

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLUMBIA

ENERGY & ENVIRONMENT LEGAL INSTITUTE	)	
	)	
Plaintiff,	)	
	)	
v.	)	cv: 16-00915-TSC
	)	
	)	
UNITED STATES ENVIRONMENTAL	)	
PROTECTION AGENCY,	)	
	)	
Defendant.	)	

**MEMORANDUM OF POINTS AND AUTHORITIES IN SUPPORT OF APPLICATION  
FOR TEMPORARY RESTRAINING ORDER**

Plaintiff the Energy & Environment Legal Institute (“EELI”) submits the following memorandum of points and authorities in support of its application for a temporary restraining order and motion for relief pending review<sup>1</sup>.

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<sup>1</sup> Pursuant to LCvR 65.1(a), prior to filing this motion, EELI provided Defendant actual notice of the filing, including copies of initial complaint, application and this memorandum. This is further noted in the certificate of service accompanying the Application for Temporary Restraining Order and Motion for Relief Pending Review.

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### **Introduction**

This action arises from the EPA's appointment of 26 members of its Clean Air Scientific Advisory Committee Particulate Matter Review Panel (CASAC PM Panel) on November 17, 2015. This review panel is charged with examining the agency's Draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter, pursuant to the Clean Air Act, 42 U.S.C. § 7409(d). This review panel is scheduled to meet initially and hear public comments on Monday, May 23, 2016. 81 Fed. Reg. 13362 (March 14, 2016).

This review panel's membership is improper however. Its membership composition violates the protections built into the Clean Air Act and the Federal Advisory Committee Act designed to prevent agency's from building committees made up of those who already support the agency's position, and to prevent agency's from ignoring the free and open exchange of divergent views in favor of a pre-determined outcome.

The committee selected by the agency, through the EPA Science Advisory Board Staff Office, fails to comport with the necessary legal protections. The committee as it is currently constructed is not an "independent scientific review committee" because its members are closely tied to the agency through funding sources. The members thus are likely to be inappropriately influenced by the appointing agency, in violation of the Federal Advisory Committee Act. Further the committee is not fairly balanced in terms of the points of view represented on the very issue being examined, which is to review the agency's own proposals with regard to particulate matter.<sup>2</sup>

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<sup>2</sup> The EPA's Health and Environmental Impacts Division, Office of Air Quality Planning and Standard's charge to the CASAC Panel is to examine and review the draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter. *See Ex. 1* Charge Memo

Absent action by this Court, the process for review of the agency's proposals will become hopelessly tainted after being initially reviewed by an improperly composed committee. A properly comprised committee will doubtless contain some of those currently named to the CASAC PM Panel, along with others who are not currently members. Yet if the Panel holds an initial public meeting and begins reviewing material, the views of those removed will forever become part of the process. The bell, once rung, cannot be unrung. The final conclusions of this Panel carry great weight. Indeed in reaching final standards on the national ambient air quality level, the agency would be acting arbitrarily and capriciously if it simply ignored the work of the scientific review panels it is mandated to convene.

The work of this panel will have a substantial impact on Plaintiff and its members and an improper panel or a panel forever altered by the views of those improperly named to it will cause irreparable harm. Plaintiff seeks this temporary restraining order to prevent the panel from holding this initial meeting or beginning its work to review the agency's draft documents until this Court can determine whether the panel as comprised meets the criteria set by law.

### **Factual Background**

#### **1) Controversy Over PM<sub>2.5</sub>**

Ambient airborne fine particles, also known as PM<sub>2.5</sub>, are fine particulate matter like soot or dust in outdoor air. PM<sub>2.5</sub> is both naturally occurring (e.g., forest fires, volcanic eruptions, dust, mold, pollen) and man-made (e.g., emissions from smokestacks and tail pipes, and smoking).

The EPA regulates so-called PM<sub>2.5</sub> under the Clean Air Act, which permits the EPA to establish permitted levels of PM<sub>2.5</sub> in outdoor air (called "National Ambient Air Quality

Standards” or “NAAQS” and to limit the emissions of PM<sub>2.5</sub> and its precursors from smokestacks and tailpipes. The Clean Air Act requires that the EPA periodically review its NAAQS standards. A new review NAAQS review cycle for PM<sub>2.5</sub> has begun.

The Clean Air Act requires that the EPA establish an independent scientific advisory committee to review the scientific basis for EPA’s regulation of air pollutants. The EPA established the Clean Air Scientific Advisory Committee to satisfy this requirement. For the purposes of specifically reviewing particulate matter science, the EPA established the CASAC Particulate Matter Review Panel (CASAC PM Panel). The composition and membership of the CASAC PM Panel varies as new panels are appointed for new review cycles of the particulate matter science.

EPA began regulating PM<sub>2.5</sub> in 1997, after decades of regulating larger sizes of airborne particulate matter, claiming that its new rules would prevent 15,000 premature deaths every year.

The EPA’s claim that PM<sub>2.5</sub> caused deaths was controversial at the time. In a March 1996 letter from the CASAC PM Panel (1996 CASAC PM Panel) to then EPA Administrator Carol Browner, the CASAC PM Panel doubted that PM<sub>2.5</sub> was linked with mortality (premature death):<sup>3</sup>

*[Mortality] does not appear to be unambiguously related to any single pollutant let alone a specific portion of the particulate matter.*

At the time, the CASAC PM Panel was comprised of seven (7) members and fourteen (14) consultants. Of the seven members, only two (2) had at the time or afterwards received

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<sup>3</sup> See Letter from George T. Wolff, Chair, CASAC, to Carol M. Browner, Administrator, EPA, March 15, 1996 ([https://yosemite.epa.gov/sab/sabproduct.nsf/92B3B27CE879F5BE852571A900665309/\\$File/cas19605.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/92B3B27CE879F5BE852571A900665309/$File/cas19605.pdf)).

grants from the EPA. Of the fourteen consultants, only five (5) had at the time or afterwards received grants from the EPA. In total, then of the 21 individuals involved in the CASAC PM Panel that reviewed the particulate matter science in 1996, only one-third (33 percent) had received grants from the EPA.

As the EPA is not compelled to heed the advice of the CASAC PM Panel, the EPA went ahead and regulated PM<sub>2.5</sub> on the basis of mortality anyway.

In its 2009 scientific assessment of PM<sub>2.5</sub>, the EPA determined that any inhalation of PM<sub>2.5</sub> can be fatal in as little as a few hours, and that PM<sub>2.5</sub> can also cause death on a long-term exposure basis.

In 2009, a new CASAC PM Panel (2009 CASAC PM Panel) concluded that:

*CASAC recommends “upgrading” the causal classification for PM<sub>2.5</sub> and total mortality as “causal” for both the short-term and long-term time frames.*

The 2009 CASAC PM Panel was comprised of seven (7) members and sixteen (16) consultants. Of its seven members, six (6) had at the time or afterwards received grants from the EPA. Of the 16 consultants, eleven (11) had at the time or afterwards received grants from the EPA. So of the twenty-three (23) individuals on the 2009 CASAC PM Panel, seventeen (17) had at the time or afterwards received grants from the EPA.

However, the EPA’s claim that PM<sub>2.5</sub> is causally related to death was controversial in 1996, as concluded by the 1996 CASAC PM Panel, and remains so today. Past and recent well-conducted research, including research funded by the EPA itself, fails to associate PM<sub>2.5</sub> with mortality:

- A study published by UCLA epidemiologist James Enstrom, PhD. reported no association between exposure to PM<sub>2.5</sub> and mortality in a cohort of 49,975 elderly Californians.<sup>4</sup> A new analysis finds no association between exposure to PM<sub>2.5</sub> and mortality in a cohort that includes all deaths (over two million) occurring in the state of California for the period 2000 to 2012.<sup>5</sup> This analysis was submitted to EPA as part of a recent rulemaking involving PM<sub>2.5</sub>, but the agency ignored the study in its response to public comments.<sup>6</sup>
- A large EPA-funded study involving 3.2 million deaths reported, "... we are not able to demonstrated any change in life expectancy for a reduction in PM<sub>2.5</sub>."<sup>7</sup> Comments to EPA and testimony before Congress has also been critical of EPA's claim that PM<sub>2.5</sub> kills:
- The Texas' Commission on Environmental Quality (TCEQ) commented to the agency, *inter alia*, that:<sup>8</sup>

*It appears that the EPA did not consider all of the available scientific evidence or adequately weigh the significant limitations and uncertainties in using observational epidemiological studies to set the proposed NAAQS. Furthermore, the conclusion to lower the NAAQS is based on two faulty assumptions: (1) that exposure to PM<sub>2.5</sub> at relevant environmental concentrations causes premature mortality; and (2) that the relationship between PM<sub>2.5</sub> exposure and the purported effect on mortality is linear with no threshold. Neither of these assumptions is borne out by the available epidemiologic or toxicological data.*
- Epidemiologist and toxicologist Julie E. Goodman, Ph.D., DABT testified to the United States House of Representatives Committee on Energy and Commerce Subcommittee on Energy and Power as follows:<sup>9</sup>

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<sup>4</sup> Enstrom J, Fine Particulate Air Pollution and Total Mortality Among Elderly Californians, 1973–2002, *Inhalation Toxicology*, 17:803–816, 2005.

<sup>5</sup> See, Lopiano KK, Et al., Air quality and acute deaths in California, 2000-2012, <http://arxiv.org/abs/1502.03062>.

<sup>6</sup> See <https://www.federalregister.gov/articles/2016/04/25/2016-09429/supplemental-finding-that-it-is-appropriate-and-necessary-to-regulate-hazardous-air-pollutants-from>.

<sup>7</sup> See, Greven S *et al.*, An Approach to the Estimation of Chronic Air Pollution Effects Using Spatio-Temporal Information, *Journal of the American Statistical Association* June 2011, Vol. 106, No. 494 (June 2011).

<sup>8</sup> See, U.S. House of Representatives, Committee on Science, Space and Technology, "ICYMI : TCEQ Criticism of EPA Air Pollution Science," Sep. 7, 2012, at <https://science.house.gov/news/press-releases/icymi-tceq-criticism-epa-air-pollution-science>.



*EPA estimated that the Mercury and Air Toxics Standards will reduce the disease burden in America to such an extent that it will translate to tens of billions of dollars saved. The largest benefits from the Mercury and Air Toxics Standards are derived not from reducing mercury, but from reducing fine particulate matter (PM<sub>2.5</sub>). Despite the vast array of peer-reviewed scientific literature on the topic, EPA based its calculations on only two PM<sub>2.5</sub> epidemiology studies that reported statistical associations between PM<sub>2.5</sub> reductions and health benefits and assumed a causal relationship. These studies had methodological limitations and were not consistent with many epidemiology studies indicating no correlation between reducing PM<sub>2.5</sub> and health benefits or experimental studies indicating an exposure threshold below which PM<sub>2.5</sub> is not likely to overwhelm the body's natural defenses. Thus, EPA's analysis led to grossly inflated estimates of benefits.*

Additional facts that draw into question the EPA claims that PM<sub>2.5</sub> kills include the following.

EPA asserts its claim that the PM<sub>2.5</sub> kills is supported by existing epidemiology, toxicology and clinical studies. This is false.

- **Epidemiology.** EPA admitted in federal court that its epidemiologic studies on PM<sub>2.5</sub> prove nothing by themselves.<sup>10</sup> In 2012 litigation in which EPA attempted to justify its experiments on humans with PM<sub>2.5</sub>, EPA admitted doing the experiments because: “epidemiologic studies do not generally provide evidence of direct causation.” The purpose of the human experiments, according to EPA, was to develop a medical or biological explanation (i.e., the direct causation) that would support the merely statistical results of the PM<sub>2.5</sub> epidemiology studies.
- **Animal toxicology.** No laboratory animal has ever died from PM<sub>2.5</sub> in an experimental setting

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<sup>9</sup> See, <https://energycommerce.house.gov/sites/republicans.energycommerce.house.gov/files/Hearings/EP/20120208/HHR-G-112-IF03-WState-JGoodman-20120208.pdf>.

<sup>10</sup> See <http://junkscience.com/wp-content/uploads/2016/05/EPA-Memo-in-opp-to-TRO-1.pdf>

— even though animals have been exposed to levels of PM<sub>2.5</sub> as much as 100+ times greater than human exposures to PM<sub>2.5</sub> in outdoor air.<sup>11</sup>

- **Human clinical studies.** EPA has tested a variety of air pollutants — including very high exposures to PM<sub>2.5</sub> — on over 6,000 human volunteers. Many of these volunteers were elderly or already health-compromised — the very groups EPA claims are most susceptible to dying from PM<sub>2.5</sub> exposures. EPA has admitted that there have been no deaths or any dangerous adverse events clearly caused by these PM<sub>2.5</sub> exposures. PM<sub>2.5</sub> exposures in these experiments have been as high as 21 times greater than allowable by EPA’s own air quality rules.<sup>12</sup>

Moreover, there is a whole host of scientific studies and common-sense facts and experiences involving PM<sub>2.5</sub> that expose EPA’s claims as faulty including the epidemiology on smoking, the mortality experiences of coal miners and current air pollution levels in places like China and India.<sup>13</sup>

The EPA has even prevented, for more than 20 years, independent experts and the public from being able to scrutinize the key scientific data on which the EPA relies for its PM<sub>2.5</sub> claims.<sup>14</sup>

## 2) CASAC PM PANEL 2015-2018

In February 2015, EPA listed a notice in the Federal Register that it would accept nominations for the CASAC PM Panel for the 2015-2018 period, in order to review the Draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter

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<sup>11</sup> See, U.S. E.P.A., Air Quality Criteria for Particulate Matter, Vol. II, Chapter 7, October 2004.

<sup>12</sup> See <http://junkscience.com/wp-content/uploads/2016/05/EPA-Memo-in-opp-to-TRO-1.pdf>

<sup>13</sup> See e.g., <http://junkscience.com/wp-content/uploads/2014/11/epa-pm-health-claims-debunked-112514.pdf>.

<sup>14</sup> See e.g., <https://science.house.gov/news/press-releases/committee-approves-bill-prohibit-epa-using-secret-science>.

(draft IRP), which had been released in April of 2014. Ex 1. The release of the draft IRP included a charge to the next CASAC PM Panel to review the agency's work, listen to public discussion, determine the quality of the work and make recommendations to the administrator, as required under the Clean Air Act.

On November 17, 2015 the EPA Science Advisory Board (SAB) Staff Office issued a memo selected 26 nominees for the CASAC PM Panel. The memo outlined the criteria for membership, including the requirements for impartiality, objectivity, and lack of financial interest. The memo simply stated that "The SAB Staff Office has determined that there will be no direct and predictable effect on the financial interests of CASAC PM Review Panel members" and that "The SAB Staff Office has determined that there is no reason to believe that members of the selected for the CASAC PM Panel would not be objective and open-minded and able to engage in deliberative discussions with scientists who may have disparate points of view on the matter before the panel." *See Ex. 2 - Determination Memo- Formation of the Clean Air Scientific Advisory Committee (CASAC) Particulate Matter (PM) Review Panel.*

The 26 person Panel announced included Ana Diez Roux (Chairman), Peter Adams, John Adgate, George A. Allen, John R. Balmes, Kevin Boyle, Judith Chow, Douglas Dockery, Henry (Dirk) Felton, Mark Frampton, Christopher H. Frey, Terry Gordon, Jack Harkema, Joel Kaufman, Patrick Kinney, Michael T. Kleinman, Rob McConnell, David Peden, Richard L. Poirot, Stephen Polasky, Jeremy Sarnat, James Jay Schauer, Elizabeth A. (Lianne) Sheppard, Barbara Turpin, Sverre Vedal, and Ronald Wyzga.

However of the 26 members of the panel, 22 of the members are listed as principal investigators by EPA in the agency's own research grants database and received research grants from the agency. Ana Diez Roux Panel Chairman has received \$33,575,181; Peter Adams

\$4,230,423; John Adgate \$3,042,219; George A. Allen; \$3,907,111; John R. Balmes \$5,857,626; Kevin Boyle \$321,178; Judith Chow \$449,456; Douglas Dockery \$16,046,649; Mark Frampton \$17,447,566; Christopher H. Frey \$3,136,162; Terry Gordon \$11,401,166; Jack Harkema \$26,918,114; Joel Kaufman \$44,424,256; Patrick Kinney \$40,054,030; Michael T. Kleinman \$18,250,432; Rob McConnell \$19,561,006; Stephen Polasky \$2,441,066; Jeremy Sarnat \$21,268,475; James Jay Schauer \$17,198,482; Elizabeth A. (Lianne) Sheppard \$51,524,256; Barbara Turpin \$1,444,533; and Sverre Vedal (\$8,000,000).

In addition two members of the panel are not listed as principal investigators but also received research grants from the agency. David Peden has received \$2.5 million in grants from the EPA, NIH and NSF. James Jay Schauer has, according to the biographical information the agency itself posted about him, received an unknown amount in grants with his “core grant research support primarily being from the federal government (U.S. Environmental Protection Agency, National Science Foundation, U.S. Department of Energy, National Oceanic and Atmospheric Administration).”

In total 23 of the 26 members the agency selected to this panel have received over \$190 million dollars in research grants from the agency. These panel members engaged in research on the agency’s behalf, and many of them research for the agency in the area of particulate matter. Thus they are tasked with reviewing the science underlying agency recommendations where those recommendations are based on research they themselves did.

## **Jurisdiction, Standing and Standard of Review**

### **1) Jurisdiction**

Jurisdiction is proper in this Court pursuant to the Administrative Procedures Act, 5 U.S.C. § 703. The decision by the EPA to name the CASAC PM Review Panel as a subcommittee of the overall Clean Air Science Advisory Committee mandated by the Clean Air Act 42 U.S.C. § 7409(d)(2), through its memorandum of November 17, 2015 was a final agency action for which there is no other remedy in court. Thus it falls within the “catch-all” provision of the Administrative Procedures Act, which has “the central purpose of providing a broad spectrum of judicial review of agency action” *Bowen v. Massachusetts*, 487 U.S. 879, 903, (1988).

