

# A Review of *Nano-hype:* *The Truth Behind the Nanotechnology Buzz*

MICHELE MEKEL\*



*Nano-hype: The Truth Behind the Nanotechnology Buzz*

By David M. Berube  
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The hype—both positive and negative—surrounding nanotechnology dwarfs its industry and its present panoply of products. No pun is intended by this statement, nor is it meant as a slight to the field. This phenomenon of nanotechnology hype is laid out in clever prose and in well-footnoted detail by David Berube, professor of communication studies in the Department of English at the University of South Carolina, in his book, *Nano-hype: The Truth Behind the Nanotechnology Buzz*.

## I. BOOK SUMMARY

In part a sociology of nanotechnology, in part a nanotechnology timeline, and in part a nanotechnology “tell all,” the book is a compendium of interesting facts and figures, as well as quotes and anecdotes, from and about the key nanoplayers and nanoposers in the nanotech realm. It provides a thoroughly-cited narrative—to the tune of more than 2,000 endnotes over 360 pages of text—on the relatively brief history of nanopolicy, nanopolitics, and nanotechnology’s public perception. With a silver tongue—or, in this case, a silver pen—Berube, himself, best sums up this history by setting the stage and stating: “Stories are the vehicles for communicating adventures of all sorts, and that is true for nanotechnology.”<sup>1</sup> In the process of becoming the voice of this nanonarrative, Berube takes on the role of

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\* Michele Mekel, J.D., M.H.A., M.B.A., is the Associate Director/Legal Fellow of the Center on Nanotechnology and Society, and the Executive Director/Legal Fellow of the Institute on Biotechnology and the Human Future—both at Chicago-Kent College of Law/Illinois Institute of Technology. She is also an Associate Editor for *Nanotechnology, Law & Business*.

<sup>1</sup> DAVID BERUBE, NANO-HYPE: THE TRUTH BEHIND THE NANOTECHNOLOGY BUZZ, 47 (2006) (hereinafter BERUBE).

the right-minded, expert storyteller charged with deconstructing and vetting the nanotech tale in order to first uncover and, then, to start managing the hyperbole surrounding the technology.<sup>2</sup>

## II. CRITIQUE

Berube's book is not a pop-culture science book, although he and his publisher have attempted to position it as such.<sup>3</sup> Rather, it is a tome for nanophiles and the *nanocognoscenti*. Berube admits as much in the book itself, stating: "*As third-culture intellectuals ourselves, we need to address the public,*"<sup>4</sup> and "*As academics without actual and perceived self-interest, we might be able to shed some light on this emerging technology.*"<sup>5</sup>

Regardless of the intended or the actual audience, Berube tells the story of nanopolicy and nanopolitics by weaving together a nanotapestry that incorporates an interesting and occasionally eccentric cast of characters; an array of public and private entities and initiatives; a parade of carefully-researched details; and a set of genuine conflicts—all with the talent of a true wordsmith.<sup>6</sup> In doing so, Berube lets his views be known. Yet, he is fair; he takes to task *all* of the nanoparticipants—advocates and naysayers, alike—whether it be the NanoBusiness Alliance, the Foresight Nanotech Institute, the ETC Group, or the U.S. government—just to name a few.<sup>7</sup> He also aptly identifies what is amiss in the nanosphere, including:

- the pervasive role of politics in science funding;
- the nationalistic and protectionist stance of governments, especially the U.S. government, when it comes to the promotion of nanotech as a key economic driver of the future;

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<sup>2</sup> Berube's view, as expressed in *Nano-hype*, is, in his words:

Right or wrong, these voices [(i.e., those of nanoexperts and others)] are writing the narrative about nanotechnology. They are moving the issues and controversies into the public venue[,] and citizen-consumers are attempting to decide what they think is fact from fiction. . . . As third-culture intellectuals ourselves, we need to address the public. For that to happen, the story needs to be deconstructed and vetted, especially those stories told outside the venues of science and by the underinformed and misguided.

*Id.*

<sup>3</sup> In an online response to a review of his book, Berube wrote:

I made a decision to use a non-academic press and that meant I had to focus on the audience more than academics are accustomed . . . . [B]ut for my choice in publishers I might have taken a more academic and hypothetical angle (though I thought I did a good job with the last chapter). My goal was to write a basic history or the events and issues, a chronicle. That's how I sold the book concept . . . .

David Berube, *Response to "More about Nanohype,"* SLATE (Feb. 19, 2006), <http://www.softmachines.org/wordpress/?p=204>.

<sup>4</sup> BERUBE at 47 (emphasis added).

