Reflections on Victor de Mello, Friend, Engineer and Philosopher

By

Professor John Burland
“Beware of Greeks bearing gifts”

“Beware of Geeks bearing gifts”
“I excuse myself for repeating my own earlier work (4th Panamerican Conference - 1971): I would have been quite satisfied if the authors had quoted it as a reference and had curtly stated their disagreement with such and such. I am sure that there is much room for disapproving and correcting some of my preliminary claims; but, since they were offered with the best of intentions and were aimed at avoiding unnecessary effort and pitfalls, the thing that I find quite disconcerting is that four years can pass without agreement or contestation but only a disparaging silence”!
At the 1965 Montreal Conference:

“I took the liberty to submit a discussion decrying the introduction of mechanistic practices that would wipe out the painstaking gains of the fundamental principle of Soil Mechanics of requiring first the determination of the nature (classification) of the soil type by direct sampling, and not by indirect inference”.
Victor’s introduction to key-note address – 6th African Regional Conference

The primordial precedence of values:
Human being 1st; engineer 2nd; specialist 3rd

“But I am compelled to state, right from the start, that in my experience it is principally in the connection between Soil Mechanics and the overall field of Civil Engineering, and in our obligations as members of society, that the greatest challenge and chances of creative vision beckon us and lead us forward”
“If a geologist declares that at a given site the joints strike unfavourably in an upstream-down-stream direction and tend to open to a significant depths, and therefore the site should be abandoned; as a Civil Engineer I would say:

• accept the first part of the statement, as the information comes from the appropriate source,
• challenge it ("so what") to the point of requiring and achieving some quantification, and
• as regards the concluding affirmative, do not hesitate to say "ne sutor ultra crepidam" - the consequence and decision are part of an overall Civil Engineering optimization, and should be so assessed.
Paraibuna Dam and suggested optimised section
At Bishop Cotton Boys’ School, Bangalore
Kothavala Cup in recognition of Best All-rounder
17th June 1946 – MIT Graduation with the BSc degree
Selected photographs of Victor including Casagrande and Terzaghi?
At the Paranoa Dam site - 1960
Victor with his Father, Indalencio Froilano
Examples of word play

• “We need not look for new tasks, but merely look at the tasks newly” – de Mello (1969)
• “.. I may be described as specializing in being a practising generalist” – de Mello (1977)
• “Water has an unfortunate habit of seeping through every theory”
• “Choose your love and love your choice” – de Mello (1985)
BRITISH GEOTECHNICAL SOCIETY
The British National Section of the International Society for Soil Mechanics and Foundation Engineering

THE SEVENTEENTH RANKINE LECTURE

REFLECTIONS ON DESIGN DECISIONS OF PRACTICAL SIGNIFICANCE TO EMBANKMENT DAMS

PROFESSOR VICTOR F. B. DE MELLO
ISSMFE Vice-President for South America
The oath of the Horatii
“Our ability to predict what will happen is poor compared to our ability to predict what will not happen”
Golder, 1971

“Any design that relies for its success on a precise calculation is a BAD design”.
• What load is carried by each leg?
• What load should each leg be designed to carry? This question is profoundly influenced by the brittleness of the material and the fitness for purpose
Ductility and Robustness

- **Ductility:**
  “The ability to undergo inelastic deformations without significant loss of strength”

- **Robustness:**
  “The ability to absorb damage without collapse”
The boundary conditions are often unknown and unknowable.
Fragile (brittle) Behaviour
Robust Behaviour
Heyman’s conclusion on Hambly’s Paradox:

- Hambly’s four-legged stool stands for the general problem of design of any redundant structure.

- To calculate the ‘actual’ state, all three of the basic structural statements must be made - equilibrium, material properties and deformation.

- *Calculations do not in fact lead to a description of the actual state.*
  - Boundary conditions are often unknown and unknowable
  - An imperfection in assembly, or a small settlement of a footing, will lead to a state completely different from that calculated

- *This is not a fault of the calculations, whether elastic or not, it is a result of the behaviour of the real structure.*

- There is no correct solution, but there is one that will lead to the greatest economy of materials - provided there is no inherent instability.

