>	4/6/16	7/1/16	12/31/16	Year 1 : \$8500 <b>Total WBC Funding:</b> <b>\$8500</b>
<b>FUND-13: Multi-scale investigation of adhesive bond durability</b>					
<b>OREGON STATE:</b> F. Kamke A. Sinha  (Paige McKinley, MS w/D. Ching, PhD, D.Way, PhD)	<ul style="list-style-type: none"> <li>•</li> <li>• Arclin</li> <li>• APS</li> <li>• USDA FPL</li> </ul>	8/1/13 (2-year award)	7/1/14	12/31/16 (NCE)	Year 1: \$98,096 Year 2: \$98,095 <b>Total NSF Funding:</b> <b>\$196,191</b> <b>Total WBC Funding: \$0</b>
<b>H-15-KA: Analysis of vertical density profile during hot pressing</b>					
<b>OREGON STATE:</b> F. Kamke  (Kenya Hazell, PhD, Günther Schagerl, BS)	<ul style="list-style-type: none"> <li>• Arauco</li> <li>• Arclin</li> <li>• Hexion</li> <li>• LP</li> <li>• Oxiquim</li> </ul>	4/6/16	7/1/16	10/31/16	Year 1 : \$8845 <b>Total WBC Funding:</b> <b>\$8845</b>
<b>H-03-LI: Bio-based polyamide with oligomeric lignin backbone</b>					
<b>OREGON STATE:</b> Z. (Glen) Li (Jacob Staudhammer, BS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Henkel</li> <li>• Oxiquim</li> </ul>	10/15/15	1/4/16	10/1/16	Year 1 : \$2500 <b>Total WBC Funding:</b> <b>\$2500</b>
<b>H-01-NA: Numerical simulation of adhesive penetration into realistic wood structures</b>					
<b>OREGON STATE:</b> John Nairn (Chad Hammerquist, PhD)	<ul style="list-style-type: none"> <li>• States Industries</li> <li>• WVCO</li> </ul>	10/15/15	1/1/16	5/1/16	Year 1 : \$8750 <b>Total WBC Funding:</b> <b>\$8750</b>
<b>B-02-NA: Methodologies for ranking resins by their effects on durability of wood composites</b>					
<b>OREGON STATE:</b> J. Nairn A. Sinha (B. Mirzaei, PhD, w/J. Adam, BS, D. Terry, BS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Fraunhofer-WKI</li> <li>• GP Chemicals</li> </ul>	10/18/12	1/1/13	3/31/16	Year 1: \$43,498 Year 2: \$43,373 Year 3: \$49,682 <b>Total WBC Funding:</b> <b>\$136,553</b>
<b>D-02-KA: Application of accelerated weathering for the development of an NDT product durability assessment toolkit</b>					

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>OREGON STATE:</b> F. Kamke  (P.F. Laleicke, PhD)	<ul style="list-style-type: none"> <li>GP Chemicals</li> <li>WVCO</li> </ul>	10/8/13	1/1/14	12/31/15	Year 1: \$25,670 Year 2: \$54,325 <b>Total WBC Funding:</b> <b>\$79,995</b>
<b>SUPP-OSU-13: I/UCRC Innovations Fellows Supplement (NSF-funded)</b>					
<b>OREGON STATE:</b> F. Kamke (M. Schwarzkopf, PhD)	<ul style="list-style-type: none"> <li>Fraunhofer-WKI</li> </ul>	9/25/13 (1-yr award)	9/25/13	7/30/14	Year 1: \$16,633 <b>Total WBC Funding: \$0</b> <b>Total NSF Funding:</b> <b>\$16,633</b>
<b>A-22-SM: Resin efficiency for non-structural panels</b>					
UBC: G. Smith (J. Dettmer, MS) <b>OREGON STATE:</b> L. Muszynski J. Simonsen (N. Lampert, MS)	<ul style="list-style-type: none"> <li>Ashland</li> <li>GP Chemicals</li> <li>Momentive</li> </ul>	9/15/10	4/1/11	4/16/14	Year 1: \$59,500 Year 2: \$53,811 <b>Total WBC Funding:</b> <b>\$113,311</b>
