

RCSfile: s3-s4-s5-apj.tex,v Revision: 1.7 Date: 2007/08/02  
16:46:37 Name: T070078-02

## S3,S4,S5 LIGO Scientific Collaboration Author List

Generated from Author Database Revision: 1.16 Date: 2007/08/02 15:01:15 Name: S3-S4-S5-V05

B. Abbott<sup>15</sup>, R. Abbott<sup>15</sup>, R. Adhikari<sup>15</sup>, J. Agresti<sup>15</sup>, P. Ajith<sup>2</sup>, B. Allen<sup>2, 52</sup>, R. Amin<sup>19</sup>, S. B. Anderson<sup>15</sup>, W. G. Anderson<sup>52</sup>, M. Arain<sup>40</sup>, M. Araya<sup>15</sup>, H. Armandula<sup>15</sup>, M. Ashley<sup>4</sup>, S. Aston<sup>39</sup>, P. Aufmuth<sup>37</sup>, C. Aulbert<sup>1</sup>, S. Babak<sup>1</sup>, S. Ballmer<sup>15</sup>, H. Bantilan<sup>9</sup>, B. C. Barish<sup>15</sup>, C. Barker<sup>16</sup>, D. Barker<sup>16</sup>, B. Barr<sup>41</sup>, P. Barriga<sup>51</sup>, M. A. Barton<sup>41</sup>, K. Bayer<sup>18</sup>, K. Belczynski<sup>25</sup>, J. Betzwieser<sup>18</sup>, P. T. Beyersdorf<sup>28</sup>, B. Bhawal<sup>15</sup>, I. A. Bilenko<sup>22</sup>, G. Billingsley<sup>15</sup>, R. Biswas<sup>52</sup>, E. Black<sup>15</sup>, K. Blackburn<sup>15</sup>, L. Blackburn<sup>18</sup>, D. Blair<sup>51</sup>, B. Bland<sup>16</sup>, J. Bogenstahl<sup>41</sup>, L. Bogue<sup>17</sup>, R. Bork<sup>15</sup>, V. Boschi<sup>15</sup>, S. Bose<sup>54</sup>, P. R. Brady<sup>52</sup>, V. B. Braginsky<sup>22</sup>, J. E. Brau<sup>44</sup>, M. Brinkmann<sup>2</sup>, A. Brooks<sup>38</sup>, D. A. Brown<sup>15, 7</sup>, A. Bullington<sup>31</sup>, A. Bunkowski<sup>2</sup>, A. Buonanno<sup>42</sup>, O. Burmeister<sup>2</sup>, D. Busby<sup>15</sup>, W. E. Butler<sup>45</sup>, R. L. Byer<sup>31</sup>, L. Cadonati<sup>18</sup>, G. Cagnoli<sup>41</sup>, J. B. Camp<sup>23</sup>, J. Cannizzo<sup>23</sup>, K. Cannon<sup>52</sup>, C. A. Cantley<sup>41</sup>, J. Cao<sup>18</sup>, L. Cardenas<sup>15</sup>, K. Carter<sup>17</sup>, M. M. Casey<sup>41</sup>, G. Castaldi<sup>47</sup>, C. Cepeda<sup>15</sup>, E. Chalkey<sup>41</sup>, P. Charlton<sup>10</sup>, S. Chatterji<sup>15</sup>, S. Chelkowski<sup>2</sup>, Y. Chen<sup>1</sup>, F. Chiadini<sup>46</sup>, D. Chin<sup>43</sup>, E. Chin<sup>51</sup>, J. Chow<sup>4</sup>, N. Christensen<sup>9</sup>, J. Clark<sup>41</sup>, P. Cochrane<sup>2</sup>, T. Cokelaer<sup>8</sup>, C. N. Colacino<sup>39</sup>, R. Coldwell<sup>40</sup>, R. Conte<sup>46</sup>, D. Cook<sup>16</sup>, T. Corbitt<sup>18</sup>, D. Coward<sup>51</sup>, D. Coyne<sup>15</sup>, J. D. E. Creighton<sup>52</sup>, T. D. Creighton<sup>15</sup>, R. P. Croce<sup>47</sup>, D. R. M. Crooks<sup>41</sup>, A. M. Cruise<sup>39</sup>, A. Cumming<sup>41</sup>, J. Dalrymple<sup>32</sup>, E. D'Ambrosio<sup>15</sup>, K. Danzmann<sup>37, 2</sup>, G. Davies<sup>8</sup>, D. DeBra<sup>31</sup>, J. Degallaix<sup>51</sup>, M. Degree<sup>31</sup>, T. Demma<sup>47</sup>, V. Dergachev<sup>43</sup>, S. Desai<sup>33</sup>, R. DeSalvo<sup>15</sup>, S. Dhurandhar<sup>14</sup>, M. Díaz<sup>34</sup>, J. Dickson<sup>4</sup>, A. Di Credico<sup>32</sup>, G. Diederichs<sup>37</sup>, A. Dietz<sup>8</sup>, E. E. Doomes<sup>30</sup>, R. W. P. Drever<sup>5</sup>, J.