While the Clean Air Act does contain its own provision for judicial review, directing review to the United States Court of Appeals for the District of Columbia for actions have national applicability and to the appropriate Circuit Court for actions having regional applicability, that section is inapplicable here. 42 U.S. Code § 7607(b) applies to actions taken “by the Administrator” in promulgating regulations. The naming of the CASAC PM Panel by the EPA Science Advisory Board Staff Office is not the promulgation of such a regulation.

Moreover even accepting the stricter time limits of 42 U.S. Code § 7607(b), the time to file this action has not expired. Under the Clean Air Act a challenge to the EPA’s action must be filed within 60 days from “the date notice of such promulgation, approval, or action appears in the Federal Register.” 42 U.S. Code § 7607(b). Here while the notice that the agency was accepting nominations for the CASAC PM Panel was placed in the Federal Register, the selection of the CASAC PM Panel was not. A diligent search of the Federal Register shows that no notice of the selection of the panel was ever placed there. The agency merely issued a memo

selecting the members of the committee, which it hosted on its website.<sup>15</sup> Later a notice appeared in the Federal Register of the first meeting of the CASAC PM Panel, which did not name the members of the panel or even note when the members of the panel had been selected. *See* 81 Fed. Reg. 13362 (March 14, 2016). Thus at no point was the deadline for filing an action contained within the Clean Air Act regarding the selection of the composition of the panel triggered.

## **2) Standing**

Plaintiff EELI has standing to sue on behalf of its members because (1) those members would otherwise have standing to sue in their own right; (2) the interests EELI seeks to protect are germane to its purpose; and (3) neither the claim asserted nor the relief requested requires the participation of individual members. *See Hunt v. Wash. State Apple Adver. Comm'n*, 432 U.S. 333, 343 (1977). As an organization whose purpose is to promote transparency, good government practices, and the principles of limited government, EELI seeks to protect its members from the harms arising out of the misuse of scientific advice by an agency in order to further a regulatory agenda. *See Warth v. Seldin*, 422 U.S. 490, 515 (1975).

## **3) Standard of Review**

Courts in this circuit weigh four factors in determining whether to grant emergency injunctive relief: (1) the plaintiff's likelihood of success on the merits; (2) the prospective irreparable harm to the plaintiff if relief is withheld; (3) potential harm to the other party if relief is granted; and (4) the interest of the public. *CSX Transp., Inc. v. Williams*, 406 F.3d 667, 670 (D.C. Cir. 2005); *Baumann v. Dist. Of Columbia*, 655 F. Supp. 2d 1, 6 (D.D.C. 2009). These

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<sup>15</sup> See EPA's Clean Air Scientific Advisory Committee (CASAC) Particulate Matter Integrated Review Plan for National Ambient Air Quality Standards (NAAQS) website which hosts the memo also at: <https://yosemite.epa.gov/sab/SABPRODUCT.NSF/0/eb862b233fbd0cde85257dda004fcb8c!OpenDocument&TableRow=2.1#2>. This memo is also included as Exhibit 2.

factors “interrelate on a sliding scale and must be balanced against each other.” *Davenport v. Int’l Bhd. of Teamsters*, 166 F.3d 356, 361 (D.C. Cir. 1999). “A district court must ‘balance the strengths of the requesting party’s arguments in each of the four required areas.’” *Chaplaincy of Full Gospel Churches v. England*, 454 F.3d 290, 297 (D.C. Cir. 2006) (quoting *CityFed Fin. Corp. v. Office of Thrift Supervision*, 58 F.3d 738, 746 (D.C. Cir. 1995)). “If the showing in one area is particularly strong, an injunction may issue even if the showings in other areas are rather weak.” *Id.* Here, all four factors weigh in favor of granting relief.

## **Argument**

### **I. Plaintiffs have a Substantial Likelihood of Success on the Merits**

#### **A. The CASAC PM Panel as composed violates the requirement that it be an Independent Scientific Committee**

The Clean Air Act, 42 U.S.C. § 7409(d)(2) requires that an independent scientific advisory board be named by the Administrator of the EPA which every five years completes a review of the national primary and secondary ambient air quality standards and recommends any new national ambient air quality standards or revisions of existing criteria and standards.

Pursuant to this the EPA has created the Clean Air Scientific Advisory Committee (CASAC), and subcommittees beneath the CASAC which deal with particular areas related to air quality such as air monitoring, oxides of nitrogen, sulfur oxides, and particulate matter.

The formation of this mandated committee and these subcommittees falls under the requirements of the Federal Advisory Committee Act (FACA), which imposes requirements upon such bodies, and gives content to the words used to authorize the creation of such committees. FACA specifically notes that any legislation authorizing the creation of an advisory committee or panel shall “contain appropriate provisions to assure that the advice and recommendations of the advisory committee will not be inappropriately influenced by the

appointing authority or by any special interest” 5 U.S.C., §5 (3) appx. In the Clean Air Act such a provision is contained through the requirement that the committee being formed and thus and subcommittees being formed beneath it are “independent.” 42 U.S.C. § 7409(d)(2)(a).

Yet in in the case of the CASAC PM Panel, the EPA has conspicuously failed to meet that requirement. Instead the panel that was named is comprised of scientists and researchers who are deeply tied to the agency, and whose independence is thus compromised. Far from being a panel that would not be inappropriately included by the agency, instead EPA appointed a panel almost wholly made of researchers it regularly dealt with and to whom it gave enormous grants.

As the court noted in *American Lung Association v Browner* “Congress required that CASAC, **independent** from the EPA, shall complete a review of criteria documents and air quality standards.” 884 F.Supp. 345, 348 (Az. 1994)(emphasis added). The D.C. Circuit explained that this need for independence stemmed from the history of the Clean Air Act itself. Explaining that Congress valued the role outside groups had played in helping set the first national air quality standards, the Circuit wrote that “CASAC would “provide an outside mechanism for evaluating whether any pollutant may reasonably be anticipated to endanger public health or environment, for evaluating the scientific and medical data which might bear on this question, and for reviewing gaps in the available data and recommending additional needs for research.” *Mississippi v. E.P.A.*, 744 F.3d 1334, 1354 (2013). Further the Circuit stated that CASAC was created to fulfill the desire for continued independent scientific review of the Environmental Protection Agency's exercise of judgment.” *Id.*

Yet the EPA has moved steadily away from permitting a review of its own proposals by an independent panel, through the appointment of those with whom it already has a relationship.



While the 2009 CASAC PM Panel had 17 members out of 23 who had received EPA funding, with this current panel EPA selected 26 members, 24 of who have received considerable EPA grants.

These grants totaled more \$190 million dollars between the 24 panel members. Such substantial financial support is precisely the sort of financial relationship that raises concern that these panel members might be inappropriately influenced by the agency which appointed them, and lavishes such funding on them. Yet rather than explain what, if any, mechanism had been put in place to prevent such influence, the EPA Science Advisory Board Staff Office simply stated that “The SAB Staff Office has determined that there will be no direct and predictable effect on the financial interests of CASAC PM Review Panel members” without explaining the discrepancy between the agency as a source of funding for these panel members and their independence from the agency whose work they would be reviewing. *See Ex. 2. Determination Memo.*

Thus the EPA has failed to comply with the requirements of the Clean Air Act and FACA that it create a truly independent advisory board, one which is not subject to influence from the agency and likely to agree with the agency’s own views given the long relationship between the panel member and the agency and the deep financial grants the agency has made available to them.

**B. The CASAC PM Panel as composed violates the requirement that it be fairly balanced in terms of points of views represented**

The Federal Advisory Committee Act also requires that all committee formed “be fairly balanced in terms of the points of view represented.” 5 U.S.C., §5 (2) appx. In determining whether a committee is fairly balanced courts look to the purpose of the committee, or as here the panel. “In considering whether a committee is fairly balanced... courts naturally have looked

first at the functions to be performed.” *Cargill, Inc. v. U.S.*, 173 F.3d 323 (5<sup>th</sup> Cir.1999). This Court has stated that “the legislative history makes clear, the “fairly balanced” requirement was designed to ensure that persons or groups directly affected by the work of a particular advisory committee would have some representation on the committee” *Washington Legal Foundation v. American Bar Ass'n.*, 648 F.Supp. 1353 (D.D.C. 1986)(ultimately finding that FACA did not apply to a private organization, regardless of that organization’s connection to government activity)

Thus the test for whether a committee or panel is ‘fairly balanced’ turns on the purpose for the creation of the committee. Here the Clean Air Act speaks to the overall purpose of the CASAC committee. Its job is to review the proposals put forth by the agency under the act and to recommend any new standards or revisions of current standards it deems necessary. 42 U.S.C. § 7409(d)(2)(b). The charge given by the agency in announcing the CASAC PM Panel was even clearer. It was to review the Draft Integrated Review Plan for the Particulate Matter National Ambient Air Quality Standards (Draft IRP) and provide the answer with a scientific assessment of the validity of the draft IRP including answering questions about whether the proposals included were adequate and whether additional information should have been considered.

The scope of the committee is broad, and thus calls for a broad array of views on the topic under review. In *National Anti-Hunger Coalition v. Executive Committee of the President’s Private Sector Survey on Cost Control, et al.*, this Court found that there was no violation of the balance requirement despite the committee being almost entirely of private sector executives precisely because the purpose of the committee was to apply to federal programs the expertise of leaders in the private sector with special abilities to give detailed advice on cost-effective management of large organizations.” 557 F.Supp. 524 (D.D.C. 1983). Thus there was

no need to require the committee to hold members from other sectors when the committee's very purpose was to gather the views of the private sector. *See also National Treasury Employees Union v. Reagan*, WL 21700 (D.D.C., 1988) (holding that the President's Commission on Privatization did not need members opposed to privatization in order to be balanced only because the function of the committee was not to determine whether or not privatization was in general a good or desirable public policy, but merely what should be privatized)

Here in contrast the CASAC PM Panel's purpose is to review the EPA proposals and to serve as independent scientific review of the Environmental Protection Agency's exercise of judgment. *Mississippi v. E.P.A.*, 744 F.3d 1334, 1354 (2013). To do so the committee must hold a balanced set of views on the topic by those within the scientific community. Yet rather than pick committee members with scientific credentials who possess diverse views on the issue of particulate matter, the EPA selected a committee deeply tied to the agency through funded grants, whose work using EPA grants showed they already agreed with the agency's view on particulate matter. Indeed of the 26 candidates selected, virtually all were noted by EPA as having worked on projects which claimed there were close links between particulate matter and health. *See Ex. 3 - Invitation for Public Comment and Biographies on the List of Candidates for the EPA Clean Air Scientific Advisory Committee Particulate Matter Review Panel.*

In forming the committee this way, EPA ignored credentialed scientists whose work called into question the conclusions already reached in the draft IRP and whose work EPA had not funded. Indeed EPA's draft IRP drew, in part, on the work the agency had funded from the very scientists and researchers it placed on the committee which was supposed to review these proposals and the science underlying them. Thus EPA built a committee in which members would end up reviewing, at least in part, their own scientific work, and the conclusions drawn

from that work. Such an arrangement cannot but lead to endorsement of EPA's preferred policy outcomes.

EPA had the obligation under the Clean Air Act and the Federal Advisory Committee Act to build a committee with qualified people holding divergent points of view so that the committee as a whole would be balanced in terms of the views represented. This does not mean the agency had to create so large a committee that every single point of view was represented. But it certainly cannot mean the agency was free to stack the committee almost exclusively with members it funded and whose work showed they already agreed with the agency's viewpoint. Plaintiffs are likely to prevail on the merits as EPA failed to build a committee even minimally balanced in terms of the viewpoints represented, an especially egregious problem when the committee is not designed to hew to a limited perspective, but instead supposed to broadly examine the agency's work and determine the scientific validity of the agency's policy proposals.

## **II. Plaintiff and its Members will Suffer Irreparable Harm Absent Relief**

"[T]he basis of injunctive relief in the federal courts has always been irreparable harm." *Chaplaincy of Full Gospel Churches v. England*, 454 F.3d 290, 297 (D.C. Cir. 2006) (quoting *Sampson v. Murray*, 415 U.S. 61, 88 (1974)). "Although the concept of irreparable harm does not readily lend itself to definition, the courts have developed several well-known and indisputable principles to guide them in the determination of whether this requirement has been met." *Wisconsin Gas Co. v. FERC*, 758 F.2d 669, 674 (D.C. Cir. 1985). First, the injury must be imminent—that is, it must be "actual not theoretical," *id.*, and cannot be "something merely feared as liable to occur at some indefinite time in the future." *Connecticut v. Massachusetts*, 292

U.S. 660, 674 (1931). Second, the injury “must be beyond remediation.” *Chaplaincy of Full Gospel Churches*, 454 F.3d at 297. Both of those criteria are satisfied here.

The inevitable harm of EPA’s violation of the required that the CASAC PM Panel be independent from the agency and have a diverse range of viewpoints is that as it is currently comprised, the panel will inevitably approve policy measures that will cause pecuniary loss to Plaintiff’s members. The panel will bind the agency’s hand, propelling the agency down the road toward stricter regulation, however unnecessary. Indeed the D.C. Circuit has noted that that the recommendations of the CASAC panel carry great weight and must be given considerable deference by the agency in determining final regulatory decisions. *See Communities for a Better Environment v. E.P.A.*, 748 F.3d 333 (D.C. Cir. 2014).

However the more immediate harm flows from the impermissible tainting of the process that would occur if an improperly comprised committee is allowed to begin meeting and undertaking a review, only to then be replaced by a committee that is properly selected. For it is certain that some of the current members of the committee will continue on. The failure of the EPA was to properly balance the committee and properly ensure there would be no bias toward the agency’s preferred positions. Certainly nothing suggests that every member of the current committee would be replaced. Yet if the current committee begins its work it will undertake actions that would inevitable carry over into the properly selected committee if any of the current members remained.

If it meets, the committee will inevitably identify a leadership team, both formally and informally, that will control the formative discussion on what the committee should consider and how. This will include whether to reconsider the presumption of mortality from particulate matter, or whether to not reconsider that and only focus on the a recommended standard and new

studies. As well, early on the committee will decide how to limit reconsideration of older studies in the context of new studies, and may choose only to work at the margins rather than conduct a full reconsideration of all studies. When members of the committee are replaced so that a properly balanced committee is formed, those early decisions by the current committee will have some precedential effect that will influence any individuals who serve on a newly appointed committee. This is a bell that cannot be unrung, and one that will cause significant harms to Plaintiff's members. Moreover this is a harm that simply does not need to occur.

### **III. The Balance of the Equities Tips in Plaintiffs' Favor**

In order to grant an application for a temporary restraining order, a moving party must show that the injunction would "not substantially injure other interested parties." *Chaplaincy of Full Gospel Churches*, 454 F.3d at 297. When agency action is involved, the Court should balance the actual irreparable harm to the plaintiff and the potential harm to the government. *See Gonzales v. O Centro Espirita Beneficente Uniao Do Vegetal*, 546 U.S. 418, 429 (2006).

Here the relief sought would cause no harm to the agency or the CASAC PM Panel or its current members. The only result would be that the currently scheduled meeting, which is, as noticed in the Federal Register, occurring via teleconference, not in-person, would be postponed until this matter can be fully briefed and resolved. *See* 81 Fed. Reg. 13362 (March 14, 2016). There would not even be the inconvenience of committee members having traveling unnecessarily. Accordingly, the balance of the equities strongly favors the Plaintiff and this factor supports the granting of this application.

#### **IV. The Proposed Application Would Serve The Public Interest.**

It is well established that there is a strong public interest in favor of the enforcement of public laws and regulations. *F.T.C. v. Whole Foods Mkt., Inc.*, 548 F.3d 1028, 1035 (D.C. Cir. 2008). Further "there is a substantial public interest in ensuring that [an agency] acts within the limits of its authority," *Clarke v. Office of Fed Housing Enterprise Oversight*, 355 F. Supp. 2d 56, 66 (D.D.C. 2004). Here the EPA has failed to act within the limits of its authority, with the result that an improperly composed committee will do the work of a properly organized one, and will fail to give EPA draft IRP the scrutiny it requires. Such an outcome is not in the public interest, nor are the inevitable challenges to whatever regulations that might develop from such a process. The public interest lies in having this issue resolved now, not long down the road when much work has been done, and taxpayer money squandered for naught.

#### **Conclusion**

For the reasons set forth above, Plaintiff respectfully asks this Court to grant this application for a Temporary Restraining Orders and Motion for Relief Pending Review and order that the CASAC PM Review Panel not convene a session, meet, or begin any work or any review of EPA's Draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter.

Respectfully submitted this 23rd day of May, 2016,

\_\_\_\_\_/s/  
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ATTORNEYS FOR PLAINTIFF





April 14, 2014

**MEMORANDUM**

**SUBJECT:** CASAC Review of the *Draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter*

**FROM:** Erika Sasser, Director /s/  
Health and Environmental Impacts Division  
Office of Air Quality Planning and Standards

**TO:** Aaron Yeow  
Designated Federal Officer  
Clean Air Scientific Advisory Committee  
EPA Science Advisory Board Staff Office

As part of the ongoing review of the national ambient air quality standards (NAAQS) for Particulate Matter (PM), staff in the EPA's Office of Air Quality Planning and Standards and National Center for Environmental Assessment have prepared the *Draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter* (draft IRP). The draft IRP is being made available for review by the Clean Air Scientific Advisory Committee (CASAC) Particulate Matter Panel (the Panel). The Panel is scheduled to review the draft IRP at a public teleconference to be held on May 23, 2016.

The planning phase for the current review of the PM NAAQS began in 2015, with a science policy workshop held in Research Triangle Park, NC. Drawing from the workshop discussions, the draft IRP presents the plan and anticipated schedule for this review of the PM NAAQS, the process for conducting the review, and the key policy-relevant science issues that will guide the review. The final IRP is scheduled to be released later this year and will reflect consideration of CASAC advice and public comments.

Attached to this memo is the charge to the Panel, including charge questions for discussion at the upcoming teleconference. I request that you forward to the Panel this memo and the attached charge questions. The draft IRP is being made available to the Panel in the form of an electronic file, and is available from the EPA website at:  
[https://www3.epa.gov/ttn/naaqs/standards/pm/s\\_pm\\_index.html](https://www3.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html).