<sup>5</sup> *Id.* at 334 (emphasis added).

<sup>6</sup> As a professor of English, Berube should know best the requirements of a good story.

<sup>7</sup> The only nanoparticipants arguably missing in his discussion are the transhumanists.

- the fear mongering by Luddite-leaning interest groups under the guise of nanotechnology's ethical, legal, and societal implications (“NELSI”)<sup>8</sup>—or SEIN, Berube's acronym for the modified concept of the “societal and ethical implications of nanotechnology”;<sup>9</sup>
- the use of NELSI/SEIN as a tool in social-engineering efforts by government and nanobusiness interests that desire public acceptance of nanotechnology;
- the “squishiness” of NELSI/SEIN, in terms of what it means and what is contained within its rubric, which often depends on who is defining it, and the related concerns about NELSI/SEIN research funding by the U.S. government, in terms of level, reporting, and structure;<sup>10</sup>
- the current dearth of both technical data on nanotechnology's environmental, health, and safety (“EHS”) impacts, and a regulatory framework for nanotechnology, which, together, “enable ‘both nanotechnology proponents and skeptics alike to make contradictory and sweeping conclusions about the safety of engineered nanoparticles’”;<sup>11</sup>
- the absence of a truly engaged and interested public;

<sup>8</sup> NELSI is the term for nanotechnology's ethical, legal, and societal implications coined and used by the Center on Nanotechnology and Society as a variant on ELSI, the traditional-but-non-technology-specific term used for the general area of study.

<sup>9</sup> BERUBE at 26, n. 28 (noting that SEIN “include[s] environment and safety, equity, and potential conflict of interest arising from the interactions among government, industry, and universities, and intellectual property ownership,” and citing W. Zhou, *Ethics of Nanobiology at the Frontline*, 19 SANTA CLARA COMPUTER & HIGH TECH. L. J. 485 (2003)).

Interestingly, Berube's acronym for nano-related ELSI foregoes making the “L”—the legal component—explicit. However, it is mentioned in passing, and he also incorporates the EHS—environmental, health, and safety—issues by reference in his broader definition. See BERUBE at 26, n. 28 (see parenthetical *supra*); *id.* at 311 (stating that “SEIN encapsulates research by toxicologists, ethicists, and futurists into a range of issues from environmental impacts, regulatory regimes, workplace and economic dislocations, bionanotechnology convergence, and transhumanism and posthumanism”).

<sup>10</sup> See, e.g., *id.* at 125-35 (This is the case, despite the fact that NELSI/SEIN initiatives are called for in the 21<sup>st</sup> Century Nanotechnology Research and Development Act and are part of the core goals of the NNI.); *id.* at 303 (observing that the “call by government, industry, and academia to develop a societal ethics that will provide insight into SEIN . . . remains incredibly unclear [as to] what this mandate would entail”); *id.* at 309 (noting that, “[o]n a much more cynical note, SEIN may simply be perception management by legislators, regulators, and civil servants to distance themselves from culpability should anything disastrous ensue”); *id.* at 311 (stating, in Berube's own view, that “SEIN encapsulates research by toxicologists, ethicists, and futurists into a range of issues from environmental impacts, regulatory regimes, workplace and economic dislocations, bionanotechnology convergence, and transhumanism and posthumanism”); *id.* at 312 (alleging that “[Mihail] Roco seems to perceive SEIN as a college of academics who can mollify the negative consequences of outrage”); *id.* at 317 (averring that “[t]he primary directive [of SEIN] activity [under the National Nanotechnology Initiative (NNI)] is ‘to promote a new generation of skilled workers’” (quoting an NNI press release)); *id.* at 317-19 (reporting: “To date, SEIN research has not been substantial. Little has been published because SEIN research has been undertaken sparingly and *grant support has been underwhelming.*” (emphasis added); noting the early failures to expend NNI funds earmarked for NELSI/SEIN research on such projects; and highlighting the problem of reconciling government funding reports to determine the exact amount actually spent on NELSI/SEIN research); *id.* at 322 (stating: “There have been many NSF awards on societal implications, according to Roco. While meritorious, some seem less concerned with fundamental societal and ethical concerns and are only loosely categorized as SEIN projects.”); *id.* at 323-24 (lambasting the National Science Foundation (NSF) for the creation of an “informal bifurcated network” rather than a consolidated Nanoscale Science and Engineering Center (NSEC) dedicated to NELSI/SEIN, as is called for in the 21<sup>st</sup> Century Nanotechnology Research and Development Act). See also, *supra*, n. 10.