-C. Dumas<sup>51</sup>, R. J. Dupuis<sup>15</sup>, J. G. Dwyer<sup>11</sup>, P. Ehrens<sup>15</sup>, E. Espinoza<sup>15</sup>, T. Etzel<sup>15</sup>, M. Evans<sup>15</sup>, T. Evans<sup>17</sup>, S. Fairhurst<sup>8, 15</sup>, Y. Fan<sup>51</sup>, D. Fazi<sup>15</sup>, M. M. Fejer<sup>31</sup>, L. S. Finn<sup>33</sup>, V. Fiumara<sup>46</sup>, N. Fotopoulos<sup>52</sup>, A. Franzen<sup>37</sup>, K. Y. Franzen<sup>40</sup>, A. Freise<sup>39</sup>, R. Frey<sup>44</sup>, T. Fricke<sup>45</sup>, P. Fritschel<sup>18</sup>, V. V. Frolov<sup>17</sup>, M. Fyffe<sup>17</sup>, V. Galdi<sup>47</sup>, K. S. Ganezer<sup>6</sup>, J. Garofoli<sup>16</sup>, I. Gholami<sup>1</sup>, J. A. Giaime<sup>17, 19</sup>, S. Giampaanis<sup>45</sup>, K. D. Giardina<sup>17</sup>, K. Goda<sup>18</sup>, E. Goetz<sup>43</sup>, L. M. Goggin<sup>15</sup>, G. González<sup>19</sup>, S. Gossler<sup>4</sup>, A. Grant<sup>41</sup>, S. Gras<sup>51</sup>, C. Gray<sup>16</sup>, M. Gray<sup>4</sup>, J. Greenhalgh<sup>27</sup>, A. M. Gretarsson<sup>12</sup>, R. Grossos<sup>34</sup>, H. Grote<sup>2</sup>, S. Grunewald<sup>1</sup>, M. Guenther<sup>16</sup>, R. Gustafson<sup>43</sup>, B. Hage<sup>37</sup>, D. Hammer<sup>52</sup>, C. Hanna<sup>19</sup>, J. Hanson<sup>17</sup>, J. Harms<sup>2</sup>, G. Harry<sup>18</sup>, E. Harstad<sup>44</sup>, T. Hayler<sup>27</sup>, J. Heefner<sup>15</sup>, I. S. Heng<sup>41</sup>, A. Heptonstall<sup>41</sup>, M. Heurs<sup>2</sup>, M. Hewitson<sup>2</sup>, S. Hild<sup>37</sup>, E. Hirose<sup>32</sup>, D. Hoak<sup>17</sup>, D. Hosken<sup>38</sup>, J. Hough<sup>41</sup>, E. Howell<sup>51</sup>, D. Hoyland<sup>39</sup>, S. H. Huttner<sup>41</sup>, D. Ingram<sup>16</sup>, E. Innerhofer<sup>18</sup>, M. Ito<sup>44</sup>, Y. Itoh<sup>52</sup>, A. Ivanov<sup>15</sup>, D. Jackrel<sup>31</sup>, B. Johnson<sup>16</sup>, W. W. Johnson<sup>19</sup>, D. I. Jones<sup>48</sup>, G. Jones<sup>8</sup>, R. Jones<sup>41</sup>, L. Ju<sup>51</sup>, P. Kalmus<sup>11</sup>, V. Kalogera<sup>25</sup>, D. Kasprzyk<sup>39</sup>, E. Katsavounidis<sup>18</sup>, K. Kawabe<sup>16</sup>, S. Kawamura<sup>24</sup>, F. Kawazoe<sup>24</sup>, W. Kells<sup>15</sup>, D. G. Keppel<sup>15</sup>, F. Ya. Khalili<sup>22</sup>, C. Kim<sup>25</sup>, P. King<sup>15</sup>, J. S. Kissel<sup>19</sup>, S. Klimenko<sup>40</sup>, K. Kokeyama<sup>24</sup>, V. Kondrashov<sup>15</sup>, R. K. Kopparapu<sup>19</sup>, D. Kozak<sup>15</sup>, B. Krishnan<sup>1</sup>, P. Kwee<sup>37</sup>, P. K. Lam<sup>4</sup>, M. Landry<sup>16</sup>, B. Lantz<sup>31</sup>, A. Lazzarini<sup>15</sup>, B. Lee<sup>51</sup>, M. Lei<sup>15</sup>, J. Leiner<sup>54</sup>, V. Leonhardt<sup>24</sup>, I. Leonor<sup>44</sup>, K. Libbrecht<sup>15</sup>, P. Lindquist<sup>15</sup>, N. A. Lockerbie<sup>49</sup>, M. Longo<sup>46</sup>, M. Lormand<sup>17</sup>,