We look forward to discussing the draft IRP with the Panel at the upcoming teleconference. Should you have any questions regarding this document, or the review of the PM NAAQS in general, please contact Scott Jenkins on my staff (919-541-1167; [jenkins.scott@epa.gov](mailto:jenkins.scott@epa.gov)).

Attachment

cc: Karen Wesson, OAQPS/HEID  
Bob Hetes, OAQPS/HEID  
Scott Jenkins, OAQPS/HEID  
Nicole Hagan, OAQPS/HEID  
Amy Lamson, OAQPS/HEID  
John Vandenberg, ORD/NCEA-RTP  
Steve Dutton, ORD/NCEA-RTP  
Jason Sacks ORD/NCEA-RTP

## Attachment

Charge to the CASAC Particulate Matter Panel for its review of the *Draft Integrated Review Plan for the Particulate Matter National Ambient Air Quality Standards*

The draft IRP includes six chapters:

Chapter 1 provides an introduction summarizing the NAAQS legislative requirements, the steps in the NAAQS review process, the history of the air quality criteria and standards for PM, and the general scope and anticipated schedule for the current review of the PM NAAQS.

Chapter 2 presents an overview of the decisions made in the last review of the PM NAAQS, the key policy-relevant questions to guide the current review, and an overview of the available ambient PM monitoring networks.

Chapter 3 describes the plan for the science assessment phase of the current review.

Chapter 4 describes the plan for the quantitative health risk and exposure assessment phase of the current review.

Chapter 5 describes the plan for the quantitative welfare risk and exposure assessment phase of the current review.

Chapter 6 briefly summarizes the policy assessment and rulemaking phases of the review.

Charge questions for the Panel's consideration are presented below.

- 1) ***Overall organization and clarity:*** To what extent does the Panel find that the draft IRP is clearly organized and that it appropriately communicates the plan for the current review of the PM NAAQS and the key scientific and policy issues that will guide the review?
- 2) ***Chapter 2:***
  - To what extent does the Panel find that Chapter 2 clearly articulates the decisions made in the last review of the primary (sections 2.1.1, 2.1.2) and secondary (sections 2.2.1, 2.2.2) PM standards, and the rationales supporting those decisions?
  - To what extent does the Panel find that the policy-relevant questions presented in sections 2.1.3 (primary) and 2.2.3 (secondary) appropriately characterize the key scientific and policy issues for consideration in the current review? Are there additional issues that should be considered?
- 3) ***Chapter 3 (Science Assessment):***
  - To what extent does Chapter 3 clearly and adequately describe the scope, specific issues to be considered, and organization of the ISA?
  - What are the panel's views on the overall scope of the ISA? Does the planned scope ensure that the EPA will capture the scientific literature most pertinent to the ISA's focus, which is answering the question, "Is there an independent effect of PM on health and welfare at relevant ambient concentrations?"
  - What are the panel's views on the approaches outlined in Chapter 3 to streamline the discussion in some sections of the ISA? What are the panel's views on EPA's plans to

produce an assessment that is concise and forms an adequate scientific foundation for subsequent steps of the NAAQS review process?

**4) Chapter 4 (Health Risk and Exposure Assessment):**

- To what extent does Chapter 4 clearly and adequately describe the scope and specific issues, including the identification of the most important uncertainties, to be considered in developing the HREA Planning Document for this review?
- Is there additional information that should be considered or are there additional issues that should be addressed in considering the potential for risk and/or exposure analyses in the current review?

**5) Chapter 5 (Welfare Risk and Exposure Assessment):**

- To what extent does Chapter 5 clearly and adequately describe the scope and specific issues, including the identification of the most important uncertainties, to be considered in developing the WREA Planning Document for this review?
- Is there additional information that should be considered or additional issues that should be addressed in considering the potential for quantitative analyses for welfare effects in the current review?

**6) Chapter 6 (Policy Assessment and Rulemaking):** To what extent does Chapter 6 clearly summarize the general process for the policy assessment and rulemaking phases of this review?



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR  
SCIENCE ADVISORY BOARD

November 17, 2015

**MEMORANDUM**

**SUBJECT:** Formation of the Clean Air Scientific Advisory Committee (CASAC) Particulate Matter (PM) Review Panel

**FROM:** Aaron Yeow */Signed/*  
Designated Federal Officer (DFO)  
EPA Science Advisory Board Staff Office (1400R)

**THRU:** Wanda Bright */Signed/*  
Ethics Official  
EPA Science Advisory Board Staff Office (1400R)

**TO:** Christopher S. Zarba  
Director  
EPA Science Advisory Board Staff Office (1400R)

The Clean Air Scientific Advisory Committee (CASAC or Committee), which is comprised of seven members appointed by the EPA Administrator, was established under section 109(d)(2) of the Clean Air Act (CAA or Act) (42 U.S.C. 7409) as an independent scientific advisory committee. The CASAC provides advice, information and recommendations on the scientific and technical aspects of air quality criteria and National Ambient Air Quality Standards (NAAQS) under sections 108 and 109 of the Act. The CASAC is a Federal advisory committee chartered under the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C., App. Section 109(d)(1) of the CAA requires that the Agency carry out a periodic review and revision, where appropriate, of the air quality criteria and the NAAQS for "criteria" air pollutants, including particulate matter (PM).

This memorandum addresses the set of determinations that were used in forming the CASAC PM Review Panel including:

1. The type of review body that will be used to conduct the review, and the nature of the review;
2. The types of expertise needed to address the general charge;
3. Financial conflict of interest considerations, including identification of parties who are potentially interested in or may be affected by the topic to be reviewed;

4. How regulations concerning “appearance of a lack of impartiality,” pursuant to 5 C.F.R. § 2635.502 apply to members of the panel; and
5. Other considerations that might affect the objectivity if members of the panel; and
6. How individuals were selected for the panel.

**DETERMINATIONS:**

1. The type of review body that will be used to conduct the review, and the nature of this review.

An ad hoc expert panel of the CASAC will provide independent advice through the chartered CASAC on EPA’s technical and policy assessments that support the Agency’s review of the National Ambient Air Quality Standard (NAAQS) for PM, including drafts of the Integrated Review Plan, Integrated Science Assessment, Risk/Exposure Assessment, and Policy Assessment.

2. The types of expertise needed to address the general charge.

On February 4, 2015, the EPA SAB Staff Office announced in a Federal Register Notice (Volume 80, Number 23, Pages 6086-6089) that it was forming a panel to review and provide independent expert advice through the Chartered CASAC on EPA’s technical and policy assessments that support the Agency’s review of the National Ambient Air Quality Standard (NAAQS) for PM, including drafts of the Integrated Review Plan, Integrated Science Assessment, Risk/Exposure Assessment, and Policy Assessment. To form the panel, the SAB Staff Office sought public nominations of nationally and internationally recognized scientists in the science of air pollution related to PM. Experts were sought in air quality and climate responses, atmospheric science and chemistry, dosimetry, toxicology, controlled clinical exposure, epidemiology, biostatistics, human exposure modeling, risk assessment/modeling, characterization of PM concentrations and light extinction, and visibility impairment and related welfare effects.

3. Financial conflict of interest considerations, including identification of parties who are potentially interested in or may be affected by the topic to be reviewed.

(a) Identification of parties (or class of parties) whose financial interests may be affected by the topic to be reviewed: The principal interested and affected parties for this topic are: research institutions; makers of air quality monitoring or emissions control equipment; and various industry sectors (for example, fossil fuel-fired electricity generation) that are significant sources of PM emissions and are affected by the current or any revised NAAQS for PM.

(b) Conflict of interest considerations: For Financial Conflict of Interest (COI) issues, the basic 18 U.S.C. § 208 provision states that: “An employee is prohibited from participating *personally or substantially* in an official capacity in any *particular matter* in which he, to his knowledge, or any person whose interests are imputed to him under this statute has a *financial interest*, if the particular matter will have a direct and predictable effect on that interest [emphasis added].” For a conflict of interest to be present, all elements in the above provision must be present. If an element is missing the issue does not involve a formal conflict of interest; however, the general provisions in the appearance of impartiality guidelines must still apply and need to be considered.

(i) Does the general charge to the panel involve a particular matter? A “particular matter” refers to matters that “...will involve deliberation, decision, or action that is focused upon the interest of specific people, or a discrete and identifiable class of people.” It does not refer to “...consideration or adoption of broad policy options directed to the interests of a large and diverse group of people.” [5 C.F.R. § 2640.103 (a)(1)]. A particular matter of general applicability means a particular matter that is focused on the interests of a discrete and identifiable class of persons, but does not involve specific parties [5 C.F.R. § 2640.102(m)].

The activity of this CASAC Panel will qualify as a *particular matter of general applicability* because the resulting advice will be part of a deliberation, and under certain circumstances the advice could involve the interests of a discrete and identifiable class of people but does not involve specific parties. That group of people constitutes those who are involved with organizations facing regulatory decisions related to the release of or exposure to PM.

(ii) Will there be personal and substantial participation on the part of the panel members? Participating personally means direct participation in this review. Participating substantially refers to involvement that is of significance to the matter under consideration. [5 C.F.R. § 2640.103(a)(2)]. For this review, the *CASAC Panel members will be participating personally in the matter*. Panel members will be providing the Agency with advice and recommendations on the Agency’s PM technical analyses, and such advice is expected to directly influence the Agency’s guidance on risk assessment and risk management decisions involving PM. *Therefore, participation in this review will also be substantial.*

(iii) Will there be a direct and predictable effect on Panel members’ financial interest? A direct effect on a participant’s financial interest exists if “...a close causal link exists between any decision or action to be taken in the matter and any expected effect of the matter on the financial interest. ...A particular matter does not have a direct effect ...if the chain of causation is attenuated or is contingent upon the occurrence of events that are speculative or that are independent of, and unrelated to, the matter. A particular matter that has an effect on a financial interest only as a consequence of its effects on the general economy is not considered to have a direct effect.” [5 C.F.R. § 2640.103(a)(i)] A predictable effect exists if, “...there is an actual, as opposed to speculative, possibility that the matter will affect the financial interest.” [5 C.F.R. § 2640.103(a)(ii)]. CASAC members and prospective panelists were asked to submit Form 3110-48, a Confidential Financial Disclosure for Special Government Employees, so that the SAB Staff Office could make this determination. *The SAB Staff Office has determined that there will be no direct and predictable effect on the financial interests of CASAC PM Review Panel members.*

4. How regulations concerning “appearance of a lack of impartiality” pursuant to 5 C.F.R. § 2635.502, apply to members of the Panel

The Code of Federal Regulations at 5 C.F.R. 2635(a)(2) describes general requirements for considering an appearance of a loss of impartiality for employees of the Executive Branch (including Special Government Employees) participating in a *particular matter involving specific parties*.

*The SAB Staff Office has determined that the matter to be considered by the panel is not a particular matter involving specific parties; i.e., this matter does not involve “any judicial or other proceeding, application, request for a ruling or other determination, contract, claim, controversy, investigation,*

*charge, accusation, arrest or other particular matter involving a specific party or parties in which the United States is a party or has a direct and substantial interest” [5 C.F.R. 2637.102(a)(7)].*

5. Other considerations that might affect the objectivity of members of the panel.

Members of CASAC panels must be scientific and technical experts who are objective and open-minded, able to engage in deliberative discussions with scientists who may have disparate perspectives. To evaluate candidates, the SAB Staff Office considers information (if any) provided by the public in response to the invitation for public comment on the candidates, information provided by candidates (including on the EPA Form 3110-48), and information independently gathered by the SAB Staff Office.

As part of a determination that members of committees and panels are objective and open-minded on the topic of the review, and consistent with the agency’s Peer Review Policy, the SAB Staff Office considers previous involvement in the matter before the committee or panel. This evaluation includes responses provided by candidates to the following supplemental questions:

- a. Do you know of any reason that you might be unable to provide impartial advice on the matter to come before the panel/committee/subcommittee or any reason that your impartiality in the matter might be questioned?
- b. Have you had any current or previous involvement with the review document(s) under consideration including authorship, collaboration with the authors, or previous peer review functions? If so, please identify and describe that involvement.
- c. Have you served on previous advisory panels, committees or subcommittees that have addressed the topic under consideration? If so, please identify those activities.
- d. Have you made any public statements (written or oral) on the issue that would indicate to an observer that you have taken a position on the issue under consideration? If so, please identify those statements.

*The SAB Staff Office has determined that there is no reason to believe that members of the selected for the CASAC PM Panel would not be objective and open-minded and able to engage in deliberative discussions with scientists who may have disparate points of view on the matter before the panel.*

6. How individuals were selected for the Panel

On September 2, 2015 the SAB Staff Office posted a list of 49 candidates for the Panel, identified based on their expertise and willingness to be considered for the panel. This list was accompanied by a notice inviting public comments on a list of candidates to be submitted by September 23, 2015. The SAB Staff Office received one comment from the public on this list of candidates, from EPA’s Office of Children’s Health Protection.

The SAB Staff Office Director makes the final decision about who serves on the Panel based on all of the relevant information, including a review of candidates confidential financial disclosure for (EPA-Form 3110-48), the responses to the questions above, public comments, and information independently gathered by SAB Staff.



For the SAB Staff Office, a balanced committee or panel is characterized by candidates who possess the necessary domains of scientific knowledge, relevant perspectives (which, among other factors, can be influenced by work history and affiliation), and the collective breadth of experience to adequately address the general charge. Specific criteria to be used in evaluating an individual panel member include: (a) scientific and/or technical expertise, knowledge, and experience; (b) availability and willingness to serve; (c) absence of financial conflicts of interest; (d) absence of an appearance of a lack of impartiality; (e) skills working on advisory committees and panels (including objectivity and open-mindedness); and (f) for the committee as a whole, diversity of scientific expertise and viewpoints.

On the basis of the above-specified criteria, the members of the CASAC PM Review Panel are as follows:

**CASAC PM Review Panel Members**

- Dr. Ana Diez Roux, Drexel University (PA), Chair
- Dr. Peter Adams, Carnegie Mellon University (PA)
- Dr. John Adgate, University of Colorado (CO)
- Mr. George A. Allen, Northeast States for Coordinated Air Use Management (NESCAUM) (MA)
- Dr. John Balmes, University of California at San Francisco (CA)
- Dr. Kevin Boyle, Virginia Tech (VA)
- Dr. Judith Chow, Desert Research Institute (NV)
- Dr. Douglas Dockery, Harvard University (MA)
- Mr. Dirk Felton, New York State Department of Environmental Conservation (NY)
- Dr. Mark Frampton, University of Rochester (NY)
- Dr. H. Christopher Frey, North Carolina State University (NC)
- Dr. Terry Gordon, New York University School of Medicine (NY)
- Dr. Jack Harkema, Michigan State University (MI)
- Dr. Joel Kaufman, University of Washington (WA)
- Dr. Patrick Kinney, Columbia University (NY)
- Dr. Michael Kleinman, University of California, Irvine (CA)
- Dr. Rob McConnell, University of Southern California (CA)
- Dr. David Peden, University of North Carolina at Chapel Hill (NC)
- Mr. Richard L. Poirot, Vermont Department of Environmental Conservation (VT)
- Dr. Stephen Polasky, University of Minnesota (MN)
- Dr. Jeremy Sarnat, Emory University (GA)
- Dr. James Jay Schauer, University of Wisconsin-Madison (WI)
- Dr. Elizabeth A. (Lianne) Sheppard, University of Washington (WA)
- Dr. Barbara Turpin, University of North Carolina at Chapel Hill (NC)
- Dr. Sverre Vedal, University of Washington (WA)
- Dr. Ronald Wyzga, Electric Power Research Institute (CA)

Concurred,

*/Signed/*

November 17, 2015

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Christopher S. Zarba  
Director and Deputy Ethics Official  
EPA Science Advisory Board Staff Office (1400R)

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Date

**Invitation for Public Comment on the List of Candidates for the  
EPA Clean Air Scientific Advisory Committee  
Particulate Matter Review Panel**

September 2, 2015

The U.S. Environmental Protection Agency (EPA) Science Advisory Board (SAB) Staff Office announced in a *Federal Register* Notice (Volume 80, Number 23, Pages 6086-6089) published on February 4, 2015 that it was forming the EPA Clean Air Scientific Advisory Committee (CASAC) Particulate Matter Review Panel to review and provide independent expert advice, through the Chartered CASAC, on EPA's technical and policy assessments that support the Agency's review of the Primary National Ambient Air Quality Standard (NAAQS) for particulate matter, including drafts of the Integrated Review Plan, Integrated Science Assessment, Risk/Exposure Assessment, and Policy Assessment. To form the Panel, the SAB Staff Office sought public nominations of nationally recognized and qualified experts in one or more of the following areas, particularly with respect to particulate matter air pollution: air quality and climate responses, atmospheric science and chemistry, dosimetry, toxicology, controlled clinical exposure, epidemiology, biostatistics, human exposure modeling, risk assessment/modeling, characterization of PM concentrations and light extinction, and visibility impairment and related welfare effects.

Based on the qualifications and interest of the nominees, the SAB Staff Office identified 49 candidates for the panel and the biosketches of these candidates are included.

The SAB Staff Office Director will make the final decision about who will serve on the Panel based on all relevant information. This includes a review of the confidential disclosure form (EPA Form 3110-48), relevant information gathered by staff, and public comments. For the EPA SAB Staff Office, a balanced Panel is characterized by inclusion of candidates who possess the necessary domains of knowledge, the relevant scientific perspectives (which, among other factors, can be influenced by work history and affiliation), and the collective breadth of experience to adequately address the general charge. Specific criteria to be used in evaluating a candidate include: a) scientific and/or technical expertise, knowledge, and experience; b) availability and willingness to serve; c) absence of financial conflicts of interest; d) absence of appearance of a lack of impartiality; e) skills working in advisory committees and panels; and, for the panel as a whole, f) diversity of scientific expertise and viewpoints.

