Some Personal Reflections About ISLSCP, FIFE & BOREAS

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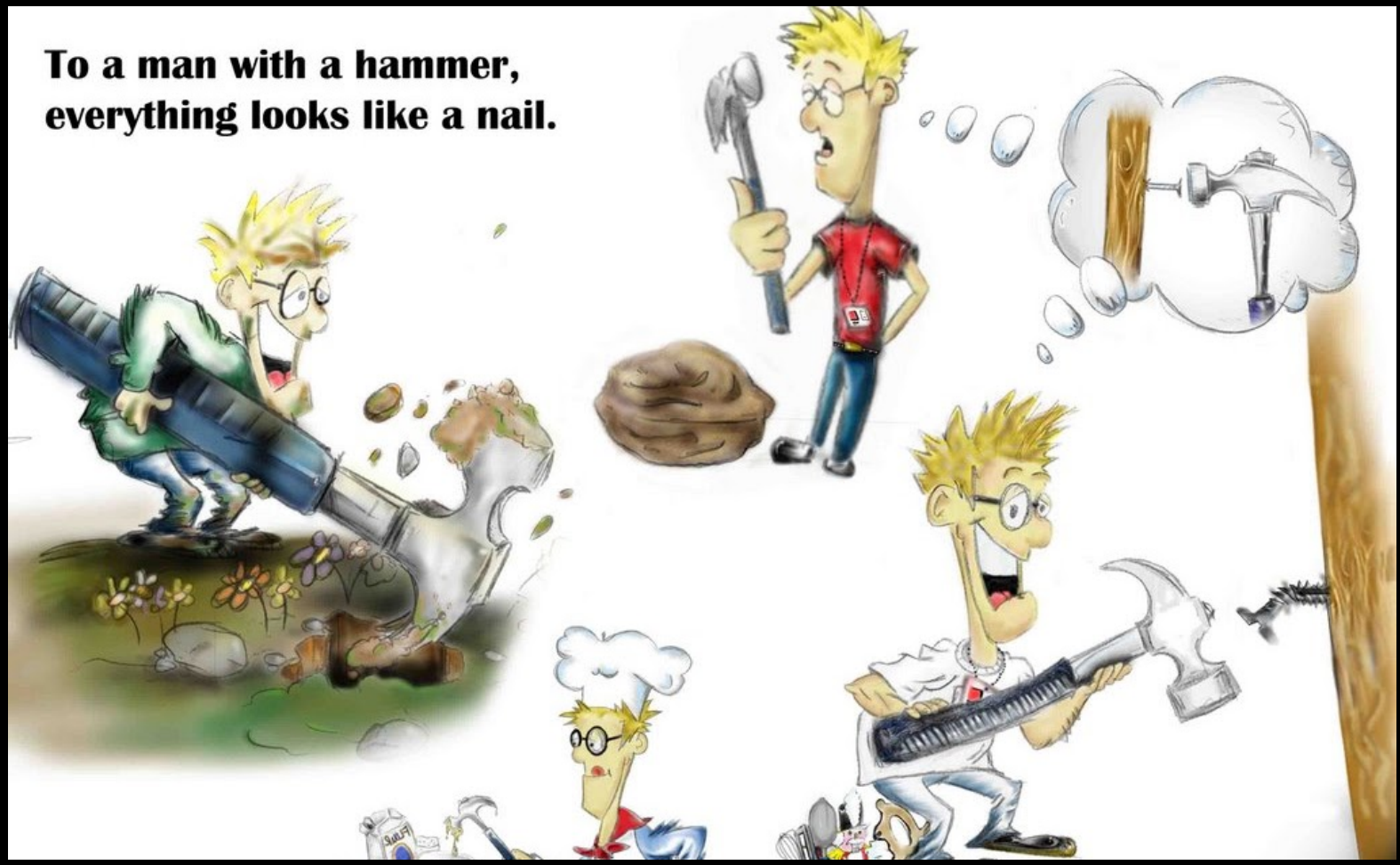
Slightly Satirical Insight into NASA Motivations



