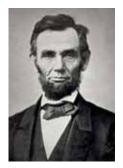# InFocus | *The Structure of Reason*

By Jon A. Schmidt, P.E., SECB

Abraham Lincoln is widely regarded as one of the most eloquent and persuasive speakers in American history. What was the secret of his success?

Many scholars over the last 150 years have sought to answer this question. It was not some kind of special training; in fact, he was almost entirely self-educated, having received only a year (at most) of formal schooling. It was certainly not his style of delivery or any unusual charisma that he possessed; on the contrary, firsthand observers typically characterized his appearance and manner as somewhat awkward, and his voice as high-pitched and even unpleasant.

A new book, *Abraham Lincoln and the Structure of Reason* (New York: Savas Beatie, 2010), purports to unlock this mystery. The authors – David Hirsch, an Iowa attorney, and Dan Van Haften, an Illinois engineer who also has degrees in mathematics – posit that Lincoln ingeniously adapted the classical format of a geometrical demonstration to language. They cite what he once told a friend: "At last I said to myself, 'Lincoln, you can never make a lawyer if you do not know what "demonstrate" means,' and so I worked until I could give any proposition of the six books of Euclid at sight."

Hirsch and Van Haften quote a commentary on Euclid by Proclus, a fifth-century Greek philosopher, to define the six elements of a proposition:

1) The **enunciation** states what is given and what is being sought from it.
2) The **exposition** takes separately what is given and prepares it in advance for use in the investigation.
3) The **specification** takes separately the thing that is sought and makes clear precisely what it is.
4) The **construction** adds what is lacking in the given for finding what is sought.
5) The **proof** draws the proposed inference by reasoning scientifically from the propositions that have been admitted.
6) The **conclusion** reverts to the enunciation, confirming what has been proved.

They then identify eight principles for transferring Euclid's approach:

1) The elements of a proposition build sequentially.
2) Although one may work to make both the learning process and demonstrations as short as possible, they abide no shortcuts.
3) Axioms must be clearly understood.
4) Many steps are small, but all are necessary; none can be skipped.
5) The fewer the steps, the more elegant the demonstration.
6) Although many steps are simple, occasionally dramatic or creative steps must be made.
7) Each step must be precisely stated so that the demonstration is understandable and correct.
8) When the conclusion of a proposition is stated, the demonstration is complete, and further words generally are counterproductive.

Finally, the authors provide some additional guidelines for those who wish to emulate Lincoln's method:

- Enunciation – begin by reciting relevant, assumed, non-controversial facts.
- Exposition – present key, high-level background information.
- Specification – make a clear affirmative statement of the proposition to be proved.
- Construction – marshal the evidence that the investigation has produced.
- Proof – lay out a straightforward case, avoiding argumentative language until this stage.
- Conclusion – restate what is proved concisely and forcefully.

The book contains an extensive collection of Lincoln's speeches and writings, which Hirsch and Van Haften have "demarcated" – that is, subdivided into the six elements of a proposition. These include not only famous examples like "A House Divided," the Gettysburg Address (**www.thestructureofreason.com/the-gettysburg-address/the-gettysburg-address-demarcated**), and the Second Inaugural, but also lesser-known works and numerous letters. The authors thus provide compelling illustrations showing that this was indeed Lincoln's own methodology, whether he was explicitly conscious of it or not.

Abraham Lincoln "found out what 'demonstrate' meant" from Euclid and cleverly applied that knowledge to achieve an unparalleled clarity of expression that more than compensated for his perceived lack of rhetorical gifts. He was eloquent and persuasive because the structure of his presentations closely matched the structure of reason.▪

The Reasoning of Structural Engineers?

As I have written previously ("Engineering as Willing," March 2010), I believe that engineering is more intentional than rational, since it routinely involves selecting a way forward from among multiple options when there is no one "right" answer. Even so, I see parallels between the Euclidean elements of a proposition and what William Addis calls a design procedure ("The Nature of Theory and Design," May 2009). For the enunciation, exposition, and specification, the client requirements, applicable codes and standards, and time and cost constraints constitute the given, and the completed project is what is being sought. The construction is the engineer's artful development of a suitable model, and the proof is the deterministic analysis showing that the structure will provide adequate strength and serviceability (justification). The conclusion is what is conveyed in the contract documents (description).

Join the Conversation

The SEI Engineering Philosophy Committee is meeting and sponsoring a session on "Demarcating the Profession: Where Should We Draw the Line?" at the 2012 Structures Congress in Chicago. For more information, please contact the author.

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