**We hereby invite comments from members of the public to provide relevant information of other documentation that the SAB Staff Office should consider in determining who should serve on the CASAC Particulate Matter Review Panel. Please be advised that comments received are subject to release under the Freedom of Information Act. Comments should be submitted to Mr. Aaron Yeow, Designated Federal Officer, no later than September 23, 2015. E-mailing comments ([yeow.aaron@epa.gov](mailto:yeow.aaron@epa.gov)) is the preferred mode of receipt.**

## Candidates for the CASAC Particulate Matter Panel

### Adams, Peter

#### Carnegie Mellon University

Dr. Peter Adams is a Professor in the Civil and Environmental Engineering Department and the Engineering and Public Policy Department at Carnegie Mellon University. Dr. Adams' research largely focuses on development of chemical transport models and their application to decision-making, especially related to PM<sub>2.5</sub>. Dr. Adams also has extensive expertise in the simulation of aerosol microphysical processes, ultrafine particles and the formation of cloud condensation nuclei in global climate models. Areas of research have also included the effects of climate change on air quality, short-lived climate forcers, atmospheric ammonia and particulate matter formation from livestock operations, and the simulation organic particulate matter. Dr. Adams was selected for a Fulbright grant to collaborate with researchers at the Institute of Atmospheric Sciences and Climate in Bologna, has been a Visiting Senior Research Scientist at the National Aeronautics and Space Administration's Goddard Space Flight Center, and received the Sheldon K. Friedlander Award for outstanding doctoral thesis from the American Association for Aerosol Research. He has previously served on the Commonwealth of Pennsylvania's Air Quality Technical Advisory Committee and the Allegheny County Health Department's Air Toxics New Guidelines Proposal Committee as well as service to the American Association for Aerosol Research. His research is supported primarily by the Environmental Protection Agency, the National Science Foundation, the National Aeronautics and Space Administration, the Department of Energy, and the Department of Defense. Dr. Adams received his B.S. degree in Chemical Engineering, summa cum laude, from Cornell University. He was awarded a Hertz Foundation Applied Science Fellowship for graduate study and received M.S. and Ph.D. degrees in Chemical Engineering from the California Institute of Technology. He also holds an associated faculty position in the Chemical Engineering department at Carnegie Mellon.

### Adar, Sara

#### University of Michigan

Dr. Sara Adar is the John Searle Assistant Professor of Epidemiology at the University of Michigan. She has over 15 years of experience investigating human exposures to and the health effects of air pollution, including fine and coarse particulate matter. Her research has been funded by the Environmental Protection Agency, National Institutes of Environmental Health, and Washington State Department of Ecology resulting in authorship on over 40 original research articles and the Sandra A. Daugherty Award for Excellence in Cardiovascular Epidemiology from the American Heart Association. Dr. Adar holds a BS in Environmental Engineering from MIT, a MHS in Environmental Health Sciences from the Johns Hopkins School of Public Health, and a ScD in Environmental Epidemiology, Exposure, and Risk from the Harvard School of Public Health.

### Adgate, John

#### University of Colorado

John L. Adgate, Ph.D is Professor and Chair of the Department of Environmental and Occupational Health at the Colorado School of Public Health, University of Colorado. His exposure science research focuses on improving public health and epidemiological studies by documenting the magnitude and variability of human exposure to air pollutants, pesticides, metals, and allergens. His research projects have included evaluation of methods to reduce lead and allergen exposure exploration of longitudinal exposure to indoor and outdoor air pollutants, and, most recently, assessing the environmental and human health impacts of unconventional oil and gas development and the impact of climate change on indoor environments. Dr. Adgate has served on multiple U.S. EPA Science Advisory Panels exploring technical and policy issues related to residential exposure to pesticides, metals, and implementation of the Food Quality Protection Act of 1996. He was also a member of US Institute of Medicine's Committee on Research Ethics in Housing Related Health Hazard Research in Children and the National Research Council's 2011 Committee on Indoor Air and Climate Change. Most recently he has advised the States of New York, Maryland, and Michigan on the potential public health impacts of high volume hydraulic fracturing, and leading studies exploring the public health impacts of hydraulic fracturing funded by the National Science Foundation, the National Institutes of Environmental Health Sciences, and the Department of Energy. His current research is focused on characterizing the exposures and impacts of the wide range of chemical and non chemical stressors found in and around oil and gas development sites and indoor air and climate change funded by USEPA. Dr. Adgate received a B.Sc. in biology from Calvin College, an M.S.P.H. from the University of North Carolina at Chapel Hill, and a Ph.D. in Environmental Health Sciences jointly awarded by Rutgers University and the University of Medicine and Dentistry of New Jersey. He has held faculty positions at the University of Minnesota and has current appointments at the University of Colorado Denver and Colorado State University. In 2006-7 he was a Fulbright Visiting Scholar at the Pontificia Universidad Católica de Chile in Santiago, where he taught risk analysis and worked on air quality research. He has served as an elected Councilor of the International Society of Exposure Science (ISES), was a recipient of its Joan M. Daisey Outstanding Young Scientist Award, and co-chaired ISES's 2009 meeting. He has taught graduate level courses on Risk Analysis and Communication, Advanced Methods in Exposure Science, Introduction to Environmental and Occupational Health, and Occupational Health and Safety.

### Allen, George A.

#### Northeast States for Coordinated Air Use Management (NESCAUM)

Mr. George Allen is a Senior Scientist at NESCAUM (Northeast States for Coordinated Air Use Management), an interagency association of the eight Northeastern States. He holds a B.S. in Electrical Engineering from Tufts University (1974). At NESCAUM, Mr. Allen is responsible for monitoring and exposure assessment activities across a range of wide range of air topics, including regional haze, air toxics, on and off-road diesel, wood smoke, and continuous aerosol measurement technologies. He is the author or co-author of more than 30 peer-reviewed journal papers on development and evaluation of measurement methods, exposure assessment, and air pollution health effects. Before joining NESCAUM in 2002, Mr. Allen was on the professional staff at the Harvard School of Public Health (HSPH) in Boston for more than 20 years, working on a wide range of U.S. Environmental Protection Agency (EPA) and National Institutes of Health- funded air pollution studies. While at HSPH, he developed several new techniques for real-time aerosol measurements. Currently, Mr. Allen is serving as the lead for the NESCAUM Monitoring and Assessment Committee. He also represents states interests to EPA in the National Association of Clean Air Agencies (NACAA) Monitoring Steering Committee, and is a member of the EPA AIRNow Steering Committee. Mr. Allen's current and pending research support pertains to scientific, technical, analytical, and policy support for NESCAUM states' air quality and climate programs, with a focus on air pollution exposure assessment and measurement methods development. These funders include New York State Energy Research and Development Authority (NYSERDA) (characterization of biomass air pollution), Massachusetts Department of Environmental Protection (spatial and temporal trends of black carbon), NESCAUM member states and Federal Land Managers (CAMNET visibility network), NESCAUM member states and US EPA (support member states' air quality programs).

**Balmes, John R.**

University of California

Dr. John Balmes is Professor of Medicine at the University of California, San Francisco (UCSF) and Professor of Environmental Health Sciences in the School of Public Health at UC Berkeley. He is a member of the faculty of the UCSF Division of Occupational and Environmental Medicine and the UCSF Division of Pulmonary and Critical Care Medicine at San Francisco General Hospital. He was recently named Acting Director of the UC Berkeley-UCSF Joint Medical Program. Dr. Balmes received a BA in Psychology from the University of Illinois in Urbana and his MD from Mount Sinai School of Medicine. He completed a residency in Internal Medicine at Mount Sinai and a post-doctoral fellowship in Pulmonary Medicine at Yale. For over 35 years, Dr. Balmes has been studying the effects of exposures to occupational and environmental agents on respiratory and cardiovascular health. In the UCSF Human Exposure Laboratory, he has conducted controlled human exposure studies with sampling of respiratory tract lining fluid to characterize acute exposure-response relationships for oxidant pollutant-induced airway inflammation in subjects with and without asthma, and more recently, investigation of acute cardiovascular responses. Recently, his group has been the first to show that experimental exposure to ozone can cause decreased heart rate variability and brief exposures to secondhand tobacco smoke can induce increased blood pressure, epithelial injury, and epithelial dysfunction. His lab is currently funded by the Health Effects Institute to participate in a multi-center study designed to determine whether experimental exposure to ozone induces cardiovascular toxicity (decreased heart rate variability, epithelial dysfunction, and a pro-thrombotic state) and whether any of these effects are associated with airway inflammation, systemic oxidative stress, and systemic inflammation. At UC Berkeley, Dr. Balmes has collaborated on a number of studies of the chronic effects of air pollutants on respiratory health. He has investigated the effects of exposures to air pollutants on respiratory symptoms, growth of lung function, and immune dysfunction in children with asthma in Fresno, CA. He contributed to the first randomized controlled trial of a chimney stove to prevent pneumonia among infants in Guatemala and led follow-up studies on the effects of exposure to biomass smoke on lung function in both the children and their mothers. He has also investigated whether chronic environmental exposure to hydrogen sulfide is associated with adverse effects on respiratory health in Rotarura, New Zealand. Dr. Balmes is one of the multiple PIs (SK Hammond, G Shaw, JR Balmes) recently awarded a Children's Environmental Health Center grant (NIEHS/EPA) to study the adverse effects of air pollution on children living in the San Joaquin Valley. The Center project that he leads is investigating the potential effects of exposure to polycyclic aromatic hydrocarbons on risk of obesity and glucose dysregulation. Dr. Balmes has received multiple awards for his research from various organizations, including the American College of Occupational and Environmental Medicine (ACOEM), the Western Occupational and Environmental Medicine Association, the American Lung Association of California, and the South Coast Air Quality Management District. He is a member of the American Thoracic Society, the American College of Chest Physicians, and the ACOEM. He has served on several US EPA advisory committees, including CASAC panels on ozone, NO<sub>2</sub>, and SO<sub>2</sub>, as well as on various National Academy of Sciences/Institute of Medicine committees. In addition to his experience in air pollution health effects research, Dr. Balmes also has policy experience in the regulation of air quality and climate change mitigation in his role as physician member of the California Air Resources Board (since January 2008).

**Boyle, Kevin**

Virginia Tech

Dr. Kevin Boyle is an environmental economist who specializes in the valuation of resources that are not traded in markets. Dr. Boyle is Professor and Director of the Virginia Tech Program in Real Estate. Prior to this position he was Head of the Department of Agricultural and Applied Economics at Virginia Tech. He was formerly Distinguished Maine Professor and Libra Professor of Environmental Economics at the University of Maine. Dr. Boyle holds a Ph.D. from the University of Wisconsin. Dr. Boyle has held editorial positions with the Journal of Environmental Economics and Management and Marine Resource Economics. Dr. Boyle was recognized by the Carnegie Foundation for the Advancement of Teaching as "U.S. Professor of the Year, Maine" in 2004. Dr. Boyle's research investigates the validity of nonmarket valuation methods, including stated preferences (contingent valuation and attribute-based choices), revealed preferences (random-utility, travel-cost models, averting behavior and hedonic, property-value models), and benefits transfers. He has published more than 90 peer-reviewed journal articles. His current research on benefit transfers establishes the theoretical basis of benefit transfers and the estimation of bounds for benefit-transfers to address uncertainty. Dr. Boyle is serving as the PI for a National Park Service grant to develop procedures to estimate the value of changes in the annual distribution of visibility in Class 1 areas in accordance with U.S. EPA's Regional Haze Program.

**Brook, Jeffrey****Environment Canada**

Dr. Jeffrey Brook is a senior scientist for the federal government of Canada in the Ministry of the Environment's Air Quality Research Division. He is recognized nationally as a leading expert on air quality and has helped shape policy through his research, activities on national committees, leadership in preparing science assessments and advice to senior levels of government. Over the past 20 years he has contributed substantially, frequently including lead roles, to many of the government's science assessments including two rounds of acid deposition science assessments, two rounds of particulate matter assessments including the recent Canadian SMOG (PM<sub>2.5</sub> and ozone) Science Assessment and both joint Canada-U.S. Assessments on Transboundary Particulate Matter in support of the Canada-U.S. Air Quality Agreement. Internationally, he was a lead author on NARSTO's (U.S. – Mexico – Canada) Assessment on Particulate Matter for Policy Makers, a co-chair and multi-chapter author on NARSTO's assessment on Technical Challenges of Multipollutant Air Quality Management and co-authored the Network on Environmental Risk Assessment and Management's Guidance Document for Risk Managers on Air Pollution and Public Health. Given Dr. Brook's recognized expertise on the linkage between air pollutants and health and exposure assessment he has served on expert panels/committees advising the Canadian Government, the California Air Resources Board, the Health Effects Institute (HEI) and the U.S. Environmental Protection Agency. He has recently joined HEI's Research Committee for a four year term. Dr. Brook is a faculty member in the Dalla Lana School of Public Health and the Department of Chemical Engineering and Applied Chemistry at the University of Toronto. He has been a co-investigator on multiple grants funded through the Canadian Institutes for Health Research, the National Science and Engineering Research Council, the U.S. NIH and EPA. Through his extensive collaborations with the Canadian academic community Dr. Brook has taken on a leadership role within a Canadian Network of Centres of Excellence (NCE) known as AllerGen. This multi-university NCE is geared towards understanding, treating and preventing asthma and allergy while generating direct and indirect economic benefits to Canada. Dr. Brook has served on AllerGen's Research Management Committee since its inception in 2007 and for the last four years has been the co-lead on the Genes and Environment Program. He also serves on the Executive Committee and leads the Environmental Working Group for one of AllerGen's key initiatives: the Canadian Health Infant Longitudinal Development (CHILD) study - a Canadian national birth cohort examining the influences of environmental factors on children's health. Dr. Brook received his B.S. from Michigan State University and a Diploma in Meteorology from McGill University. He began his career as a meteorologist before undertaking graduate work (M.S., Ph.D.) at The University of Michigan focusing on acid deposition and air quality model application. Through his government scientist position and a long-standing collaboration with the Federal Health Ministry (Health Canada) and academia Dr. Brook has played a lead exposure scientist role in wide range of epidemiological, toxicological and clinical health effects studies. As a result of his research on air quality and health and exposure work, Dr. Brook has authored or co-authored over 200 journal papers and more than 11 book chapters, as well as giving many invited lectures. His research generally focuses air pollution, its sources, its movement in the atmosphere and its effects. Dr. Brook's team develops and operates advanced mobile laboratories for measuring multiple particulate and gaseous air pollutants and meteorology. His recent studies have focused on regional to local scale interactions between air pollutants and meteorology, intra-urban pollutant patterns, traffic air pollution exposure assessment and near-road gas-particle processes. He is currently leading short and long term measurement studies examining the impacts of resource development on air pollutant levels and community exposure. This has led to a new and growing research program in partnership with Canadian Aboriginal communities.

**Buser, Michael****Oklahoma State University**

Dr. Michael Buser is an Associate Professor in the Biosystems and Agricultural Engineering Department at Oklahoma State University in the College of Engineering, Architecture and Technology and the Division of Agricultural Sciences and Natural Resources. He received his BS and MS in Biosystems Engineering from Oklahoma State University and his Ph.D. in Biological and Agricultural Engineering from Texas A&M University. Dr. Buser has 19 years of Agricultural Engineering experience. This experience includes two years as a Research Engineer with Oklahoma State University, eleven years as a Category I Scientist with USDA Agricultural Research Service, followed by his current 65% research and 35% extension appointment at Oklahoma State University. He has established national high-impact, stakeholder-driven research and extension programs. He works with forestry, specialty crop, nut, wheat, corn, forage, cotton, beef cattle, and poultry industries on projects ranging from air quality, bioenergy, machinery development, product traceability, safety, sustainability, and supply chain logistics. Dr. Buser's research and extension teams have received over \$21,000,000 in competitive grant, industry or special funding; funding sources for the past two years include: USDA (Sun Grant Initiative, NRCS CIG, NIFSI, AFRI, ARS, and BRDI) and Oklahoma State University. Dr. Buser has published 103 peer-reviewed journal articles; 4 book chapters; 68 industry technical reports; 281 technical reports for regulatory agencies; 173 conference papers or posters; and 38 extension videos. He has given 19 expert comments and 31 invited presentations. His work has been highlighted in over 100 popular press articles. He is actively involved technical committees and standards development related to his membership in the American Society of Agricultural and Biological Engineers and the National Cotton Ginners Association. Throughout his career he has received several awards including the USDA National Institute of Food and Agriculture's Partnership award for Mission Integration.

**Chow, Judith****Desert Research Institute**

Dr. Judith Chow holds the Nazir and Mary Ansari Chair in Science and Entrepreneurialism and is a Research Professor in the Division of Atmospheric Sciences of the Desert Research Institute (DRI) of the Nevada System of Higher Education in Reno, Nevada. Dr. Chow has led DRI's Environmental Analysis Facility since its inception in 1985. She earned her B.S. degree in Biology from Fu-Jen Catholic University in Taiwan (1974), her M.S. degree in Environmental Health Science (1983) from Harvard University, and her Sc.D. degree in Environmental Science and Physiology (1985) from Harvard University. For more than 30 years, she has conducted air quality studies and performed data analysis to improve understanding of effects of air quality on human health, visibility, historical treasures, ecosystems, and climate. Dr. Chow is currently the principal investigator for: 1) organic and black carbon measurements with the U.S. Environmental Protection Agency's (EPA) Chemical Speciation Network (CSN) and the Interagency Monitoring of Protected Visual Environments (IMPROVE) network; 2) tracking changes in air quality with control measures at the ports of Los Angeles and Long Beach; and 3) conducting real-world emissions characterization in Canada's Athabasca Oil Sands region. She has been principal investigator or a major collaborator in more than 50 large air quality studies (and many smaller ones) across the United States and in other countries. Dr. Chow prepared and revised sections of the EPA's PM Criteria Document pertaining to chemical analysis and source emissions and contributed to EPA guidance documents on network design, continuous particulate monitoring, and particulate matter chemical speciation. Dr. Chow's research has been sponsored by grants and contracts from the federal government (e.g., EPA, Department of Interior, Department of Defense), local, state, and international air quality management authorities, industry, and foundations. As past chair and a member of the Air & Waste Management Association's (AWMA) Critical Review Committee, Dr. Chow has coordinated and reviewed Critical Reviews and discussions on environmental science and technology topics. She was chair of the Publications Committee for the Journal of the Air & Waste Management Association and serves on Editorial Boards and/or as Associate Editor for several international journals including: the Journal of Air Quality, Atmosphere, & Health, Aerosol and Air Quality Research, Atmospheric Pollution Research, and Particology. Dr. Chow was a member of the National Research Council's (NRC) committees on Research Priorities for Airborne Particulate Matter (1998–2003) and Energy and Air Pollution Futures in the U.S. and China (2004–2008); she also served on the NRC Board on Environmental Studies and Toxicology (2002–2005). She has served on advisory panels for the EPA, National Environmental Respiratory Center [New Mexico], and South Coast [California] Air Quality Management District. Dr. Chow has been a member of the Air Monitoring and Methods Subcommittee (AMMS, formerly the Ambient Air Monitoring and Methods Subcommittee) of the EPA's Clean Air Scientific Advisory Committee (CASAC) since 2004. She is the principal author or co-author of more than 340 peer-reviewed articles and more than 90 peer-reviewed book chapters and has been recognized by ISI HighlyCited.com in ecology and environment with more than 13,000 citations of her work. Dr. Chow was selected for the 2011 Shaanxi Province Friendship Award in China and the California Air Resources Board 2011 Haagen-Smit Clean Air Award for her contributions to air quality science and technology.