<b>A-04-KA: Microscale wood adhesive interaction</b>					
<b>OREGON STATE:</b> F. Kamke L. Muszynski J. Nairn  (J. Paris, PhD, M. Schwarzkopf, PhD)	<ul style="list-style-type: none"> <li>Arclin</li> <li>Ashland</li> <li>Henkel</li> <li>Weyerhaeuser</li> </ul>	9/15/10	10/1/10	10/1/13	Year 1: \$35,600 (total: \$85,600) Year 2: \$62,230 Year 3: \$48,577 <b>Total WBC Funding:</b> <b>\$146,407</b>
<b>C-01-KA: Preliminary investigation of adhesive bonds using IR microscopy</b>					
<b>OREGON STATE:</b> F. Kamke (P. Boehm, MS, S. Freitas, PhD)	<ul style="list-style-type: none"> <li>GP Chemicals</li> <li>WVCO</li> </ul>	10/18/12	2/1/13	7/31/13	Year 1: \$10,937 <b>Total WBC Funding:</b> <b>\$10,937</b>
<b>A-19-GU: Impact of short veneer on bending properties of LVL</b>					
<b>OREGON STATE:</b> R. Gupta F. Kamke (S. Mlasko, BS, M. Belda, BS)	<ul style="list-style-type: none"> <li>GP Chemicals</li> <li>Momentive</li> <li>Weyerhaeuser</li> </ul>	9/15/10	1/1/11	7/30/11	Year 1: \$9000 <b>Total WBC Funding:</b> <b>\$9,000</b>

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>VIRGINIA TECH</b>					
<b><i>N-06-CA: Bench-Scale Characterization of Joints and Coatings</i></b>					
<b>VIRGINIA TECH:</b> S. Case B. Lattimer  <b>STUDENT:</b> Akhilesh Kulkarni, MS	<b>IAB TC LEAD:</b> Sudip Chowdhury, WVCO  <ul style="list-style-type: none"> <li>• Arclin</li> <li>• Freres</li> <li>• LP</li> </ul>	10/14/2021	1/1/2022	Expected 08/30/2022	<b>Year 1 / 1: \$31,342</b>  <b>Total-to-date:</b> <b>\$31,342</b>  Expected Request: \$0
<b><i>K-02-CA: Bench-Scale Screening Test for ASTM E119</i></b>					
<b>VIRGINIA TECH:</b> S. Case B. Lattimer  <b>STUDENT:</b> Michael Gangj, PhD	<b>IAB TC LEAD:</b> Jim Ni, LP  <ul style="list-style-type: none"> <li>• ARCLIN</li> <li>• FRERES LUMBER</li> <li>• G-P CHEMICALS</li> <li>• LP</li> <li>• OXIQUM</li> </ul>	10/10/19	1/1/20	Expected 12/2021	Year 1: \$55,399 Year 2: \$55,000  <b>Total-to-date:</b> <b>\$110,399</b>  Expected Request: \$0
<b><i>J-02-HA: GEOMETRY AND MECHANICS OF PANEL WARPAGE</i></b>					
<b>VIRGINIA TECH:</b> J. Loferski Univ of Nevada/Reno: J. Hanna  <b>STUDENT:</b> <del>Harrison Wood, MS;</del> Kerrigan Strong, MS	<b>IAB TC LEAD:</b> Dave Ruth, Boise)  <ul style="list-style-type: none"> <li>• Boise</li> <li>• CFP</li> <li>• Oxiquim</li> <li>• Roseburg</li> </ul>	10/24/17	12/26/17	Expected 7/13/21	Year 1: \$47,810 Year 2: \$50,000 Year 3: \$42,079  <b>Total-to-date:</b> <b>\$139,889</b>  Expected Future Request: \$0
<b><i>I-01-DI: DEVELOPING METHODOLOGY TO INTERROGATE HIGH/LOW DENSITY WOOD BONDS (FORMERLY: CHARACTERIZING ADHESION BETWEEN HIGH AND LOW DENSITY WOODS)</i></b>					
<b>VIRGINIA TECH:</b> S. Case D. Dillard C. Frazier  <b>STUDENT:</b> <del>Kayla Howes, MS</del> Yuqin Li, PhD <del>Angelo Said, BS</del> Jessie Johnson, BS	<b>IAB TC LEAD:</b> Sudip Chowdhury  <ul style="list-style-type: none"> <li>• CFP</li> <li>• G-P Chemicals</li> <li>• Queensland</li> <li>• WVCO</li> </ul>	10/13/16	5/1/17	Expected 12/30/20	Year 1: \$42,153 Year 2: \$43,766 Year 3: \$43,773  <b>Total-to-date:</b> <b>\$129,692</b>  Expected Future Request: \$0