<sup>11</sup> BERUBE at 303, n. 224 (quoting Vicki Colvin, *The Potential Environmental Impact of Engineered Nanomaterials*, 21 NATURE BIOTECHNOLOGY 1166 (2003)). Furthermore, he astutely remarks that “[d]eny[ing] a claim is much more difficult than making one, and that is true irrespective of the integrity of the data and the logical rigor of the warrant.” *Id.* at 275.

- the media's penchant for flash over substance in reporting on technically complex topics, such as nanotechnology;
- the inherent dangers of the distortion between the hype of nanotechnology's promise and the truth of nanotechnology's present-day reality; and
- the folly of trying to accurately predict the course of—and the issues associated with—an emerging technology, such as nanotechnology.<sup>12</sup>

For articulating all of these concerns in one compendium—and a well-cited one with quotable quips, at that—Berube is to be commended.

The one fault to be found with the book is that, in *Chapter 7: Nano-industry and Nano-entrepreneurs*, Berube admonishes readers and researchers about their track records as poor prognosticators of the success and implications of budding innovations and novel technological inventions. He states: “Predicting the social and economic implications of emerging technology has proved to be a loser’s game.”<sup>13</sup> Nevertheless, in *Chapter 10: Societal and Ethical Implications of Nanotechnology Research*, while acknowledging that “[i]t is fairly important to understand how challenging [SEIN] research can be”<sup>14</sup> and that the study of SEIN is a still rather undeveloped discipline,<sup>15</sup> he lambastes SEIN researchers, averring that: “[d]ebating about low-incidence/high-consequence scenarios should be the subject of disaster B movies and not SEIN research”;<sup>16</sup> “[t]o date, SEIN research has not been substantial”;<sup>17</sup> “[t]he primary strategy for most SEIN research can best be described as bootstrapping”;<sup>18</sup> and “there is also a tendency for those who conduct research about the ethical dimensions of emerging technology to gravitate toward the more comfortable, even trivial questions involved, avoiding issues that might become a focus of conflict.”<sup>19</sup> (But, while he sets forth models for organizing and conducting NELSI/SEIN research,<sup>20</sup> unfortunately, he does not explicitly

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<sup>12</sup> Berube masterfully illustrates this point by asserting that:

[p]redicting the social and economic implications of emerging technology has proved to be a loser’s game,” then citing Erasmus Wilson’s erroneous conjecture that electric lighting would fail to catch on and John Von Neuman’s speculation that energy would be free; and repeating Lester Lave’s quote: ““When you introduce a new technology, it’s almost impossible to foresee what the consequences will be,”” thereafter noting the “incredible anecdotes usually told by hospital emergency room personnel” regarding unintended—and unintelligent—uses of sundry items.

*Id.* at 216, n. 27, n. 28 (citing CHRISTOPHER CERF & VICTOR S. NAVSKY, *THE EXPERTS SPEAK: THE DEFINITIVE COMPENDIUM OF AUTHORITATIVE MISINFORMATION*, x (1984)); *id.* at 276, n. 3 (quoting Lester Lave from Alan Leo, *Get Ready for Your Nano Future*, 3 *TECH. REV.* (May 4, 2001), available at [http://www.technologyreview.com/articleswo\\_leo050401.asp](http://www.technologyreview.com/articleswo_leo050401.asp) (hyperlink under “Get Ready for Your Nano Future”). See also, *infra*, n. 14 & accompanying text.

<sup>13</sup> *Id.* at 216. See also, *supra*, n. 13.

<sup>14</sup> *Id.* at 329.

<sup>15</sup> *Id.* at 330.

<sup>16</sup> *Id.* at 306.

<sup>17</sup> *Id.* at 317. In doing so, however, Berube acknowledges the low levels of funding for such research. *Id.* at 317-19 (reporting: “To date, SEIN research has not been substantial. Little has been published because SEIN research has been undertaken sparingly and *grant support has been underwhelming*.” (emphasis added); noting the failure to expend NNI funds earmarked for NELSI/SEIN research on such projects; and highlighting the problem of reconciling government funding reports to determine the exact amount actually spent on NELSI/SEIN research).

<sup>18</sup> *Id.* at 330.

<sup>19</sup> *Id.* at 320, n. 88 (*The Societal Implications of Nanotechnology: Hearings Before the H. Comm. on Sci.*, 108th Cong. (2003) (statement of Langdon Winner, Committee on Science in the House of Representatives).