**Cox, Jr., Louis Anthony (Tony)****Cox Associates**

Tony Cox is President of Cox Associates, a Denver-based applied research company specializing in quantitative health risk analysis, causal modeling, advanced analytics, and operations research. In 2012, Dr. Cox was inducted into the National Academy of Engineering (NAE), "For applications of operations research and risk analysis to significant national problems." He is a member of the National Academies' Board on Mathematical Sciences and their Applications (BMSA) and a member of the National Academies Standing Committee on the Use of Public Health Data in FSIS Food Safety Programs. He is also co-founder and Chief Sciences Officer of NextHealth Technologies, a Denver-based company offering advanced data analytics solutions to healthcare plans to reduce health, financial, and member attrition risks. Dr. Cox holds a Ph.D. in Risk Analysis (1986) and an S.M. in Operations Research (1985), both from M.I.T.; an AB from Harvard University (1978); and is a graduate of the Stanford Executive Program (1993). He is Honorary Full Professor of Mathematics at the University of Colorado, Denver, where he has lectured on risk analysis, biomathematics, health risk modeling, computational statistics and causality; is on the Faculties of the Center for Computational Mathematics and the Center for Computational Biology; and is Clinical Professor of Biostatistics and Informatics at the University of Colorado Health Sciences Center. He has taught a variety of graduate and professional courses, including Game Theory for the Department of Mathematics and Decision Analysis for the Business School of the University of Colorado at Denver. Dr. Cox is Editor-in-Chief of Risk Analysis: An International Journal, is Area Editor for Real World Applications for the Journal of Heuristics, and is on the Editorial Board of the International Journal of Operations Research and Information Systems. He is an Edelman Laureate of INFORMS, a member of the American Statistical Association (ASA), and a Fellow of the Society for Risk Analysis (SRA). In 2007, he won the Society of Toxicology's Outstanding Published Paper in Risk Assessment Award and the Society for Risk Analysis Outstanding Risk Practitioner Award. In 2008, his solution to a challenge on "Statistical Methods to Predict Clinical Response" won an InnoCentive Award. His work won the Society for Risk Analysis (SRA) Best Paper Awards in both 2002 and 2003 for modeling uncertain public health risks and benefits of animal antibiotics; and in 2011 for mathematical modeling of chronic obstructive pulmonary disease (COPD). Dr. Cox has taught many graduate and professional courses in risk analysis, decision analysis, and advanced analytics. He has authored and co-authored about 200 journal articles and book chapters on these fields. His most recent books are Improving Risk Analysis (Springer, 2013), Risk Analysis of Complex and Uncertain Systems (Springer, 2009) and the Wiley Encyclopedia of Operations Research and Management Science (Wiley, 2011), which Dr. Cox co-edited. He has over a dozen U.S. patents on applications of artificial intelligence, signal processing, statistics and operations research in telecommunications. His current research interests include computational statistical methods for causal inference in risk analysis, data-mining, and advanced analytics for enterprise risk management, insurance, and public policy applications.

**Diez Roux, Ana****Drexel University**

Ana Diez Roux, M.D., Ph.D., is Professor of Epidemiology and Dean of the Drexel School of Public Health. Before joining Drexel she was Chair of Epidemiology and Director of the Center for Social Epidemiology and Population Health at the University of Michigan School of Public Health. Dr. Diez Roux has been an international leader in the investigation of the social determinants of health, the application of multilevel analysis in health research, and the study of neighborhood health effects. Her research areas include social epidemiology and health disparities, environmental health effects, urban health, psychosocial factors in health, and cardiovascular disease epidemiology. Recent areas of work include social environment-gene interactions and the use of complex systems approaches in population health. She has led large NIH and foundation funded research and training programs in the United States and in collaboration with various institutions in Latin America. She has been a member of the MacArthur Network on Socioeconomic Factors and Health and is a Co-Director of the Network on Inequality, Complexity and Health. Dr. Diez Roux has served on numerous review panels and advisory committees including most recently the Clean Air Scientific Advisory Committee (CASAC) of the Environmental Protection Agency, the Board of Scientific Counselors (BSC) of the National Center for Health Statistics, the Committee on Health and Wellbeing in the Changing Urban Environment of the International Council for Science (ISCUS) and the Editorial Board of the Annual Review of Public Health. She was awarded the Wade Hampton Frost Award for her contributions to public health by the American Public Health Association. She is an elected member of the American Epidemiological Society, the Academy of Behavioral Medicine Research, and the Institute of Medicine of the National Academy of Sciences. Dr. Diez Roux received an M.D. from the University of Buenos Aires, a master's degree in public health and doctorate in health policy from the Johns Hopkins School of Hygiene and Public Health.

**Dockery, Douglas****Harvard University**

Dr. Douglas W. Dockery is the John L. Loeb and Frances Lehman Professor of Environmental Epidemiology and Chair of the Department of Environmental Health at the Harvard TH Chan School of Public Health. He is the Director of the Harvard-National Institute of Environmental Health Sciences (NIEHS) Center for Environmental Health Sciences, currently in its 52nd year. He received a B.S. in physics from the University of Maryland, an M.S. in meteorology from the Massachusetts Institute of Technology, and a ScD in environmental health from the Harvard School of Public Health. Dr. Dockery has been studying air pollution exposures and their health effects for almost 40 years. He served as Principal Investigator of the Harvard Six Cities Study of the Respiratory Health Effects of Respirable Particles and Sulfur Oxides. His current work includes assessment of the health benefits of air pollution controls. Dr. Dockery has published over two hundred peer reviewed articles. His 1993 New England Journal of Medicine paper on air pollution and mortality in the Harvard Six Cities study is the single most cited air pollution paper. In 1998, he was honored with the first John Goldsmith Award from the International Society of Environmental Epidemiology for Outstanding Contributions to the field. Dr. Dockery's research over the past two years has been supported by grants from and contracts from the federal government (NIEHS, U.S. Environmental Protection Agency) with additional grant support from the Health Effects Institute.

**Donahue, Neil****Carnegie Mellon University**

Neil M. Donahue is Director of the Steinbrenner Institute for Environmental Education and Research and Lord Professor of Chemistry in the Departments of Chemistry, Chemical Engineering and Engineering and Public Policy at Carnegie Mellon University. He has an AB in Physics from Brown University, a PhD in Meteorology from MIT and worked as a postdoctoral researcher and research scientist in gas-phase chemical kinetics at Harvard University before joining the CMU faculty in 2000. Donahue is an internationally recognized expert in radical-molecule kinetics and mechanisms, including OH-radical and ozone reactions with hydrocarbons. At CMU he was the founding director of the Center for Atmospheric Particle Studies. A significant portion of his research at CMU has focused on the origin and fate of organic aerosols in the atmosphere, with an emphasis on the role of gas-phase oxidation chemistry in the transformation of organic aerosols. This includes formation of Secondary Organic Aerosols (SOA) but also the subsequent aging of both Primary Organic Aerosols (POA) and SOA. He developed the Volatility Basis Set (VBS) to describe this coupling between phase partitioning and oxidation chemistry and has carried out a succession of laboratory studies to constrain this evolution. Recently he has joined the Cosmics Leaving Outdoor Droplets (CLOUD) consortium at CERN, focusing on the role of organics in new-particle formation and growth. Donahue's research is funded by peer-reviewed grants from the US EPA, the National Science Foundation, the Department of Energy, and NASA. He is a Fellow of the American Geophysical Union, Associate Editor of the Journal of Geophysical Research, Atmospheres and Editorial Board member of Atmospheric Chemistry and Physics. He has published more than 170 peer reviewed scientific papers, which have been cited more than 8500 times in the scientific literature.

**Faulkner, William Brock****Texas A&M university**

Dr. William Brock Faulkner is an Assistant Professor in the Department of Biological and Agricultural Engineering at Texas A&M University. He holds a BS in Agricultural Engineering and an MS and PhD in Biological and Agricultural Engineering from Texas A&M University. Dr. Faulkner's research activities have included characterization and abatement of particulate matter and gaseous emissions from multiple agricultural sources, including a variety of animal and crop production systems and agricultural processing operations, and development and assessment of post-harvest processing operations. Dr. Faulkner has extensive understanding of air pollutant emission, sampling, fate, and transport. He operates two wind tunnels for evaluating the performance of ambient aerosol samplers and has developed novel and well-accepted air pollutant abatement strategies for multiple agricultural sources throughout the US. His research has been funded by USDA, NIH, Cotton Incorporated, the Cotton Foundation, Southwest Agriculture, and Tisch Environmental. Dr. Faulkner's teaching responsibilities include courses on agricultural processing and safety. He has received multiple awards for research, service, and teaching, including the Outstanding Achievement Award for Early Career Research from the Texas A&M College of Agriculture and Life Sciences, the Holloway Professional Development Award from the American Society of Agricultural and Biological Engineers (ASABE), and a Colorado Environmental Leadership Program Bronze Award as part of a multidisciplinary team that developed an "Early Warning System" to reduce nitrogen deposition from agricultural sources in Rocky Mountain National Park. Dr. Faulkner has a national reputation as a leader in agricultural air quality, serving on both the USDA Agricultural Air Quality Task Force and the EPA Science Advisory Board Animal Feeding Operation Emission Review Panel. He also serves on the ASABE editorial board, chairs the Environmental Air Quality committee and Texas Section, and serves as past-chair for the Cotton Engineering committee.

**Felton, Henry (Dirk)****New York State Department of Environmental Conservation**

Mr. Henry (Dirk) Felton is currently employed by the New York State Department of Environmental Conservation (NYSDEC) as a Research Scientist III. He has a Bachelor of Arts undergraduate degree in Physics from Kenyon College, Gambier Ohio (1987), and a Master of Science in Environmental Engineering from Stevens Institute of Technology in Hoboken, New Jersey (1993). He is also a Civil Engineer licensed in the State of New York. Mr. Felton's professional work has been entirely focused on ambient air monitoring. His first independent work involved setting up a monitoring network for criteria, toxic and tracer compounds around the Freshkills Landfill on Staten Island. Since then he has worked to optimize monitoring technology to operate a rural upwind PAMS site for NARSTO-NE, conducted several experiments to evaluate new automated mass measurement technologies, initiated speciated Mercury and ultrafine monitoring programs and has designed the PM-2.5 FRM and PM speciation monitoring program in New York. Mr. Felton also was the lead for his Agency's participation in the New York PMTACS EPA SuperSite program, participated on the Board of Science Counselors review of EPA ORD's Clean Air Research program and was a two term member of the CASAC Ambient Air Monitoring and Methods subcommittee (AAMMs). Mr. Felton currently participates on the NESCAUM Monitoring Assessment Committee (MAC), the NACAA Monitoring Steering Committee (MSC) and recently was elected to his local school board.

**Frampton, Mark****University of Rochester**

Dr. Frampton is trained as a physician, specializing in pulmonary and critical care medicine. His current position is Professor Emeritus in Medicine and Environmental Medicine, in the Pulmonary & Critical Care division, at the University of Rochester Medical Center. During specialty training at the University of Rochester Medical Center, Dr. Frampton became interested in the ongoing human clinical studies of air pollution health effects, under the direction of Dr. Mark Utell. Dr. Utell's research at that point had focused primarily on pulmonary function effects. Working with Dr. Utell, he expanded that focus to include research on other important pulmonary effects of pollutants, including airway inflammation, host defense against viral infection, and systemic effects. As epidemiological studies provided increasing evidence for cardiovascular effects of exposure to particulate matter, Dr. Frampton began to explore cardiovascular effects in our chamber studies, in collaboration with cardiologists and other specialists. Dr. Frampton's laboratory was the first to conduct human clinical studies of ultrafine particles (smaller than 100 nm), first using laboratory generated elemental carbon particles, and subsequently with concentrated ambient ultrafine particles, using the Harvard Ultrafine Concentrator system. Over the years his laboratory has studied healthy subjects as well as those considered to have increased susceptibility, including older subjects and people with mild asthma, chronic obstructive pulmonary disease, type 2 diabetes, and even genetic susceptibility. Funding for the studies has come from the National Institutes of Health, the U.S. EPA, the Health Effects Institute, the New York State Energy Research and Development Authority, CONCAWE, ExxonMobil, the American Petroleum Institute, and others. Dr. Frampton's laboratory is one of three centers completing a study of the cardiovascular effects of ozone exposure in healthy older subjects, funded by the Health Effects Institute. The studies have helped to understand the physiological changes and pathways to adverse effects that occur in response to pollutant exposure, and have helped to inform the EPA's promulgation of rational ambient air quality standards (NAAQS). Dr. Frampton has served as a consultant to the EPA in developing Integrated Scientific Assessments (formerly Criteria Documents) for nitrogen dioxide, ozone, and particulate matter. In addition, he has served on several EPA grant and fellowship review panels and scientific workshops, and has been invited to speak at EPA functions. Dr. Frampton has served on numerous scientific review panels with the National Institutes of Health and other scientific funding organizations. He has been active in the Environmental and Occupational Health Assembly of the American Thoracic Society, serving as its Chair in 2001-2003. At the request of the ATS President at the time, Dr. Frampton chaired a Task Force on Bioterrorism, and helped to form a new Section on Bioterrorism, serving as its first Chair in 2003-2005. Currently he is a member of the ATS committee preparing a revision of the important and oft-cited document, "What Constitutes a Health Effect of Air Pollution?" Dr. Frampton has been and remains quite active with the Health Effects Institute, a health research organization jointly funded by EPA and the automobile industry. He is currently a member of the Science Review Committee for the Health Effects Institute. Dr. Frampton chaired an HEI Review Panel on ultrafine particles, which produced a recent HEI Perspectives, "Understanding the Health Effects of Ambient Ultrafine Particles".

**Frey, H. Christopher****North Carolina State University**

Dr. H. Christopher Frey is a professor of environmental engineering in the Department of Civil, Construction, and Environmental Engineering at North Carolina State University. His research interests are measurement and modeling of real-world fuel use and emissions of onroad and nonroad vehicles; modeling and evaluation of advanced energy conversion (e.g., combustion, gasification) and environmental control systems; development and application of methods for quantification of variability and uncertainty and for sensitivity analysis in environmental systems models; and exposure and risk analysis. He has been the principal investigator or co-principal investigator for over 50 externally sponsored research projects, and has published over 90 journal papers, 150 conference papers, and 60 technical reports, and 7 book chapters and one book. He teaches courses in air pollution control, air quality, and environmental exposure and risk assessment. He currently serves on the U.S. Environmental Protection Agency's Clean Air Scientific Advisory Committee (CASAC) and on the Board of Environmental Studies and Toxicology of the National Research Council. He is Chair of the CASAC Lead Review Panel. In recent years, he has served on an EPA Science Advisory Board panel on expert elicitation, an EPA Advisory Council on Clean Air Compliance Analysis panel on EPA's Report to Congress on Black Carbon, National Research Council committees on review of the toxicological assessment of tetrachloroethylene and of EPA's New Source Review program, a NARSTO assessment of multipollutant air quality management, and a World Health Organization working group on uncertainty in exposure assessment. He was a lead author for 2006 guidance by the Intergovernmental Panel on Climate Change (IPCC) regarding uncertainty in greenhouse gas emission inventories. He is a Fellow and Past President of the Society for Risk Analysis and a Fellow of the Air & Waste Management Association. He received the 2008 NCSU Alumni Association Outstanding Research Award and 1999 Chauncey Starr Award of the Society for Risk Analysis. He has a B.S. in Mechanical Engineering from the University of Virginia, and from Carnegie Mellon University he has a Master of Engineering in Mechanical Engineering and Ph.D. in Engineering and Public Policy. Dr. Frey is the principal investigator of grants from the National Science Foundation and U.S. Environmental Protection Agency and contracts from the North Carolina Department of Transportation and United States Department of Transportation. He has received funding from the U.S. Department of Interior (National Park Service) via Louis Berger Group, Inc., the New Jersey Department of Environmental Protection via GbD, Inc., and the Environmental Research and Education Foundation via the University of Nebraska at Lincoln. He was a co-PI on a recently completed grant from the National Institutes of Health. These projects pertain to measurement and modeling of the activity, energy use, and emissions of vehicles and to exposure assessment.