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>H-17-ZS: Adhesive challenges with maple &amp; hickory veneer at low moisture levels</b>					
<b>VIRGINIA TECH:</b> Zink-Sharp (Cody Wykle, MS; Alexandra Flevarakis, BS; Dylan Harris, BS)	<b>(IAB TC LEAD: Fred Carter, CFP)</b> • CFP • Henkel	4/6/16	9/1/16	4/15/19	Year 1 : \$38,784 Year 1.5: \$20,446 <b>Total WBC Funding: \$59,230</b>
<b>I-31-RO: Dispersion force-based new adhesive concept</b>					
<b>VIRGINIA TECH:</b> M. Roman  (Apratim Jash, PhD)	<b>(IAB TC LEAD: TBD)</b> • Arclin • Fraunhofer • GP Chemicals • Hexion • Oxiquim • WVCO	5/17/17	1/1/18	Expected 12/31/21 (Project cancelled by IAB TC, 10/18)	Year 1: \$48,582 <b>Total-to-date: \$48,582</b> Expected Year 2 Request: \$50,338 (Fall 2018) (9/27/18: cancelled; returned \$34,431)
<b>F-07-FR: MDF fiber quality</b>					
<b>VIRGINIA TECH:</b> C. Frazier  (Mohammad Tasooji, PhD)	• Arauco NA • Arclin • Columbia FP • GP Chemicals • WVCO	10/16/14	10/20/14	5/9/18	Year 1 : \$48,890 Year 2: \$48,890 Year 3: \$27,310 <b>Total WBC Funding: \$125,090</b>
<b>F-08-KA (VT only): Wetting and diffusion associated with selected liquid/wood interfaces</b>					
<b>OREGON STATE:</b> F. Kamke (Balkis Bakar, Elizabeth Mills)  <b>VIRGINIA TECH:</b> C. Frazier (Christa Stables, MS)	• Arclin • Hexion • WVCO	10/16/14	4/1/15 (OSU)  6/15/15 (VT)	1/1/17  9/6/17	Year 1: \$42,559 Year 2: \$39,255 <b>Total WBC Funding: \$81,814</b>
<b>F-05-FR: Biogenic formaldehyde emission</b>					
<b>VIRGINIA TECH:</b> C. Frazier  (Guigui Wan, PhD)	• Arauco NA • Arclin • Hexion • Oxiquim	10/16/14	10/1/14	12/20/16	Year 1: \$48,890 Year 2: \$41,890 <b>Total WBC Funding: \$90,780</b>
<b>F-04-FR: Organic fillers used in PF resoles</b>					
<b>VIRGINIA TECH:</b> C. Frazier  (X. (Chuck) Wang, MS)	• Arclin • GP Chemicals • Hexion • WVCO	10/16/14	10/30/14	8/31/16	Year 1 : \$16,000 Year 2: \$47,446 <b>Total WBC Funding: \$63,446</b>

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>SUPP-IMD-13: Innovative Managing Director Model I/UCRC Supplement</b>					
VIRGINIA TECH: C. Frazier  (L. Caudill)	<ul style="list-style-type: none"> <li>• NA</li> </ul>	9/18/13 (up to 3 yr. award)	9/18/13	7/31/16	Year 1: \$200,000 Year 2: \$200,000 <b>Total NSF Funding: \$400,000</b> <b>Total WBC Funding: \$0</b>
<b>G-05-FR: Surfactants: Fundamental impacts in veneer bonding</b>					
VIRGINIA TECH: C. Frazier  (TBD)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• GP Chemicals</li> <li>• Hexion</li> </ul>	5/7/15	TBD	(Postponed indefinitely due to Phase II delay)	Year 1: \$49,636 <b>Total-to-date: \$0</b> Expected Year 2 funding request: \$49,636
<b>Queensland-13: Adhesion fundamentals in spotted gum (Corymbia sp.)</b>					
VIRGINIA TECH: C. Frazier  (C. Burch, MS)	<ul style="list-style-type: none"> <li>• Hexion</li> <li>• Queensland Govt.</li> </ul>	7/1/12	1/22/13	11/6/15	Year 1: \$40,000 Year 2: \$40,000 <b>Total WBC Funding: \$80,000</b>