<sup>20</sup> *Id.* at 333-34.

instruct those in the NELSI/SEIN arena about the issues on which they should focus their efforts.<sup>21</sup> Taken together, these rather disjointed assessments could lead a reader to the conclusion that Berube supports a “Miss Cleo-esque” or a “pin-the-tail-on-the-donkey” approach to evaluating nanotechnology through a NELSI/SEIN lens, which is most improbable for one as steeped in academia as Berube.<sup>22</sup>

Of particular interest to journal readers is another curious observation about the book, which frequently focuses on Berube’s SEIN. That particular observation is that SEIN seemingly avoids—either purposely or in the interest of maintaining a catchy acronym—making the “L,” the legal component of the traditional ELSI (*i.e.*, ethical, legal, and societal implications) concept, explicit. Berube directly incorporates only the societal (*i.e.*, the “S”) and the ethical (*i.e.*, the “E”) implications, which he defines as *including* “research by toxicologists, ethicists, and futurists into a range of issues from environmental impacts, *regulatory regimes*, workplace and economic dislocations, bionanotechnology convergence, and transhumanism and posthumanism.”<sup>23</sup> This avoidance is somewhat intriguing, as so much of today’s debate surrounding nanotech specifically revolves around the “L” of ELSI—or NELSI—in terms of the applicability of existing laws and regulations, and calls for new nano-specific legislation and regulation.<sup>24</sup>

*Nano-hype* has been criticized for not being a book about science.<sup>25</sup> In its defense, this criticism is entirely misguided. Writing a book about the science of nanotechnology was not Berube’s intent<sup>26</sup>—nor need it have been. The misconception is that books *addressing* nanotechnology must be *about* the

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<sup>21</sup> Rather, he provides his view that “SEIN encapsulates research by toxicologists, ethicists, and futurists into a range of issues from environmental impacts, regulatory regimes, workplace and economic dislocations, bionanotechnology convergence, and transhumanism and posthumanism.” *Id.* at 311. In addition, after devoting an entire chapter to nanotoxicology and nanohazards, he adds the disclaimer, “While the previous chapter seemed to indicate that environmental considerations are the only SEIN-related concerns, that is not my intention. On the contrary, there are a plethora of considerations, however there is limited time and space. Indeed, there are serious moral and ethical concerns with many nanorelated projects.” *Id.* at 333, n. 133 (citing B. Falconer, *Defense Research Agency Seeks to Create Supersoldiers*, NAT’L J. (Nov. 10, 2003), available at <http://www.govexec.com/dailyfed/1103/111003nj1.htm>).

Worth noting is that Berube’s SEIN does not explicitly acknowledge the legal implications of nano. *See* BERUBE at 26, n. 28; *id.* at 311. Yet, it is mentioned in passing, and he recognizes the lack of a regulatory framework for nanotechnology. *See id.* at 26, n. 28 (noting that SEIN “include[s] environment and safety, equity, and potential conflict of interest arising from the interactions among government, industry, and universities, and intellectual property ownership,” and citing W. Zhou, *Ethics of Nanobiology at the Frontline*, 19 SANTA CLARA COMPUTER & HIGH TECH. L. J. 485 (2003)); *id.* at 303; *id.* at 311 (stating that “SEIN encapsulates research by toxicologists, ethicists, and futurists into a range of issues from environmental impacts, regulatory regimes, workplace and economic dislocations, bionanotechnology convergence, and transhumanism and posthumanism”).

<sup>22</sup> *See, e.g.*, n. 5, 6, & accompanying text.

<sup>23</sup> BERUBE at 26, n. 28 (noting that SEIN “include[s] environment and safety, equity, and potential conflict of interest arising from the interactions among government, industry, and universities, and intellectual property ownership,” and citing W. Zhou, *Ethics of Nanobiology at the Frontline*, 19 SANTA CLARA COMPUTER & HIGH TECH. L. J. 485 (2003)) (emphasis added); *id.* at 311. Berube, however, does acknowledge the dearth of a regulatory framework for nanotechnology. *Id.* at 303.

<sup>24</sup> *See, e.g.*, International Center for Technology Assessment, Petition Requesting FDA Amend Its Regulations for Products Composed of Engineered Nanoparticles Generally and Sunscreen Drug Products Composed of Engineered Nanoparticles Specifically, No. \_\_\_\_\_, (FDA filed May 16, 2005), available at <http://www.icta.org/doc/Nano%20FDA%20petition%20final.pdf> (last visited May 22, 2006); FRIENDS OF THE EARTH, NANOMATERIALS, SUNSCREENS AND COSMETICS: SMALL INGREDIENTS, BIG RISKS (2006), available at <http://www.foe.org/camps/comm/nanotech/nanocosmetics.pdf>; J. CLARENCE DAVIES, MANAGING THE EFFECTS OF NANOTECHNOLOGY (2006), available at [www.nanotechproject.org/file\\_download/30](http://www.nanotechproject.org/file_download/30). It should be noted that, while these reports post-date the book’s release, the legal and regulatory questions surrounding nano are not novel. *See also* n. 24.