M. Lubinski<sup>16</sup>, H. Lück<sup>37, 2</sup>, B. Machenschalk<sup>1</sup>, M. MacInnis<sup>18</sup>, M. Mageswaran<sup>15</sup>, K. Mailand<sup>15</sup>,  
M. Malec<sup>37</sup>, V. Mandic<sup>15</sup>, S. Marano<sup>46</sup>, S. Márka<sup>11</sup>, J. Markowitz<sup>18</sup>, E. Maros<sup>15</sup>, I. Martin<sup>41</sup>,  
J. N. Marx<sup>15</sup>, K. Mason<sup>18</sup>, L. Matone<sup>11</sup>, V. Matta<sup>46</sup>, N. Mavalvala<sup>18</sup>, R. McCarthy<sup>16</sup>,  
D. E. McClelland<sup>4</sup>, S. C. McGuire<sup>30</sup>, M. McHugh<sup>21</sup>, K. McKenzie<sup>4</sup>, J. W. C. McNabb<sup>33</sup>,  
S. McWilliams<sup>23</sup>, T. Meier<sup>37</sup>, A. Melissinos<sup>45</sup>, G. Mendell<sup>16</sup>, R. A. Mercer<sup>40</sup>, S. Meshkov<sup>15</sup>,  
E. Messaritaki<sup>15</sup>, C. J. Messenger<sup>41</sup>, D. Meyers<sup>15</sup>, E. Mikhailov<sup>18</sup>, S. Mitra<sup>14</sup>, V. P. Mitrofanov<sup>22</sup>,  
G. Mitselmakher<sup>40</sup>, R. Mittleman<sup>18</sup>, O. Miyakawa<sup>15</sup>, S. Mohanty<sup>34</sup>, G. Moreno<sup>16</sup>, K. Mossavi<sup>2</sup>,  
C. MowLowry<sup>4</sup>, A. Moylan<sup>4</sup>, D. Mudge<sup>38</sup>, G. Mueller<sup>40</sup>, S. Mukherjee<sup>34</sup>, H. Müller-Ebhardt<sup>2</sup>,  
J. Munch<sup>38</sup>, P. Murray<sup>41</sup>, E. Myers<sup>16</sup>, J. Myers<sup>16</sup>, T. Nash<sup>15</sup>, G. Newton<sup>41</sup>, A. Nishizawa<sup>24</sup>,  
F. Nocera<sup>15</sup>, K. Numata<sup>23</sup>, B. O'Reilly<sup>17</sup>, R. O'Shaughnessy<sup>25</sup>, D. J. Ottaway<sup>18</sup>, H. Overmier<sup>17</sup>,  
B. J. Owen<sup>33</sup>, Y. Pan<sup>42</sup>, M. A. Papa<sup>1, 52</sup>, V. Parameshwaraiah<sup>16</sup>, C. Parameswariah<sup>17</sup>, P. Patel<sup>15</sup>,  
M. Pedraza<sup>15</sup>, S. Penn<sup>13</sup>, V. Pierro<sup>47</sup>, I. M. Pinto<sup>47</sup>, M. Pitkin<sup>41</sup>, H. Pletsch<sup>2</sup>, M. V. Plissi<sup>41</sup>,  
F. Postiglione<sup>46</sup>, R. Prix<sup>1</sup>, V. Quetschke<sup>40</sup>, F. Raab<sup>16</sup>, D. Rabeling<sup>4</sup>, H. Radkins<sup>16</sup>, R. Rahkola<sup>44</sup>,  
N. Rainer<sup>2</sup>, M. Rakhmanov<sup>33</sup>, M. Ramsunder<sup>33</sup>, K. Rawlins<sup>18</sup>, S. Ray-Majumder<sup>52</sup>, V. Re<sup>39</sup>,  
T. Regimbau<sup>8</sup>, H. Rehbein<sup>2</sup>, S. Reid<sup>41</sup>, D. H. Reitze<sup>40</sup>, L. Ribichini<sup>2</sup>, R. Riesen<sup>17</sup>, K. Riles<sup>43</sup>,  
B. Rivera<sup>16</sup>, N. A. Robertson<sup>15, 41</sup>, C. Robinson<sup>8</sup>, E. L. Robinson<sup>39</sup>, S. Roddy<sup>17</sup>, A. Rodriguez<sup>19</sup>,  
A. M. Rogan<sup>54</sup>, J. Rollins<sup>11</sup>, J. D. Romano<sup>8</sup>, J. Romie<sup>17</sup>, R. Route<sup>31</sup>, S. Rowan<sup>41</sup>, A. Rüdiger<sup>2</sup>,  
L. Ruet<sup>18</sup>, P. Russell<sup>15</sup>, K. Ryan<sup>16</sup>, S. Sakata<sup>24</sup>, M. Samidi<sup>15</sup>, L. Sancho de la Jordana<sup>36</sup>,  