Heyman (1996)
Checklist of Design Principles

Design Principle 1: Force
- Statistics of averages, to exclude
  - Extreme occurrences
    - Induced
      - Random occasional
        - With deterioration
          - Likely or possible
            - With potential stabilization

Within admissible statistics of averages

Design Principle 2: Use dominant feature to cut across variabilities of the statistical universe

Design Principle 3: Notwithstanding, design 2 entice integration of effects and cumulative cooperation within the said universe

Design Principle 4: Minimize untimely, uncontrollable, major and rapid, changes of condition towards problems of consequence

Design Principle 5: For every behaviour desired and assumed, check what happens, of consequence, if it is not successful
Generalisation of the Five Design Principles

DP1 Aim to ‘design out’ any risk from behaviour triggered by local phenomena e.g. piping; tension cracking; internal erosion ROBUSTNESS

DP2 Use a dominant feature to cut-across uncertainties e.g. full-height chimney filter drain; downstream drainage blanket CHANGE THE PROBLEM

DP3 Aim at homogenization e.g. long seepage paths; single well-graded filter transitions REDUNDANCY

DP4 Minimise rapid uncontrolled loading. Use pre-loading e.g. by permitting high construction pore-pressures OBSERVATIONAL CONTROL

DP5 Ask ‘what if’ questions of each design decision e.g. what happens if the permeability is 10 times different? ASK ‘WHAT IF’ QUESTIONS
Arab Proverb

• He who knows not, and knows not that he knows not - he is a fool, shun him.
• He who knows not, and knows that he knows not - he is simple, teach him.
• He who knows, and knows not that he knows - he is asleep, wake him.
• He who knows, and knows that he knows - he is wise, follow him.
Victor’s modification to the Arab proverb

• *He who knows, and knows that he knows* - *he is insufferable, use him.*

• *He who knows, and knows that he knows not* – *he is wise, follow him*
1980 in São Paulo
1980 in Rio de Janeiro

Victor, Maria Luiza and Lucia
The Tietê River tunnel crossing

Fig. 10 - Tietê River Crossing: Geological Profile
April 1981
River Tietê tunnel crossing, São Paulo
April 1981, in Guaruja
17th June 1946 – MIT Graduation with the BSc degree
“Indeed, we embrace a profession in order to better fulfil ourselves as human and social beings. Within our profession of civil engineering we delve into a specialisation in order to better fulfil ourselves as professionals: we may even need to restrict ourselves within geotechnique to a subspecialisation, but only in order to further fulfil ourselves within our calling as human beings. Let us never lose sight of the order of priorities in such allegiance, since specialisations are meant for the betterment of Society, through us and despite our deficiencies, and never to the detriment of our fulfilment as world citizens. Geotechnical Engineering is of service to all civil engineering.”
With the President’s gavel
September 1983, with Luiz Guilherme
August 1985, San Francisco Conference
Checking through the Statutes
Friday 9th August 1985

Victor Presiding at the Executive Committee meeting

Executive Committee in Session

The new Statutes approved
At Victor’s Presidential Address
“When faced with a problem of high ratio of responsibility to feasibility, it is not in better analytical work that engineers seek solutions, but rather in different statistical universes in order to set aside quite definitely the possible histogram of degrees of undesirable behaviour.” Design Principle 2?

“Have you not often woken up in the middle of the night with a flash of a brilliant solution to a problem that only becomes fuzzy during the day? If you are somewhat uncertain of being awake, I am with you: In the figure it does become certain that dreams and nightmares intermingle, requiring careful selection.”
“I submit that the most important question facing the geotechnical engineer is for him to reassume a position as the foundation instrument of every civil engineering orchestra, and for the civil engineer himself to reassume his position as the most influential element of human society in affecting the environment.”
1985, at the Guavio dam site
May 1986, at the Borde Seco dam site, Venezuela
17 February 1995, Victor and Maria marry
June, 1995. In Pisa
“In my final times in this life I can assure you that one can reach other levels of reality and consciousness and open oneself to dimensions not accessed by our rationality, no matter how brilliant it might be; and the expression of Good, Beauty and Truth is in them.”
“Earth’s crammed with heaven
And every common bush is afire with God
But only he who sees takes off his shoes
The rest sit around and pick blackberries”

Elizabeth Barrett Browning