



October 27, 2026

Expert Review Report

To: IEEE History Committee

Subject: Discovery of Carbon Nanotubes for Electronics, 1991

I reviewed the proposal with particular attention to the materials nanotechnology significance of the 1991 discovery. My responses to the Reviewers' Checklist follow.

*1. Is the suggested wording of the Plaque Citation accurate?*

Yes. The citation accurately describes the identification of carbon nanotubes by Sumio Iijima at NEC and the connection to carbon produced by arc-discharge experiments at Meijo University. It summarizes the materials significance, an unusual nanoscale structure with distinctive physical properties, and its subsequent influence on electronics. The distinction between the 1991 structural discovery and later device development is consistent with Historical Significance, "Discovery of a New Nanoscale Carbon Structure" and "Emergence of Carbon Nanotubes as Electronic Devices."

*2. Is evidence presented in the proposal of sufficient substance and accuracy to support the Plaque Citation?*

Yes. The proposal grounds the discovery in Iijima's 1991 Nature paper, "Helical micro-tubules of graphitic carbon" [1], and describes the observed concentric graphitic cylinders in Historical Significance, "Discovery of a New Nanoscale Carbon Structure." The cited follow-up papers on nanotube structure, growth, and single-walled nanotubes [2], [3], [6], [7] document the successive development of the research by Iijima and coworkers. The Appendix provides additional context about the carbon specimen and its origin. Together, these materials support both the observation and the historical significance claimed in the citation.

*3. Does the proposed milestone represent a significant technical achievement?*

Yes. The identification of multi-walled carbon nanotubes established a previously unrecognized nanoscale carbon structure: concentric graphitic shells with nanometer-scale diameters. From a materials nanotechnology perspective, the achievement was consequential because it made a new, structurally defined form of carbon available for study and later synthesis, characterization, and application. As described in Historical Significance, "From Carbon Structure to Electrical Properties," nanotube properties were subsequently linked to nanoscale structure, including diameter and atomic arrangement (chirality). This helped establish carbon nanotubes as a

platform for investigating how structure at the nanoscale determines material behavior.

*4. Were there similar or competing achievements? If so, have the proposers adequately described these and their relationship to the proposed achievement?*

Yes. The proposal discusses prior carbon materials work, including Morinobu Endo's early research on vapor grown carbon fibers [9,10,11]. Then it specifically cites Howard G. Tennent's 1987 report of carbon nanofibers [13] in "What features set this work apart from similar achievements?" It explains the distinction between earlier reports of carbon fibers and the 1991 identification of concentric graphitic cylinders as a nanotube structure. This comparison places the discovery in its materials-science context and clarifies the specific contribution recognized by the proposed milestone.

*5. Have the proposers shown a clear benefit to humanity?*

Yes. The proposal demonstrates a clear benefit through the discovery's lasting contribution to materials science and nanotechnology. Historical Significance, "A New Direction in Nanoelectronics" describes how the discovery stimulated research into nanotube transistors, interconnects, sensors, and electromechanical devices. More broadly, the milestone marks the emergence of a new materials platform for exploring how nanoscale structure can yield useful electrical, mechanical, and thermal properties. The proposal appropriately presents this as a foundation for continuing research and technological development.

*6. Are the supporting reference texts credible? Are there any important references missing?*

Yes, the supporting reference texts are credible, including Iijima's 1991 Nature report [1] and contemporaneous follow-up papers on nanotube structure and growth [2], [3], [6], [7]. These sources are particularly suitable for establishing the material's identification and the early development of the field. The proposal also provides historical context in the Appendix.

And no important references are found missing. The discussion refers to Endo's early reports on "vapor grown carbon fibers" in 1976 [9], 1983 [10], and 1988 [11], Tennent's patent on "carbon fibrils" in 1987 [13], and later device demonstrations. The primary sources presented for the 1991 discovery are credible and provide a sound basis for the milestone.

*7. If personal names are included in the plaque citation, has the proposer demonstrated that the criteria for name inclusion have been met?*

Yes. The proposal's "Alignment with IEEE Milestone Criteria for Name Inclusion" and "Justification of name-in-citation" explain Iijima's role in identifying and reporting the multi-walled nanotube structure. The Appendix also records the specimen's provenance and acknowledges Yoshinori Ando's contribution in providing the carbon specimens. On the evidence presented, naming Iijima recognizes his specific role in the structural identification while retaining the broader materials context in the historical account.

In conclusion, the identification of carbon nanotubes in 1991 was a significant achievement in materials nanotechnology. It established a new nanoscale carbon structure for investigation and helped initiate a global research trajectory linking atomic-scale structure to material properties and device possibilities. I strongly recommend the proposal for recognition as an IEEE Milestone.

Yours sincerely,

A handwritten signature in black ink, reading "Suguru Noda". The signature is fluid and cursive, with the first name "Suguru" and the last name "Noda" clearly distinguishable.

Suguru NODA Ph.D

Professor, Department of Applied Chemistry, Waseda

University 3-4-1 Okubo, Shinjuku-ku, Tokyo 169-8555, Japan