**Gordon, Terry****New York University School of Medicine**

Dr. Terry Gordon holds the rank of Professor of Environmental Medicine at the New York University (NYU) School of Medicine. He holds a B.S. in Physiology (1974) and an M.S. in Toxicology (1976) from the University of Michigan, and a Ph.D. in Toxicology from Massachusetts Institute of Technology (1981), and was appointed to the faculty of the Department of Environmental Medicine in 1989. He has served as an ad hoc member of grant review panels and/or site visit teams for the National Institute of Environmental Health Services (NIEHS), National Institute of Allergy and Infectious Diseases (NIAID), National Coalition for Cancer Research (NCCR), U.S. Department of Defense (DOD), Bureau of Mines, Health Canada, and the U.S. Environmental Protection Agency (EPA). Dr. Gordon currently serves as Chair of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value committee, a volunteer organization that publishes occupational exposure levels that are used as workplace safety guidelines throughout the world. Dr. Gordon's broad research interest is in inhalation toxicology. The major focus of his research lab is the identification and understanding of the role of genetic host factors in the pathogenesis of the adverse pulmonary effects produced by inhaled environmental and occupational agents. Because inter-individual responses to inhaled particles and gases vary so greatly in both human subjects and test animals, Dr. Gordon has hypothesized that genetic susceptibility factors play a major role in environmental and occupational lung disease. In collaboration with a number of investigators in the department, his laboratory uses classic murine genetics models, computational genomics, and DNA microarrays to identify genes involved in the acute response as well as in the development of tolerance to repeated exposure to inhaled toxicants. Dr. Gordon also plays a major role in the particulate matter (PM) research program at NYU, and was among the first researchers to use concentrator technology to study the adverse cardiopulmonary effects of ambient PM. He also led a large collaborative effort amongst EPA's five original PM research centers to evaluate the in vitro and in vivo toxicity of size-segregated PM collected in the U.S. and Europe. Dr. Gordon's research has been supported by grants from both government agencies and private companies, with core grant research support primarily being from the federal government (U.S. Environmental Protection Agency, Centers for Disease Control, National Institute of Environmental Health Sciences), with additional grant support from state and local governments, and industry. Dr. Gordon is an active member of the Society of Toxicology (SOT), and has served on the Program Committee (2002-2005), the Placement Service (1998-2001), Membership Committee (2009-2012), and as President of its Inhalation Specialty Section during 2002-2003. He has served as a consultant/author to the EPA on issues of pulmonary toxicology related to the development of various documents, and he served on EPA's Clean Air Scientific Advisory Committee (CASAC) Oxides of Nitrogen (NOx) and Sulfur Oxides (SOx) Primary National Ambient Air Quality Standards (NAAQS) Review Panels.

**Harkema, Jack****Michigan State University**

Dr. Jack R. Harkema, DVM, PhD, DACVP is a University Distinguished Professor of Pathobiology at Michigan State University in East Lansing, MI. Dr. Harkema received a DVM (veterinary medicine) from Michigan State University (MSU) and a PhD (comparative pathology) from the University of California, Davis (UCD). After completing a National Institutes of Health (NIH)-sponsored research/residency training program in comparative pathology and toxicology at the UCD, Dr. Harkema joined the scientific staff at the Lovelace Inhalation Toxicology Research Institute in Albuquerque, NM in 1985 as an experimental and toxicologic pathologist. He later became the institute's project manager for pathogenesis research. In 1994, Dr. Harkema joined the faculty of the Department of Pathobiology and Diagnostic Investigation in the College of Veterinary Medicine at MSU. His primary research is designed to understand the pathobiology and toxicology underlying the health effects of outdoor and indoor air pollutants. In 2011, he became the director of the Great Lakes Air Center for Integrated Environmental Research, one of four US EPA-funded Clean Air Research Centers in the nation. Dr. Harkema has authored or co-authored over 200 peer-reviewed scientific publications and has served on several scientific advisory committees, including those for the National Institute of Environmental Health Sciences, the National Toxicology Program, EPA, and the National Academy of Sciences. Besides training graduate students, residents, and postdoctoral fellows in biomedical research, Dr. Harkema also moderates didactic courses in advanced general pathology, integrative toxicology, and pulmonary pathobiology. Dr. Harkema is a diplomate of the American College of Veterinary Pathologists and a member of the Society of Toxicologic Pathologists, the Society of Toxicology, and the American Thoracic Society. He currently receives research funding through grants or contracts from a variety of sources that include the following: the US EPA to explore and elucidate the health effects of multi-pollutant atmospheres in the Great Lakes region and to investigate the nasal toxicology and pathology of chlorine; the American Chemistry Council to study the nasal pathology and toxicology of inhaled olefin compounds in laboratory rats; and the American Beverage Association to study the pulmonary pathology and toxicology in mice orally exposed to various chemical compounds.

**Hopke, Philip****Clarkson University**

Dr. Philip K. Hopke is the Bayard D. Clarkson Distinguished Professor at Clarkson University, the Director of the Center for Air Resources Engineering and Science (CARES), and the Director of the Institute for a Sustainable Environment (ISE). He holds a B.S. in Chemistry from Trinity College, Hartford, CT (1965), and an M.A. (1967) and Ph.D. (1969) in Chemistry from Princeton University. Dr. Hopke is the past Chair of U.S. Environmental Protection Agency (EPA)'s Clean Air Scientific Advisory Committee (CASAC), and has served on the EPA Science Advisory Board (SAB) Professor Hopke is a Past President of the American Association for Aerosol Research (AAAR), and was a member of the more than a dozen National Research Council committees. He currently serves on the NRC's Board of Environmental Studies and Toxicology. He is a fellow of the International Aerosol Research Assembly, the American Association for the Advancement of Science and the American Association for Aerosol Research. He is an elected member of the International Statistics Institute and the recipient of the Eastern Analytical Symposium Award in Chemometrics and the Lifetime Achievement Award of the Chemometrics in Analytical Chemistry Conference. Dr. Hopke is also a recipient of the David Sinclair Award of the AAAR. He served as a Jefferson Science Fellow at the U.S. Department of State during the 2008-09 academic year. After a post-doctoral appointment at the Massachusetts Institute of Technology and four years as an assistant professor at the State University College at Fredonia, NY, Dr. Hopke joined the University of Illinois at Urbana-Champaign, rising to the rank of professor of environmental chemistry, and subsequently came to Clarkson in 1989 as the first Robert A. Plane Professor with a principal appointment in the Department of Chemistry. He moved his principal appointment to the Department of Chemical and Biomolecular Engineering in 2000. Since 2002, Dr. Hopke has been the Clarkson Professor and Director of CARES. Dr. Hopke's research has been supported by grants from both government agencies and private companies, with core grant research support primarily being from the federal government (U.S. Environmental Protection Agency, U.S. Department of Energy, and the National Science Foundation) with additional grant support from state (NYSERDA) and local governments, industry, and foundations. His current EPA funding is the Great Lakes Fish Monitoring and Surveillance Program that examines the presence of legacy and emerging contaminants in Great Lakes fish. He has multiple contracts with NYSERDA to examine aspects of the use of high efficiency, low emissions wood pellet boilers. On July 1, 2010, he took on the directorship of the ISE that houses Clarkson's undergraduate and graduate environmental science degree programs as well as managing Clarkson's sustainability initiatives.

**Ito, Kazuhiko**

New York City Department of Health &amp; Mental Hygiene

Dr. Kazuhiko Ito is Senior Environmental Epidemiologist at Bureau of Environmental Surveillance and Policy, New York City Department of Health and Mental Hygiene. Dr. Ito received his B.S. in Applied Chemistry from Yokohama National University, a M.S. and Ph.D. in Environmental Health Sciences from New York University. Dr. Ito's main area of expertise is human health effects and exposure assessment of ambient air pollutants, weather, and other environmental stressors. His current research interests include: (1) the roles of particulate matter (PM) chemical components on human health effects; (2) source-oriented evaluation of PM health effects; (3) the impact of weather conditions on morbidity and mortality; (4) the exposure error associated with weather and ambient air pollution monitoring network and its implication on observed health effects; and (5) identification of sensitive sub-populations to weather and air pollution. Dr. Ito's research has been supported by grants from U.S. Environmental Protection Agency, National Institute of Health, and Health Effects Institute. Dr. Ito authored and co-authored about 50 scientific papers. He published numerous research papers on the mortality and morbidity effects of PM and gaseous pollutants. He has also published research papers on spatial/temporal variations of air pollution as well as source-apportionment. Dr. Ito was a member of the Ambient Air Monitoring and Methods Subcommittee of the EPA's Clean Air Scientific Advisory Committee (2004 – 2010) and currently serves on CASAC Augmented for Sulfur Oxides Panel (2014-present). Dr. Ito has been a contribution author to the epidemiology chapters of EPA's Integrated Science Assessment documents for: Particulate Matter (1996, 2005, 2009); Ozone (2006, 2013) ; Oxides of Nitrogen (2008), Sulfur Oxides (2008), and Carbon Monoxide (2010), as well as Sulfur Dioxide chapter of the Global Update of WHO Air Quality Guideline (2006).

**Kaufman, Joel**

University of Washington

Dr. Kaufman is a physician-epidemiologist, board-certified in internal medicine and occupational medicine. A graduate of the University of Michigan (B.A., M.D.) and the University of Washington (MPH), he has been a full-time faculty member at the University of Washington (UW) since 1997. He is currently Professor in the departments of Environmental & Occupational Health Sciences, Medicine, and Epidemiology, and the Director of the UW's Occupational and Environmental Medicine Program. His current research activities are primarily focused on environmental factors in cardiovascular and respiratory disease. He is the principal investigator of a major epidemiological prospective cohort study of air pollution and cardiovascular disease (The Multi-Ethnic Study of Atherosclerosis and Air Pollution, or "MESA Air"). He directs the UW Northlake Controlled Exposure Facility, a facility customized for experimental inhalation toxicology studies on health effects of combustion-derived pollutants including diesel exhaust. He is also principal investigator of a National Institutes of Health-funded Specialized Center for Research at the University of Washington on Cardiovascular Disease and Traffic-Related Air Pollution. Dr. Kaufman's research integrates the disciplines of epidemiology, exposure sciences, toxicology, and clinical medicine.

**Kavouras, Ilias**

University of Arkansas for Medical Sciences

Dr. Ilias Kavouras is Associate Professor of Environmental Health in the Department of Environmental and Occupational Health at University of Arkansas for Medical Sciences Fay W. Boozman College of Public since 2011. He completed his B.S. and Ph.D. degrees in Chemistry from the University of Crete studying secondary organic aerosol formation by 1998. He joined the Environmental Science and Engineering Program at Harvard School of Public Health developing a new generation of aerosol and personal exposure samplers and factorial methods for source apportionment studies. During his tenure in Europe, Dr. Kavouras developed and obtained accreditation for the Atmospheric Chemistry Laboratory in Greece and expanded and implemented the Environmental Exposures program for the Longitudinal Children Study in France. Dr. Kavouras's research concentrates on the coupling among atmospheric pollution, health and ecosystems and includes urban air quality pertaining to particulate matter sources and composition, organic aerosol speciation, development of aerosol characterization technologies, windblown dust and wildfires smoke emissions and atmospheric fate and their relation to climate change, geospatial and inverse modeling, factorial source apportionment and effects of particulate pollution on visibility. Community education and outreach activities include a multi-tiered method to engage K-12 educators and students using novel engagement approaches on indoor air quality, healthy homes and use of chemicals and pesticides. He has been funded by USEPA, NSF, NOAA, DoE, Naval Facilities Engineering Service Center, National Nuclear Security Administration, Western Regional Air Partnership, European Directorate for Research, The British Council, German Research Foundation, State of New Mexico and Motor Oil S.A. He has participated on panels for NSF, European Research Council, French Public Safety, Nutrition, Environment and Occupational Safety Agency and NOAA. He is a member of the Exposure Modelling and Assessment and Nano advisory groups of the Society of Environmental Toxicology and Chemistry, on the editorial board of the Environmental Toxicology and Chemistry journal and foreign expert for the French Public Safety, Nutrition, Environmental and Occupational Safety Agency.

**Kinney, Patrick**

Columbia University

Dr. Kinney has a broad background in environmental health sciences, with specific training and expertise in exposure assessment, respiratory health and climate change. He completed his doctoral studies in Environmental Science and Physiology at the Harvard School of Public Health in 1986. As a junior faculty member at New York University, he developed and led epidemiologic research on lung function and inflammatory biomarker changes in relation to chronic exposures to ozone and other air pollutants. Moving to Columbia in 1994, he expanded his research to include community-based studies of traffic pollutant exposures and health outcomes in underprivileged neighborhoods in New York City, leading and contributing to several large-scale studies over the following 20 years. He has contributed to the periodic reviews of the National Ambient Air Quality Standards for ozone and particulate matter, and served on the EPA Clean Air Scientific Advisory Committee for reviews of the Nitrogen Dioxide and Sulfur Dioxide standards. He developed and currently directs the Climate and Health Program at Columbia, which trains students and postdocs in research on the health dimensions of climate variability and change. He also direct ongoing research on indoor and outdoor air quality and health in Africa, including a randomized stove trial in Ghana funded by NIEHS. Other recent funding sources include the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, and the United States Department of Transportation.

**Kleeman, Michael**

University of California, Davis

Professor Michael Kleeman has a B.A.Sc. in Mechanical Engineering and M.S./Ph.D. in Environmental Engineering Science. He has been a faculty member in the Department of Civil and Environmental Engineering at the University of California, Davis since 1999. Dr. Kleeman's research is focused on the study of urban and regional air quality problems with an emphasis on the size and composition of atmospheric particles and gas-to-particle conversion processes. He has measured particle size and composition directly at sources and in the environment to provide data for statistical source receptor models. He has also constructed mechanistic air quality models to identify the most important atmospheric processes, and to better track source contributions to size-resolved ambient particulate matter. Professor Kleeman's current goals are to better understand climate-energy-air quality interactions and to determine the health effects of ultrafine particles. Dr. Kleeman has published over 100 papers in peer-reviewed scientific journals that have been cited more than 5000 times by other researchers. He has acted as Principle Investigator for more than 20 major research projects funded by the United States Environmental Protection Agency, the California Air Resources Board, the California Energy Commission, the South Coast Air Quality Management District, the San Joaquin Valley Unified Air Pollution Control District, and the Bay Area Air Quality Management District.

**Kleinman, Michael T.**

University of California, Irvine

Dr. Michael T. Kleinman is an Adjunct Professor of Toxicology in the Department of Medicine's Occupational and Environmental Medicine Division at the University of California, Irvine (UCI), with a joint appointment in the Program in Public Health. He was previously employed by the U.S. Atomic Energy Commission (AEC) as an environmental scientist and he directed the Aerosol Exposure and Analytical Laboratory at Rancho Los Amigos Hospital in Downey, CA. He has more than 40 years of experience researching the health effects of environmental contaminants. He holds a M.S. in Chemistry (Biochemistry) from the Polytechnic Institute of Brooklyn and a Ph.D. in Environmental Health Sciences from New York University. He is the Co-Director of the Air Pollution Health Effects Laboratory at UCI. He has published more than 115 peer-reviewed journal articles on effects of environmental contaminants on cardiopulmonary and immunological systems and on global and regional distribution of environmental contaminants including heavy metals and radioactive contaminants from nuclear weapons testing. He has directed more than 50 controlled exposure studies of human volunteers and laboratory animals to ozone and other photochemical oxidants, carbon monoxide, ambient particulate matter (PM) and laboratory-generated aerosols containing chemically or biologically reactive metals such as lead, cadmium, iron and manganese. He has served on two National Academy committees to examine issues in protecting deployed U.S. Forces from the effects of chemical and biological weapons. Dr. Kleinman's current research focuses on neurological and cardiopulmonary effects of inhaled particles, including nanomaterials and ultrafine, fine and coarse ambient particles in humans and laboratory animals. His recent health effects studies have the role of inhaled combustion-generated particles on the promotion of airway allergies and acceleration of development of cardiovascular disease and how these effects are mediated by organic and elemental carbon components of PM. Dr. Kleinman's current research grants and contracts include a grant to examine the effects of inhaled particles on brain stem cells related to tumor development from the California Brain and Lung Tumor Foundation, a contract from the California Environmental Protection Agency to study the role of semi-volatile components of fine and ultrafine PM on cardiac function and atherosclerosis, and a contract to examine the effects of long term inhalation exposure to concentrated fine particles on brain inflammation. Dr. Kleinman has previously served on the U.S. EPA Clean Air Scientific Advisory Committee (CASAC) Ozone, PM and NO<sub>2</sub> panels and was appointed to Chair the Scientific Review Panel for Toxic Substances for the state of California. Dr. Kleinman's current research focuses on neurological and cardiopulmonary effects of inhaled particles, including nanomaterials and ultrafine, fine and coarse ambient particles in humans and laboratory animals. His recent health effects studies have the role of inhaled combustion-generated particles on the promotion of airway allergies and acceleration of development of cardiovascular disease and how these effects are mediated by organic and elemental carbon components of PM. Dr. Kleinman is a co-Investigator on grants from NIH and NSF as well as contracts from the California Brain and Lung Tumor Foundation and from the California Environmental Protection Agency to study the role of semi-volatile components of fine and ultrafine PM on cardiac function, atherosclerosis, and effects of subchronic and chronic inhalation exposures to concentrated fine particles on brain inflammation.

**Li, Lingjuan**

North Carolina State University

Dr. Lingjuan Wang Li is an Associate Professor in the Department of Biological and Agricultural Engineering at North Carolina State University. She earned a M.S. and a Ph.D. from Texas A&M University in Biological and Agricultural Engineering, and a B.S. in Cotton Engineering in China. She specializes in air quality and animal housing environmental engineering. Much of her research addresses emissions, fate and transport of air emissions from animal feeding operations (AFOs). Dr. Li has authored 41 peer-reviewed papers/ book chapter, and 78 conference papers. Her research is currently funded by the National Science Foundation (NSF), U. S. Department of Agriculture (USDA), and Animal Production Industry. Dr. Li's teaching responsibilities include undergraduate and graduate courses in animal housing environmental control / management and air quality engineering. She was selected to serve on the USDA Agricultural Air Quality Task Force (AAQTF) from 2003-2015; she was a recipient of a 2010 National Science Foundation Career Award in Environmental Engineering. Dr. Li is a member of Association of Environmental Engineering & Science Professors (AEESP); American Society of Agricultural & Biological Engineers (ASABE), Air & Waste Management Association (AWMA), International Commission of Agricultural and Biosystem Engineering (CIGR). She has served on the editorial boards of several agriculture engineering Journals and is currently division editor of International Journal of Agricultural and Biological Engineering (IJAB) and associate editor of the transaction of the ASABE. She has also served on review panels for the USEPA and NSF. She was the President (2009-2010) of Association of Overseas Chinese Agricultural, Biological and Food Engineers (AOCABFE); Chair (2007-2008) of S1025 USDA Multi-State Air Quality Research Committee: "Systems for Controlling Air Pollutant Emissions and Indoor Environments of Poultry, Swine, and Dairy Facilities".