V. Sandberg<sup>16</sup>, G. H. Sanders<sup>15</sup>, V. Sannibale<sup>15</sup>, S. Saraf<sup>26</sup>, P. Sarin<sup>18</sup>, B. S. Sathyaprakash<sup>8</sup>,  
S. Sato<sup>24</sup>, P. R. Saulson<sup>32</sup>, R. Savage<sup>16</sup>, P. Savov<sup>7</sup>, A. Sazonov<sup>40</sup>, S. Schediyw<sup>51</sup>, R. Schilling<sup>2</sup>,  
R. Schnabel<sup>2</sup>, R. Schofield<sup>44</sup>, B. F. Schutz<sup>1, 8</sup>, P. Schwinberg<sup>16</sup>, S. M. Scott<sup>4</sup>, A. C. Searle<sup>4</sup>,  
B. Sears<sup>15</sup>, F. Seifert<sup>2</sup>, D. Sellers<sup>17</sup>, A. S. Sengupta<sup>8</sup>, P. Shawhan<sup>42</sup>, D. H. Shoemaker<sup>18</sup>,  
A. Sibley<sup>17</sup>, J. A. Sidles<sup>50</sup>, X. Siemens<sup>15, 7</sup>, D. Sigg<sup>16</sup>, S. Sinha<sup>31</sup>, A. M. Sintes<sup>36, 1</sup>,  
B. J. J. Slagmolen<sup>4</sup>, J. Slutsky<sup>19</sup>, J. R. Smith<sup>2</sup>, M. R. Smith<sup>15</sup>, K. Somiya<sup>2, 1</sup>, K. A. Strain<sup>41</sup>,  
D. M. Strom<sup>44</sup>, A. Stuver<sup>33</sup>, T. Z. Summerscales<sup>3</sup>, K.-X. Sun<sup>31</sup>, M. Sung<sup>19</sup>, P. J. Sutton<sup>15</sup>,  
H. Takahashi<sup>1</sup>, D. B. Tanner<sup>40</sup>, M. Tarallo<sup>15</sup>, R. Taylor<sup>15</sup>, R. Taylor<sup>41</sup>, J. Thacker<sup>17</sup>,  
K. A. Thorne<sup>33</sup>, K. S. Thorne<sup>7</sup>, A. Thüring<sup>37</sup>, K. V. Tokmakov<sup>41</sup>, C. Torres<sup>34</sup>, C. Torrie<sup>41</sup>,  
G. Traylor<sup>17</sup>, M. Trias<sup>36</sup>, W. Tyler<sup>15</sup>, D. Ugolini<sup>35</sup>, C. Ungarelli<sup>39</sup>, K. Urbanek<sup>31</sup>, H. Vahlbruch<sup>37</sup>,  
M. Vallisneri<sup>7</sup>, C. Van Den Broeck<sup>8</sup>, M. van Putten<sup>18</sup>, M. Varvella<sup>15</sup>, S. Vass<sup>15</sup>, A. Vecchio<sup>39</sup>,  
J. Veitch<sup>41</sup>, P. Veitch<sup>38</sup>, A. Villar<sup>15</sup>, C. Vorvick<sup>16</sup>, S. P. Vyachanin<sup>22</sup>, S. J. Waldman<sup>15</sup>,  
L. Wallace<sup>15</sup>, H. Ward<sup>41</sup>, R. Ward<sup>15</sup>, K. Watts<sup>17</sup>, D. Webber<sup>15</sup>, A. Weidner<sup>2</sup>, M. Weinert<sup>2</sup>,  
A. Weinstein<sup>15</sup>, R. Weiss<sup>18</sup>, S. Wen<sup>19</sup>, K. Wette<sup>4</sup>, J. T. Whelan<sup>1</sup>, D. M. Whitbeck<sup>33</sup>,  
S. E. Whitcomb<sup>15</sup>, B. F. Whiting<sup>40</sup>, S. Wiley<sup>6</sup>, C. Wilkinson<sup>16</sup>, P. A. Willems<sup>15</sup>, L. Williams<sup>40</sup>,  
B. Willke<sup>37, 2</sup>, I. Wilmut<sup>27</sup>, W. Winkler<sup>2</sup>, C. C. Wipf<sup>18</sup>, S. Wise<sup>40</sup>, A. G. Wiseman<sup>52</sup>, G. Woan<sup>41</sup>,  
D. Woods<sup>52</sup>, R. Wooley<sup>17</sup>, J. Worden<sup>16</sup>, W. Wu<sup>40</sup>, I. Yakushin<sup>17</sup>, H. Yamamoto<sup>15</sup>, Z. Yan<sup>51</sup>,  
S. Yoshida<sup>29</sup>, N. Yunes<sup>33</sup>, M. Zanolin<sup>18</sup>, J. Zhang<sup>43</sup>, L. Zhang<sup>15</sup>, C. Zhao<sup>51</sup>, N. Zotov<sup>20</sup>,  
M. Zucker<sup>18</sup>, H. zur Mühlen<sup>37</sup>, J. Zweizig<sup>15</sup>