<b>B-18-ZS: Understanding the differences in bonding characteristics of Douglas-fir and SYP wood</b>					
VIRGINIA TECH: Zink-Sharp S. Rennecker  (K. Mirabile, MS)	<ul style="list-style-type: none"> <li>• GP Chemicals</li> <li>• Henkel</li> <li>• Hexion</li> </ul>	9/21/11	1/8/13	11/9/15	Year 1: \$29,550 Year 2: \$29,750 Year 3: \$3006 <b>Total WBC Funding: \$62,306</b>
<b>F-06-FR: Formaldehyde in tree increment cores</b>					
VIRGINIA TECH: C. Frazier (H.Wise, BS, G.Lewis, BS)	<ul style="list-style-type: none"> <li>• Arauco NA</li> <li>• GP Chemicals</li> </ul>	10/16/14	10/20/14	7/15/15	Year 1 : \$7300 <b>Total WBC Funding: \$7300</b>
<b>A-12-CO: Fundamentals of formaldehyde detection and emission determination</b>					
Maine: B. Cole D. Gardner R. Fort VIRGINIA TECH: C. Frazier (S. Blosch, A. Hellenbrand, MS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• GP Chemicals</li> <li>• Momentive</li> <li>• Solenis</li> </ul>	9/15/10	1/10/11	12/31/14	Year 1: \$19,500 (Total: \$44,500) Year 2: \$45,964 Year 3: \$47,340 Year 4: \$48,950 <b>Total WBC Funding: \$186,754</b>

FACULTY	TECHNICAL ADVISORS	AWARD DATE	START DATE	END DATE	FUNDING
<b>FUND-12: Mechanisms of wood-generated formaldehyde emission</b> (Continued as F-05-FR: Biogenic formaldehyde emission, Fall 2014)					
VIRGINIA TECH: C. Frazier  (G. Wan, PhD)	<ul style="list-style-type: none"> <li>• NA/pending</li> </ul>	8/15/11 (2-yr. award)	5/21/12	9/30/14	Year 1: \$99,725 Year 2: \$99,725 <b>Total NSF Funding:</b> <b>\$199,450</b> <b>Total WBC Funding:</b> <b>\$0</b>
<b>A-24-FR: Influence of filler particle size on adhesive penetration and performance</b>					
VIRGINIA TECH: C. Frazier  (X. Yang, PhD)	<ul style="list-style-type: none"> <li>• GP Chemicals</li> <li>• Momentive</li> <li>• WVCO</li> </ul>	9/15/10	1/18/11	9/22/14	Year 1: \$11,612 Year 2: \$7836 Year 3: \$38,760 Year 4: \$38,687 <b>Total WBC Funding:</b> <b>\$96,895</b>
<b>A-14-FR: Formaldehyde determination through liquid extraction (formerly, Wood modifications promoting durable adhesion)</b>					
VIRGINIA TECH: C. Frazier Zink-Sharp  (M. Tasooji, MS)	<ul style="list-style-type: none"> <li>• Henkel</li> <li>• Weyerhaeuser</li> <li>• WVCO</li> </ul>	9/15/10	8/10/11	5/29/14	Year 1: \$48,000 Year 2: \$38,000 Year 3: \$18,600 <b>Total WBC Funding:</b> <b>\$104,600</b>
<b>D-01-FR: Formaldehyde/wood mass transfer</b>					
VIRGINIA TECH: C. Frazier (C. Burch – reassigned to Queensland-13)	<ul style="list-style-type: none"> <li>• Arclin</li> </ul>	10/8/13	8/26/13	Project terminated 4/17/14	Year 1 : \$38,795 <b>Total WBC Funding: \$0</b> (LCC: funds returned)
<b>B-01-LI: Developing a reference material for formaldehyde emissions testing</b>					
VIRGINIA TECH: J. Little S. Cox C. Frazier (X. Zhao, MS)	<ul style="list-style-type: none"> <li>• Arclin</li> <li>• Weyerhaeuser</li> </ul>	6/20/12	8/27/12	8/26/13	Year 1: \$44,500 <b>Total WBC Funding:</b> <b>\$44,500</b>