<sup>25</sup> *Soft Machines: Thoughts on the Future of Nanotechnology from Richard Jones, More about Nanohype*, (Feb. 13, 2006), available at <http://www.softmachines.org/workpress/?p=204> (last visited Mar. 31, 2006) (stating “one thing [the book] is *not* about is science” (emphasis in original)).

<sup>26</sup> *See id.* (Berube’s response).

science, itself—implying that books concerning science policy, science ethics, or science perception have no value. Such a wrong-headed perspective advances the dysfunction of democratic society that was cautioned against by Berube: “Some experts warn that if support for science falters and if the American public loses interest in it, such apathy may foster an age in which scientific elites ignore the public weal and global imperatives for their own narrow interests, producing something like a dictatorship of the lab coats.”<sup>27</sup>

If only the science at the core of this technology mattered, then it is doubtful that the U.S. government, through the National Nanotechnology Initiative (“NNI”), and nanobusiness would be so concerned about the public acceptance of the technology. Without such concern, there would be no reason even to mention NELSI/SEIN in discussions about nanotechnology—let alone to fund it.

Berube raises these arguments throughout the book. For example, he explains:

The undertext of SEIN research, at least as conceptualized by the US government, is based on the fear that misinformation or the absence of any information on SEIN will threaten the momentum of nanotechnology, as an industry, a national initiative, and a movement. “The NNI implementation plan recognizes that the societal implications of nanotechnology must be taken into account so as to ensure that technical advances will be adopted.”<sup>28</sup>

Even so, Berube comes out swinging against the NNI’s approach to NELSI/SEIN, stating: “The primary directive [of SEIN] activity [under the NNI] is ‘to promote a new generation of skilled workers.’”<sup>29</sup> He goes further—calling out the U.S. government on its low level of funding for NELSI/SEIN research, the “hide-the-ball” approach to reporting such funding, and the rather questionable mechanisms for providing this funding.<sup>30</sup>

### III. CONCLUSIONS

*Nano-hype: The Truth Behind the Nanotechnology Buzz* will be of interest to journal readers, because it is written for those in “the nano know” due to its comprehensiveness, its level of detail, and its witty review of nanotechnology’s brief history. Although it is not a book on nanoscale science or, for that matter, nano-related law, it puts many of the key concerns within the nanosphere squarely on the table. By doing so, perhaps Berube will serve as a nanomuckracker of sorts—motivating those public and private players in the nanotechnology sandbox to address these issues, whether out of a sense of duty or

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<sup>27</sup> BERUBE at 305, n. 3 (quoting W.J. Broad & J. Glanz, *Does Science Matter?*, N.Y. TIMES, Nov. 11, 2003, at D1).

<sup>28</sup> *Id.* at 307, n. 12 (quoting Nat’l Academy of Sciences, *Preliminary Comments, Review of the National Nanotechnology Initiative*, 7 (2001)).

<sup>29</sup> *Id.* at 317 (quoting an NNI press release). *See also, id.* at 322 (stating: “There have been many NSF awards on societal implications according to Roco. While meritorious, some seem less concerned with fundamental societal and ethical concerns and are only loosely categorized as SEIN projects.”). This is the case, despite the fact that NELSI/SEIN initiatives are called for in the 21<sup>st</sup> Century Nanotechnology Research and Development Act and are part of the core goals of the NNI. *See id.* at 125-35, 317-19.

<sup>30</sup> *See, e.g., id.* at 317-19 (reporting: “To date, SEIN research has not been substantial. Little has been published because SEIN research has been undertaken sparingly and *grant support has been underwhelming.*” (emphasis added); noting the early failure to expend NNI funds earmarked for NELSI/SEIN research on such projects; and highlighting the problem of reconciling government funding reports to determine the exact amount actually spent on NELSI/SEIN research); *id.* at 322 (stating: “There have been many NSF awards on societal implications according to Roco. While meritorious, some seem less concerned with fundamental societal and ethical concerns and are only loosely categorized as SEIN projects.”); *id.* at 323-24 (lambasting the NSF for the creation of an “informal bifurcated network” rather than a consolidated NSEC dedicated to NELSI/SEIN, as is called for in the 21<sup>st</sup> Century Nanotechnology Research and Development Act).

one of embarrassment. But, if nothing else, Berube's *Nano-hype* promises to be viewed as one of the best-referenced resources for—almost—all things nano.

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