---

<sup>1</sup>Albert-Einstein-Institut, Max-Planck-Institut für Gravitationsphysik, D-14476 Golm, Germany

<sup>2</sup>Albert-Einstein-Institut, Max-Planck-Institut für Gravitationsphysik, D-30167 Hannover, Germany

<sup>3</sup>Andrews University, Berrien Springs, MI 49104 USA

<sup>4</sup>Australian National University, Canberra, 0200, Australia

<sup>5</sup>California Institute of Technology, Pasadena, CA 91125, USA

<sup>6</sup>California State University Dominguez Hills, Carson, CA 90747, USA

<sup>7</sup>Caltech-CaRT, Pasadena, CA 91125, USA

<sup>8</sup>Cardiff University, Cardiff, CF24 3AA, United Kingdom

<sup>9</sup>Carleton College, Northfield, MN 55057, USA

<sup>10</sup>Charles Sturt University, Wagga Wagga, NSW 2678, Australia

<sup>11</sup>Columbia University, New York, NY 10027, USA

<sup>12</sup>Embry-Riddle Aeronautical University, Prescott, AZ 86301 USA

<sup>13</sup>Hobart and William Smith Colleges, Geneva, NY 14456, USA

<sup>14</sup>Inter-University Centre for Astronomy and Astrophysics, Pune - 411007, India

<sup>15</sup>LIGO - California Institute of Technology, Pasadena, CA 91125, USA

<sup>16</sup>LIGO Hanford Observatory, Richland, WA 99352, USA

<sup>17</sup>LIGO Livingston Observatory, Livingston, LA 70754, USA

<sup>18</sup>LIGO - Massachusetts Institute of Technology, Cambridge, MA 02139, USA