**McConnell,Rob**

University of Southern California

Rob McConnell is a physician and epidemiologist, a Professor of Preventive Medicine, and the director of Southern California Children's Environmental Health Center at the University of Southern California, where he has studied the effects of air pollution on children's health. He has been the principal investigator or project director on several large National Institutes of Health-funded R01s or Centers supporting the Southern California Children's Health Study, a large, ongoing longitudinal cohort study that has made important contributions to understanding the role of air pollution in childhood origins of respiratory and cardiometabolic health and obesity. His research interests include, in addition, novel methods for assessment of environmental exposure and understanding susceptibility to the effects of air pollution related to psychosocial stress and social factors, exercise, co-exposures associated with housing conditions, as well as genetics. Other interests include the development of methods for estimating the burden of disease associated with near-roadway air pollution and for assessing exposure in environmental epidemiology. He directs the Career Development Program of the NIEHS-supported Southern California Environmental Health Sciences Center. Before coming to USC, Dr. McConnell directed a World Health Organization (WHO) regional center for environmental health in Latin America and the Caribbean, where he was a member of advisory committees to the Ministries of Health in the Americas and of the senior management team to the WHO Regional Director for the Americas. He is a fellow of the American Association for the Advancement of Science.

**Peden,David**

University of North Carolina at Chapel Hill

David B. Peden, MD, MS, FAAAAI, is the Andrews Distinguished Professor of Pediatrics, Medicine & Microbiology/Immunology and Senior Associate Dean for Translational Research of the University of North Carolina School of Medicine. Dr. Peden is an internationally recognized pediatrician and allergist/clinical immunologist and an expert regarding the effect of pollutants in asthma, other lung diseases and systemic diseases. Dr. Peden has authored or co-authored 132 peer reviewed publications and 18 book chapters and has made over 80 national and international presentations. He is the PI or Project Leader of EPA, NIH and NSF grants totaling \$2.5 million in direct costs focused on the effect of controlled exposures of pollutants to normal and susceptible populations, epidemiological studies of air pollutant effects on human health, genetic factors which influence adverse health outcomes and exploration of interventions to mitigate the effect of pollutants in exposed persons. He is the Director of the UNC Center for Environmental Medicine, Asthma and Lung Biology (CEMALB), which is co-located within the EPA Human Studies Facility on the Chapel Hill campus. The CEMALB collaborates on a number of translational studies of the health effects of air pollutants in humans with the Environmental Public Health Division of the National Health and Environmental Effects Research Laboratory of the US Environmental Protection Agency. He has also served on numerous EPA and NIH grant review committees. Dr. Peden also serves as Associate Editor for the Journal of Allergy and Clinical Immunology for environmental issues, and is past chair of the Residency Review Committee of Allergy and Immunology for the ACGME and the American Board of Allergy and Immunology. He also is the Secretary/Treasurer of the American Academy of Allergy, Asthma and Immunology. Dr. Peden also serves as Chief of the Division of Allergy, Immunology, Rheumatology and Infectious Diseases, and Associate Chair for Research of the UNC Department of Pediatrics and as key faculty in the UNC Curriculum for Toxicology. Dr. Peden is the Service Director for the Team Science Service of the NC Translational and Clinical Sciences Institute (the UNC CTSA). Dr. Peden received a BA in Biology (Honors Program), a MS in Pharmacology and Toxicology and his MD degree from West Virginia University. He was a resident and chief resident of Pediatrics at West Virginia University, and was a Medical Staff Fellow and Chief Medical Staff Fellow at the National Institute of Allergy and Infectious Diseases of the NIH in Bethesda, MD.

**Peltier,Richard**

University of Massachusetts

Dr. Richard Peltier is an Assistant Professor at the University of Massachusetts in the Department of Environmental Health Science. He holds a PhD from Georgia Institute of Technology and a MPH in Environmental Health Science from Columbia University. His academic training is in applied chemistry, engineering, and public health, calling on these disciplines to identify the chemical component of particulate matter most responsible for human morbidity and mortality. Dr. Peltier's research areas are diverse and include approaches to novel instrument development for assessment of aerosol toxicity, conducting international field studies that include both stationary and personal sampling approaches, as well as well-controlled laboratory studies of in vivo exposure to aerosol. Their laboratory is particularly interested in the metals and carbonaceous fraction of PM. Dr. Peltier is an Associate Editor on the Journal of Exposure Science and Environmental Epidemiology, and he is active in the International Society of Exposure Science, the American Association for Aerosol Research, and the Society of Toxicology.

**Poirot,Richard L.**

Vermont Department of Environmental Conservation

Mr. Richard L. Poirot has worked as an Environmental Analyst in the Air Quality Planning Section of the Vermont Department of Environmental Conservation since 1978. Mr. Poirot holds a B.A. from Dartmouth College (1972), where he majored in geography and environmental studies. His responsibilities include developing the technical support for State Implementation Plans (SIPs) to ensure attainment and maintenance of federal and state standards for ozone, particulate matter, and regional haze. Mr. Poirot has also developed interests and expertise in drawing inference on the nature of pollution sources from analysis of ambient air quality and meteorological measurement data. He has been an active participant on the Acid Deposition Committee and the Ambient Monitoring and Assessment Committee for the Northeast States for Coordinated Air Use Management (NESCAUM); the U.S. Environmental Protection Agency (EPA) Acid Rain Advisory Committee; the Data Analysis Workgroup for the Ozone Transport Assessment Group (OTAG); the Science and Technical Support Workgroup for the Federal Advisory Committee on Ozone, Particulate Matter and Regional Haze (OPRHA); the Monitoring and Data Analysis Workgroup for the Mid Atlantic/Northeast Visibility Union (MANE-VU), the Steering Committees for the Interagency Monitoring of Protected Visual Environments (IMPROVE) and the Visibility Information Exchange Web System (VIEWS); the Subcommittee on Scientific Cooperation for the U.S./Canada Air Quality Agreement; the EPA Clean Air Scientific Advisory Committee (CASAC), the CASAC Ambient Air Monitoring and Methods Subcommittee and the CASAC Panels for Particulate Matter, Ozone, Lead, and Secondary SOx and NOx National Ambient Air Quality Standards Review; the NARSTO External Review Panel; the U.S. EPA Advisory Council on Clean Air Compliance Analysis and the Council Subcommittee on Ambient Air Modeling; and the Board on Environmental Studies and Toxicology (BEST) for the National Research Council. He is not currently a recipient of research grants from the Environmental Protection Agency, other federal agencies, or the private sector.

**Polasky, Stephen**

University of Minnesota

Dr. Stephen Polasky holds the Fesler-Lampert Chair in Ecological/Environmental Economics at the University of Minnesota where he is a member of the Department of Applied Economics and the Department of Ecology, Evolution and Behavior. He is also a Faculty Fellow at the Institute on the Environment, and the Law School, and a graduate faculty member of the Conservation Biology, Water Resources, and Natural Resource Science and Management Graduate Programs. He received a Ph.D. in Economics from the University of Michigan. He served as senior staff economist for environment and resources for the President's Council of Economic Advisers. He has served on the SAB, the SAB Committee on Valuing Ecosystems and Services, and the Environmental Economics Advisory Committee for US EPA. He serves on the Governing Board of the Natural Capital Project, the Board of Directors for the Beijer Institute of Ecological Economics, the Sustainability External Advisory Committee for the Dow Chemical Company, and the Board of Directors and the Science Council of The Nature Conservancy. He is a University Fellow at Resources for the Future, a Research Fellow at the Beijer Institute of Ecological Economics, and a Research Associate in the Environmental & Energy Economics Program at the National Bureau of Economic Research. His research focuses on issues at the intersection of ecology and economics. His research interests focuses on land use, the value of ecosystem services and natural capital, biodiversity conservation, sustainability, environmental regulation, renewable energy, and common property resources. Over the past five years he has received research funding from the National Science Foundation, the National Aeronautics and Space Administration, the Minnesota Pollution Control Agency, Friends of the Boundary Waters, and the University of Minnesota. He was elected into the National Academy of Sciences in 2010. He was elected as a Fellow of the Association of Environmental and Resource Economists in 2011, the American Academy of Arts and Sciences in 2009, and the American Association for the Advancement of Science in 2007.

**Pope, III, C. Arden**

Brigham Young University

Dr. C. Arden Pope, III is the Mary Lou Fulton Professor of Economics at Brigham Young University. He received his MS and PhD degrees from Iowa State University in 1981. His training was in economics and statistics and his early research publications related primarily to agriculture, natural resource, and environmental economics. In the late 1980s, Dr. Pope began conducting cross-disciplinary research in environmental economics and air pollution epidemiology that resulted in several pioneering studies on the health effects and costs of air pollution. In 1992/93 he was a Post-Doctoral Fellow and Visiting Scientist at the Harvard School of Public Health. He has conducted and collaborated on a series of seminal studies of human health effects of air pollution. He has played prominent roles in reviewing and interpreting the literature and is one of the world's most cited and recognized experts on the health effects of air pollution. He has also served on many scientific advisory, editorial, and oversight panels, boards, and committees and has been the recipient of various honors and awards including: The Gardner Prize Utah Academy of Sciences, Arts, and Letters (2014); Honorary Fellow of the American College of Chest Physicians (FCCP Hon, 2008); Thomas T. Mercer Joint Prize from the American Association for Aerosol Research and the International Society for Aerosols in Medicine (2001); Utah Governor's Medal for Science & Technology (2004); BYU Distinguished Faculty Lecturer Award (2006); among others.

**Raja, Suresh**

Louisiana State University

Dr. Raja has over ten years of experience in air quality management. His innovative contributions to the air quality management field include: development of methods to monitor and model spatial distribution of ambient particulate matter, indoor air quality and its effect on asthma symptoms, and development of methods to test emissions of criteria pollutants from new advanced high efficiency stationary combustion systems. His specific experience in air compliance related work include Title V, Non-Attainment New Source Review, Permits-By-Rule, and air quality modeling for several clients in the oil & gas sector, and in the general chemical manufacturing and industrial sectors. He also routinely serves as an expert witness in air quality litigation cases using air quality modeling tools he has developed to simulate source contribution analysis, and plume dispersion modeling tools developed by the USEPA. In addition to this, Dr. Raja has an in-depth understanding of the science behind dispersion models such as AERMOD and CALPUFF. Dr. Raja has published over 20 peer-reviewed journal papers and presented over 30 peer-reviewed conference papers. He currently serves as a reviewer for journals such as Atmospheric Environment, Environmental Science and Technology and the Canadian Journal of Environmental Engineering. He is a member of ACCESS VIII, a colloquium organized by the Brookhaven National Laboratory. ACCESS (Atmospheric Chemistry Colloquium for Emerging Scientists) is a highly selective program that brings together young atmospheric scientists from around the world for scientific discussions. Dr. Raja has current and past experience in teaching graduate-level and senior-level classes such as industrial air pollution control, air pollution modeling, atmospheric chemistry, and air pollution measurement and monitoring.

**Rom, William**

New York University

Dr. William N. Rom is a physician (University of Minnesota, 1971) scientist in pulmonary (Mount Sinai-NY) and environmental medicine (Harvard School of Public Health and Alumni Merit Award 2011) who was on sabbatical in the U.S. Senate (Senator Clinton 2003-4) and EPA (ORD 2014-2015) in the National Center for Environmental Assessment and the U.S. Global Change Research Program in climate change (and human health.) Dr. Rom is Sol and Judith Bergstein Professor of Medicine and Environmental Medicine at NYU. He has 313 peer review publications. He has served on the Health Effects Institute Review Committee for 10 years and Hewas Director of the New York University Division of Pulmonary and Critical Care Medicine for 25 years. He spent 6 years at Utah Health Sciences Center and founded the Rocky Mountain Center for Occupational and Environmental Health. He was at the National Heart, Lung, and Blood Institute, National Institutes of Health for 6 years and published on the mechanisms of fibrosis due to asbestos, silican and coal. He is Director of the NYU Lung Cancer Biomarker Center and has been funded by NIH and the Centers for Disease Control for 38 years. He is an expert in environmental health and directs the William N. Rom Environmental Lung Disease Laboratory at NYU/Bellevue Hospital.

**Sarnat,Jeremy****Emory University**

Dr. Jeremy A. Sarnat is currently an Associate Professor of Environmental Health at the Rollins School of Public Health of Emory University. He holds an Sc.D. in Environmental Health from the Harvard School of Public Health. Dr. Sarnat's research focuses primarily on characterizing exposures to urban air pollution in various populations, in particular panels of sensitive cohorts such as children, older adults and individuals with cardiorespiratory disease. Much of his work examines how exposure science informs environmental epidemiology; the impact of exposure misclassification and confounding on air pollution epidemiologic findings; and the application of these findings towards the development of novel spatiotemporal models of personal air pollution exposures. Currently, Dr. Sarnat is the Principal Investigator of several panel studies investigating exposures to primary traffic pollution in cohorts of healthy and asthmatic subjects and corresponding acute cardiorespiratory response funded by the US Environmental Protection Agency as part of the Clean Air Research Center (CLARC) program. He was awarded the 2011 Joan M. Daisey Outstanding Young Scientist Award by the International Society of Exposure Science. Prior to entering academia, Dr. Sarnat worked as staff scientist for 4 years at the Israel Union for Environmental Defense in Tel Aviv, a non-profit organization of scientists and lawyers promoting sustainable development and pollution prevention.

**Sarnat,Stefanie****Emory University**

Dr. Stefanie Ebelt Sarnat is Associate Professor of Environmental Health at the Rollins School of Public Health of Emory University in Atlanta, GA. She holds a Master of Science degree from the University of British Columbia in 2000 and a doctorate from the Harvard School of Public Health in 2005. Dr. Sarnat's research focuses on assessing exposures and corresponding health effects of urban air quality. She currently leads several time-series studies with funding from the US Environmental Protection Agency (USEPA), the National Institute of Environmental Health Sciences, and the Electric Power Research Institute, with specific interests in assessing the impacts of air pollution, meteorological conditions, and weather extremes on health care utilization for cardiorespiratory outcomes. Her research includes a multi-city time-series study as part of the Emory University/Georgia Institute of Technology Southeastern Center for Air Pollution and Epidemiology, a USEPA Clean Air Research Center. Dr. Sarnat's work on these studies focuses on assessment of health relevant ambient air pollution mixtures, examination of the impacts of exposure measurement error on observed epidemiological findings, and assessing exposure and population factors that may modify health risk. Her studies also include prospective panel-based designs, using detailed field investigation methods to further understand air pollution exposure factors and health effects among susceptible and vulnerable populations. Dr. Sarnat recently served on the National Research Council's committee on urban meteorology and the Health Effects Institute review panel on ultrafine particles. She has also participated as an expert peer reviewer of drafts of the USEPA Integrated Science Assessments for particulate matter and nitrogen oxides.

**Schauer,James Jay****University of Wisconsin - Madison**

Dr. James Jay Schauer is a Professor of Civil and Environmental Engineering at the University of Wisconsin-Madison and serves as the Associate Chair of the Department of Civil and Environmental Engineering for the Environmental Science and Engineering Division, the Director of the Water Science and Engineering Laboratory, and a Program Director at the Wisconsin State Laboratory of Hygiene at the University of Wisconsin-Madison. He holds a B.S. in Chemical and Petroleum Refining Engineering from the Colorado School of Mines, an M.S. in Environmental Engineering from the University of California at Berkeley, a Ph.D. from the California Institute of Technology and recently completed his MBA from the University of Wisconsin-Whitewater. Dr. Schauer's research focuses on the development and application of air pollution sampling methods and advanced chemical analysis methods to understand the sources and impacts of air pollution. He is applying these tools in urban air pollution studies, human health studies, and climate studies. He has extensive expertise in the measurement and data analysis of measurements of organic aerosols, trace elements in particulate matter and atmospheric mercury. Dr. Schauer has led and participated in numerous monitoring studies and source testing projects throughout the United States and in Asia, Europe, and the Middle East. Dr. Schauer's research has been supported by grants from both government agencies and private companies, with core grant research support primarily being from the federal government (U.S. Environmental Protection Agency, National Science Foundation, U.S. Department of Energy, National Oceanic and Atmospheric Administration), private industry consortia (Electric Power Research Institute, Water Environmental Research Foundation), and state and regional air quality management authorities, with additional grant support from state and local governments, industry, and foundations. He is a Guest Professor at Peking University (Beijing, China) and served as a Lead Author for the International Panel on Climate Change (IPCC) 5th Assessment Report, Working Group III: Mitigation. He has authored and co-authored over 275 peer-reviewed scientific publications that have been cited over 11,000 times according to the Institute of Scientific Information Science Citation Index, and is a registered Professional Engineering in the State of Colorado and the State of Illinois.

**Sheppard,Elizabeth A. (Lianne)****University of Washington**

Dr. Elizabeth A. (Lianne) Sheppard, PhD is Professor and Assistant Chair in the Department of Environmental and Occupational Health Sciences and Professor of Biostatistics at the University of Washington. She holds a B.A. in psychology and a Sc.M. in biostatistics from Johns Hopkins University, and a Ph.D. in biostatistics from University of Washington. Her research interests focus on modeling and understanding the health effects of environmental and occupational exposures with particular emphasis on statistical methods for environmental and occupational epidemiology. She actively collaborates on a variety of research projects in the environmental and occupational health sciences and has been lead statistician for the Multi-Ethnic Study of Atherosclerosis and Air Pollution (MESA Air) study, a 10-year study funded by EPA to determine the effect of long-term air pollution exposure on subclinical progression of cardiovascular disease. Dr. Sheppard directs a NIEHS-funded program for quantitative training in the environmental health sciences. Her recent research funding comes from EPA, NIEHS, NIOSH, and the Health Effects Institute. She is a fellow of the American Statistical Association and a member of the editorial board for Epidemiology. She serves on the Health Effects Institute's Review Committee, and has advised EPA through service on several Clean Air Scientific Advisory Committee special panels and Science Advisory Board ad hoc committees.

**Surratt, Jason****University of North Carolina at Chapel Hill**

Dr. Jason Surratt is an Assistant Professor at the University of North Carolina-Chapel Hill in the Department of Environmental Sciences and Engineering located within the Gillings School of Global Public Health. He received his Ph.D. in Chemistry from Caltech, and his BA and BS degrees in Chemistry and Meteorology, respectively, from North Carolina State University. His current research utilizes advanced mass spectrometry and analytical techniques to understand as deeply as possible the atmospheric chemistry that occurs in both the gas and particulate phases, with special focus on the chemistry leading to the formation of organic aerosol. These techniques are combined with synthetic organic chemistry in flow tube, smog chamber, and field studies. This research approach has recently helped to derive parameterizations that could be used in models to more accurately predict levels of isoprene-derived secondary organic aerosol formation. He has also helped with understanding the role of heterogeneous chemistry in organic aerosol formation. Recently, his chemical measurements are being coupled to toxicological and systems biology approaches to assess the potential adverse biological effects that occur in human lung cells upon exposure to secondary organic aerosol mixtures. He is the 2013 recipient of the American Association for Aerosol Research (AAAR) Sheldon K. Friedlander Award and the 2012 recipient of the Health Effects Institute Walter A. Rosenblith New Investigator Award. Dr. Surratt has authored and co-authored more than 75 peer-reviewed articles in leading atmospheric chemistry, environmental science and air pollution journals. He is currently funded by the U.S. Environmental Protection Agency (EPA), National Science Foundation (NSF), and National Oceanic and Atmospheric Administration (NOAA) as well as by the Health Effects Institute (HEI), Electric Power Research Institute (EPRI), Camille and Henry Dreyfus Foundation, and the University of Texas at Austin-Air Quality Research Program.

**Turner, Jay****Washington University**

Dr. Jay Turner is an Associate Professor of Energy, Environmental and Chemical Engineering at Washington University in St. Louis. Dr. Turner holds B.S. and M.S. degrees from UCLA (1987) and a D.Sc. from Washington University (1993), all in Chemical Engineering. Following his M.S. studies, he spent two years at the University of Duisburg, Germany, where he was a DAAD Fellow. Following his D.Sc. studies, Dr. Turner spent eight months on assignment with the Federal Highway Administration, U.S. Department of Transportation, as an Air Quality Specialist. He subsequently joined the Washington University faculty in 1994 as an Assistant Professor of Engineering & Policy. Dr. Turner's research primarily focuses on air quality characterization and control with emphasis on field measurements and data analysis to support a variety of applications in the atmospheric science, regulation and policy, and health studies arenas. He was the Principal Investigator of the St. Louis – Midwest Fine Particulate Matter Supersite. He manages a field site in East St. Louis that has hosted several Federal Equivalent Method testing campaigns and was recently one of two U.S. Environmental Protection Agency (EPA) coarse particulate matter pilot speciation study sites. Current and recent research projects include estimating lead emissions from piston engine aircraft, source apportionment of ambient particulate matter in Hong Kong, assessing intraurban variability of air toxics metals, and long-term fence-line monitoring for gaseous air toxics and particulate matter species at an industrial facility. Recent consulting activities include monitoring guidance and/or data analyses for agencies in four states in support of State Implementation Plan development. He is currently Washington University lead investigator on a contract from the Airport Cooperative Research Program (ACRP) to Sierra Research, Inc. to develop approaches to mitigate lead concentration hot spots at general aviation airports, and PI on an MOU between ConocoPhillips and Washington University to conduct the Roxana Air Quality Study. His consulting work is currently funded by the Millennium Challenge Corporation (MCC) through Social Impact to conduct an air quality impact evaluation of a heating stove replacement program in Mongolia, and by The Organisation for Economic Co-operation and Development (OECD) to assess the state of air quality monitoring in 51 countries and develop a framework for estimating air quality indicators. Dr. Turner has served on several state and local air quality-related advisory committees and the Science and Technical Support Workgroup of the Federal Advisory Committee Act (FACA) Subcommittee for Ozone, Particulate Matter, and Regional Haze Implementation Programs. He currently serves on the Ambient Monitoring and Methods Subcommittee (AMMS) of EPA's Clean Air Scientific Advisory Committee (CASAC) and the Independent Technical Advisory Committee of the Texas Air Quality Research Program. He recently served on the Science and Technology Achievement Awards (STAA) Committee of the EPA Science Advisory Board and on the Health Effects Institute project panel for the National Particle Components Toxicity Initiative. Dr. Turner was general chair for the 2007 Annual Conference of the American Association for Aerosol Research (AAAR) and currently serves as AAAR President.

**Turpin, Barbara****University of North Carolina - Chapel Hill**

Barbara J. Turpin is a Distinguished Professor of Environmental Sciences at Rutgers University, NJ, who specializes in atmospheric organic chemistry that transforms gaseous emissions into particulate matter (PM) affecting health, visibility and climate. She was the first to publish time-resolved measurements that provided atmospheric evidence for the formation of secondary organic aerosol (Turpin et al., 1991). Her group was the first to recognize that secondary organic aerosol forms through gas followed by aqueous chemistry in clouds, fogs and wet aerosols (Blando et al., AE 2000). Her 2000 organic aerosol review paper has been called a "primer" on organic aerosol measurement and was awarded Atmospheric Environment's Haagen Smit Prize. Professor Turpin's research continues to provide novel insights into the sources, properties and behavior of atmospheric organic aerosol. She also makes substantive contributions to the understanding of PM exposure and has conducted collaborative PM and health research. Dr. Turpin obtained a BS at the California Institute of Technology, a PhD from OGI - Oregon Health Sciences University and did postdoctoral research at the University of Minnesota Particle Technology Laboratory. She joined the faculty of Rutgers University in 1994. Professor Turpin is a Fellow of the American Association for the Advancement of Science (AAAS), the American Geophysical Union (AGU), and the American Association for Aerosol Research (AAAR). She is a recipient of AAAR's Sinclair Award for "sustained excellence in aerosol research and technology by an established scientist still active in his/her career." She is an Associate Editor of the prestigious journal, Environmental Science and Technology. Professor Turpin is a Past President of the American Association for Aerosol Research and just completed her term as a member of the International Commission for Atmospheric Chemistry and Global Pollution (ICACGP). She has published over 100 peer-reviewed papers (avg citations/paper = 71; h-index = 44) and received over \$10M of research funding from sources such as the Environmental Protection Agency (STAR), National Science Foundation, National Oceanic and Atmospheric Administration, Sloan Foundation, Health Effects Institute, New Jersey Department of Environmental Protection and Electric Power Research Institute.

**Vedal,Sverre****University of Washington**

Dr. Sverre Vedal is Professor in the Department of Environmental and Occupational Health Sciences at the University of Washington (UW) School of Public Health. He is a respiratory physician and an epidemiologist with research interests in the adverse health effects of community air pollution and in occupational lung disease. He received his MD from the University of Colorado and MSc in epidemiology from Harvard University. Dr. Vedal directs the US Environmental Protection Agency (EPA) Center for Clean Air Research at the University of Washington that employs the disciplines of exposure science, toxicology, epidemiology and biostatistics to investigate the cardiovascular health effects of exposure to multi-pollutant atmospheres. He has published widely on air pollution exposure and health effects and served on advisory committees of the US EPA and the National Institutes of Health. Dr. Vedal teaches courses in the UW School of Public Health, sees patients in the Occupational and Environmental Medicine Clinic at Harborview Medical Center in Seattle and supervises clinical trainees and graduate student research. He currently holds the AXA Research Fund Chair in Air Pollution and Health at the Chinese Research Academy of Environmental Sciences in Beijing, China and spends 3 to 4 months each year working with Chinese collaborators on air pollution exposure and health studies in China.

**Weber,Rodney****Georgia Institute of Technology**

Rodney Weber is a Professor at the Georgia Institute of Technology in the School of Earth and Atmospheric Sciences. He received a PhD in Mechanical Engineering from the University of Minnesota and has worked as an Assistant Scientist at Brookhaven National Laboratory and Professor at Georgia Tech. As an atmospheric experimental scientist, R. Weber's research includes investigating the sources, transformations, fates, and chemical and optical properties of particulate matter. Recent work involves developing new instrumentation for measurement of PM2.5 properties that have plausible physiological links to adverse health responses, and applying these methods to air pollution - health studies. The sources, chemical evolution and role of light absorbing particle organic species on aerosol optical properties, and connections between anthropogenic and biogenic emissions on PM2.5 formation, are also being studied. The National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), Environmental Protection Agency (EPA), Health Effects Institute (HEI), and Electric Power Research Institute (EPRI), currently fund Professor Weber's research.

**West,Jason****University of North Carolina at Chapel Hill**

J. Jason West is an Associate Professor in the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill, where he performs interdisciplinary research addressing air pollution and climate change, by using models of atmospheric chemistry and transport, and tools for quantitative policy analysis. Dr. West has worked as a Research Scientist at Princeton University, and prior to that, at the Environmental Protection Agency (EPA) in Washington, DC under a fellowship from the American Association for the Advancement of Science. He has also been a postdoctoral researcher at MIT and a visiting scientist at the National Institute of Ecology in Mexico City. He has a Ph.D. from Carnegie Mellon University, earned jointly between Civil & Environmental Engineering and Engineering & Public Policy, an M.Phil. in Environment & Development from the University of Cambridge, an M.S. from Carnegie Mellon, and a B.S. in Civil & Environmental Engineering from Duke University. Dr. West is interested broadly in the relationships between air pollution and climate change, and their relevance for environmental science and policy. Using computer models, Dr. West is currently exploring the effects of changes in emissions on global air quality (focusing on ozone and particulate matter), the international transport of air pollutants, the health effects of air pollution, the effects of climate change on air quality, and the radiative forcing of climate. He has been involved in air quality modeling studies on the global, regional (Middle East), national (US), and local (Mexico City) scales. Recently, Dr. West led the first study of the co-benefits of greenhouse gas (GHG) mitigation for air quality and human health to use global atmospheric models and future scenarios; results showed that the monetized co-benefits exceeded previous co-benefits estimates and exceeded the global costs of GHG mitigation in 2030 and 2050. Dr. West has been PI on grants funded by the EPA and the National Institute of Environmental Health Sciences. He is an author of 44 published journal articles. Dr. West is on the Scientific Steering Committee of the International Commission on Atmospheric Chemistry and Global Pollution (2010-present), and is a co-editor of the journal Atmospheric Chemistry and Physics. He was named a Leopold Leadership Fellow for environmental leadership in 2015 by the Stanford Woods Institute for the Environment. His research has been featured in international media, including the New York Times and National Public Radio.

**Wexler,Anthony****University of California, Davis**

Dr. Anthony Wexler is a professor of Mechanical and Aerospace Engineering, Civil and Environmental Engineering and Land, Air and Water Resources and director of the Air Quality Research Center and Crocker Nuclear Laboratory at the University of California, Davis. His research employs theoretical, mathematical modeling and measurement techniques to investigate gas and particle deposition in the airways of humans and animal models, the health effects elicited by these pollutants, and the atmospheric transport and transformation of pollutant emissions. He has obtained research support from federal agencies (e.g., EPA, DOE, NSF, NIH, NOAA), California state agencies (e.g., Air Resources Board, Tobacco-Related Disease Research Program), and industrial organizations (e.g., EPRI, pharmaceutical companies). He has published over 200 peer-reviewed papers and book chapters that are cited over 400 times per year. He was director of one of EPA's PM Health Effects Research Centers from 2005 to 2011. He has been treasurer and president of the American Association for Aerosol Research and is a fellow of that organization. He obtained his B.S. degree in Engineering Physics at UC Berkeley in 1976, his S.M. in Mechanical Engineering from MIT in 1978 and his PhD in Mechanical Engineering from Caltech in 1990. Before joining UC Davis in 2000, he was an assistant, associate and full professor in Mechanical Engineering at the University of Delaware, starting in 1991.



**Whitelock, Derek****Southwestern Cotton Ginning Research Laboratory**

Dr. Derek Whitelock is an Agricultural Engineer at the USDA-ARS Southwestern Cotton Ginning Research Laboratory in Mesilla Park, New Mexico where his research, mainly in the areas of air quality and seed-cotton and lint cleaning, covers a broad spectrum of issues in saw and roller ginning and agricultural processing. The majority of his recent work has focused on cotton gin air quality, particulate emissions, and dispersion modeling. As a USDA scientist, his research is primarily supported by federally allocated funds, but some additional funding has been awarded from agricultural processors and producer supported research and promotion organizations, and regulatory agencies for special projects. Dr. Whitelock is currently the Lead Scientist and coordinates scientific activities of the USDA ginning laboratory project – Enhancing Quality, Utility, Sustainability, and Environmental Impact of Cotton and its Byproducts through Improvement in Harvest and Gin Processing. Also, he is currently an Adjunct Associate Professor in the Biosystems and Agricultural Engineering Department at Oklahoma State University where he collaborates on agricultural processing and air quality research. Dr. Whitelock earned Bachelor and Master of Science degrees in Agricultural Engineering from Texas A&M University and a Doctor of Philosophy degree in Biosystems Engineering from Oklahoma State University. In the late 1990s, he began his cotton ginning research career as an Agricultural Engineer at the USDA-ARS Cotton Ginning Research Unit in Stoneville, Mississippi. He then taught agricultural power and machinery and precision agriculture courses in Agricultural Engineering Technology at the University of Wisconsin at River Falls for almost five years. Since his great-grandfather was a West Texas ginner, Dr. Whitelock returned to ginning research and has been at the Southwestern Cotton Ginning Research Laboratory since 2004. He also holds a professional engineer license in New Mexico.

**Wyzga, Ronald****Electric Power Research Institute**

Dr. Ronald Wyzga is Technical Executive in the Air Quality Health Effects program area of the Environment Sector at the Electric Power Research Institute. He received an AB degree in mathematics from Harvard College and an M.S. degree in statistics from Florida State University. He also received a Sc.D. degree in biostatistics from Harvard University. Dr. Wyzga has authored an extensive list of publications on his research. His current research activities focus on understanding the relationship between health effects and air pollution, an area in which he has worked for over 30 years. Dr. Wyzga is particularly interested in the design, conduct, and interpretation of epidemiological studies that examine this relationship. He is also interested in health risk assessment methods. Dr. Wyzga has studied the relationship between health effects and air pollution since he joined EPRI in 1975. In addition, he has worked on methods to attach economic values to air pollution damage and effects. Dr. Wyzga has served on, and has chaired, several committees for the EPA Science Advisory Board and National Academy of Sciences. He has also served on advisory oversight committees for several research programs on the health effects of air pollution. In 1990, Dr. Wyzga was elected a Fellow of the American Statistical Association by his peers. Prior to joining EPRI, he worked at the Organization for Economic Cooperation and Development (OECD) in Paris, where he co-authored a book on economic evaluation of environmental damage.

**York, Raymond****R.G. York & Associates**

Dr. York is a formally trained toxicologist with 30 years of research experience. He earned his Ph.D. in Toxicology at the University of Cincinnati and completed a two-year postdoctoral fellowship at Children's Hospital's Institute for Developmental Research in Cincinnati. He was board-certified as a Diplomate of the American Board of Toxicology in 1986 and has served 4 years on its Board of Directors. He is certified as a European Registered Toxicologist (2006) and a Fellow of the Academy of Toxicological Sciences, as well as a Fellow for Toxicology Excellence for Risk Assessment. He has served as a study director on over 700 safety evaluation studies and published over a 100 manuscripts, review articles, book chapters and abstracts. The most recent chapters were York and Parker: Test Methods for Assessing Female Reproductive and Developmental Toxicology (Chapter 34) and Parker and York: Hormone Assays and Endocrine Function (Chapter 35). In: Principles and Methods of Toxicology (6th Edition). Ed. A Wallace Hayes, Informa Healthcare, New York and London (2014). Dr. York has been a member of the Society of Toxicology since 1985, and the American College of Toxicology since 1998. He is currently President of the Reproductive and Developmental Toxicology Specialty Section of SOT. He has served as President of the Middle-Atlantic Regional Section (MASOT; 2012), the Midwest Teratology Association (MTA; 1989) and Mid- Atlantic Reproduction and Teratology Association (MARTA; 2004). Dr. York has been a member of the Teratology Society since 1984. He has served as a reviewer for Toxicology and Applied Pharmacology and International Journal of Toxicology and as a member of the Editorial Board of Fundamental and Applied Toxicology. Dr. York was the Principal Investigator for the Interlaboratory Validation of the Male and Female Pubertal Study and the Interlaboratory Validation of the 15-Day Adult Intact Male Rat Study for EPA as part of the Endocrine Disruptor Screening Program. In addition, Dr. York had processed a DEA Schedule I Researcher controlled license (RY0298427) and had worked extensively with controlled substances such as levo-alpha-acetylmethadol (LAAM), ibogaine and tetrahydrocannabinols, as well as amphetamine, hydrocodone, and morphine. Dr. York was an ad hoc member of the Peer Consultation Panel for the Voluntary Children's Chemical Evaluation Program (VCCEP) and the reproductive toxicologist reviewer expert for the USEPA Biodiesel Program. Peer review consultation panels for assessment of the potential risk of health effects have included exposures to tertiary-butyl acetate (TBAC), perfluorinated hexanoic acid, acetone, metabolites of brominated flame retardants, and selected bisphenols, ethyleneamines, nitroguanidine, BaP, acrylonitrile, PFOS, PFOA, tris(2-chloroethyl)phosphate (TCEP), 1,3,5-trinitro-1,3,5-hexahydrotriazine (RDX), naphthalene, and trichloroacetic acid. Dr. York is a peer consultant for assessment of the potential health-effect risks for a number of consulting and legal firms (potential adverse reproductive effects from SSRIs) and recently served on a GRAS Panel for a caffeine food additive. Currently he is on an EPA SAB panel for trimethylbenzene and an adjunct professor teaching Human Anatomy & Physiology at a local college.