<sup>19</sup>Louisiana State University, Baton Rouge, LA 70803, USA

<sup>20</sup>Louisiana Tech University, Ruston, LA 71272, USA

<sup>21</sup>Loyola University, New Orleans, LA 70118, USA

<sup>22</sup>Moscow State University, Moscow, 119992, Russia

<sup>23</sup>NASA/Goddard Space Flight Center, Greenbelt, MD 20771, USA

<sup>24</sup>National Astronomical Observatory of Japan, Tokyo 181-8588, Japan

<sup>25</sup>Northwestern University, Evanston, IL 60208, USA

<sup>26</sup>Rochester Institute of Technology, Rochester, NY 14623, USA

<sup>27</sup>Rutherford Appleton Laboratory, Chilton, Didcot, Oxon OX11 0QX United Kingdom

<sup>28</sup>San Jose State University, San Jose, CA 95192, USA

<sup>29</sup>Southeastern Louisiana University, Hammond, LA 70402, USA

<sup>30</sup>Southern University and A&M College, Baton Rouge, LA 70813, USA

<sup>31</sup>Stanford University, Stanford, CA 94305, USA

<sup>32</sup>Syracuse University, Syracuse, NY 13244, USA

<sup>33</sup>The Pennsylvania State University, University Park, PA 16802, USA

## ABSTRACT

This author list contains all authors and institution names for LSC papers. For minor corrections (e.g. spelling, initials), contact Norna Robertson, Chair of the LSC Election and Membership committee (robertson\_n@ligo.caltech.edu) For all other queries please contact your PI or relevant authorship list organiser for your institution in the first instance.

---

<sup>34</sup>The University of Texas at Brownsville and Texas Southmost College, Brownsville, TX 78520, USA

<sup>35</sup>Trinity University, San Antonio, TX 78212, USA

<sup>36</sup>Universitat de les Illes Balears, E-07122 Palma de Mallorca, Spain

<sup>37</sup>Universität Hannover, D-30167 Hannover, Germany

<sup>38</sup>University of Adelaide, Adelaide, SA 5005, Australia

<sup>39</sup>University of Birmingham, Birmingham, B15 2TT, United Kingdom

<sup>40</sup>University of Florida, Gainesville, FL 32611, USA

<sup>41</sup>University of Glasgow, Glasgow, G12 8QQ, United Kingdom

<sup>42</sup>University of Maryland, College Park, MD 20742 USA

<sup>43</sup>University of Michigan, Ann Arbor, MI 48109, USA

<sup>44</sup>University of Oregon, Eugene, OR 97403, USA

<sup>45</sup>University of Rochester, Rochester, NY 14627, USA

<sup>46</sup>University of Salerno, 84084 Fisciano (Salerno), Italy

<sup>47</sup>University of Sannio at Benevento, I-82100 Benevento, Italy

<sup>48</sup>University of Southampton, Southampton, SO17 1BJ, United Kingdom

<sup>49</sup>University of Strathclyde, Glasgow, G1 1XQ, United Kingdom

<sup>50</sup>University of Washington, Seattle, WA, 98195

<sup>51</sup>University of Western Australia, Crawley, WA 6009, Australia

<sup>52</sup>University of Wisconsin-Milwaukee, Milwaukee, WI 53201, USA

<sup>53</sup>Vassar College, Poughkeepsie, NY 12604

<sup>54</sup>Washington State University, Pullman, WA 99164, USA

### Acknowledgement

*The following paragraph should serve as a starting point for acknowledging the support LSC has received.*

The authors gratefully acknowledge the support of the United States National Science Foundation for the construction and operation of the LIGO Laboratory and the Particle Physics and Astronomy Research Council of the United Kingdom, the Max-Planck-Society and the State of Niedersachsen/Germany for support of the construction and operation of the GEO600 detector. The authors also gratefully acknowledge the support of the research by these agencies and by the Australian Research Council, the Natural Sciences and Engineering Research Council of Canada, the Council of Scientific and Industrial Research of India, the Department of Science and Technology of India, the Spanish Ministerio de Educacion y Ciencia, The National Aeronautics and Space Administration, the John Simon Guggenheim Foundation, the Alexander von Humboldt Foundation, the Leverhulme Trust, the David and Lucile Packard Foundation, the Research Corporation, and the Alfred P. Sloan Foundation.