Pre-History I

- In 1977 NASA began planning for a program of climate studies
  - It was initiated by Ichtiaque Rasool, the Chief Scientist at NASA HQ
  - Planning was led by Andy Ingersoll, a planetary scientist at Cal Tech
  - The working group was populated by meteorologists, planetary scientists, atmospheric chemists & cryospheric scientists
    - Only one member, Jim Hansen of GISS, had thought of (or was beginning to think about) the biosphere
    - The supporting task force of NASA scientists included only one member, Vince Salomonson, who actually worked with the biosphere
- In 1979 NASA began a large applications-oriented program to determine agricultural productivity (especially in the USSR) known as AgRISTARS/LACIE
  - There were *no significant interactions* between the AgRISTARS and climate programs

Pre-History II

- The “Proposed NASA Contribution to the Climate Program” served as an effective blueprint for NASA’s climate program into the early 80’s
  - Key missions and research priorities were followed
- The atmospheric chemistry program grew in parallel with the climate program
- The AgRISTARS program grew to $35,000,000 per year and then collapsed to $5,000,000
- Shelby Tilford led the consolidation into a single program that evolved to what was variously known as “Global Habitability”, Global Change” and “Mission to Planet Earth” in the middle 80’s
  - The remnants of the AgRISTARS program were incorporated into Shelby’s program and *the search for scientific relevance began*

Tid-bits from the NASA Climate Plan (1977)

- An improved understanding of the biosphere-atmosphere-ocean is needed to permit reliable projections of man's impact on the atmosphere
- "The size of the biomass, measured in terms of biospheric carbon, should be determined to within at least a factor of 2."
- "Observations to define *relative* changes in the biospheric carbon to an accuracy on the order of 1 percent per year are highly desirable."
- "Satellite observations of vegetation cover are relevant to measuring the biomass."
- "One of the tasks in the climate program should be to obtain an improved specification of observational requirements (of vegetation cover) from the relevant research community, and to analyze the potential contributions of space measurements."

Tid-bits from the NASA Climate Plan (1977)

- Evapotranspiration & plant water stress measurements are needed
  - L-band soil measurements are not deep enough; SAR observations or longer wavelength passive systems need to be investigated
  - It appears that plant stress may be able to be measured by the spectral signature of the plant or by the plants temperature relative to the air temperature
- Land albedo is needed on a 50 km grid (monthly average) to an accuracy of 0.03. Landsat is satisfactory for this.
- Root zone soil moisture on a 500 km grid (monthly average) at 4 levels can be partly met with planned systems (SMMR)
- Vegetation cover (non-forest) on a 500 km grid (monthly average) and an accuracy of 5% (of what??) can be met with Landsat and the NOAA series.
  - They pushed for the addition of the 0.8 – 1.1 channel that actually flew
- Plant water stress on a 500 km grid (monthly average) into stressed vs not stressed categories cannot be measured with any planned systems

Summary (So Far)

- In 1977 there was no NASA biospheric sciences community
- In 1977 there was no such thing as the vegetation index
- A few intrepid souls - Vince Salomonson, Jim Hansen, and Ichtiaque Rasool – emplaced a rudimentary set of requirements into NASA planning
- Some of the assessments were hopelessly optimistic; none were unreasonably pessimistic
- The budget for the land biosphere had fallen from 35M$ to 5 M$ and the community had been largely dispersed
- Ten years later we were actually doing FIFE and thinking about BOREAS
- *How did we get there?*

Some Steps Along the Way I

- In the early 80's, Jim Tucker of NASA Goddard and his colleagues were initialing global scale studies of biomass dynamics hinted at in the NASA plan of 1977
- In 1981 I *temporarily* left the planetary program to take a one year developmental assignment in NASA's Earth Applications program
- The Earth Resources Branch had an incredibly bright crew of young *applications specialists*, some of whom were destined to become great *scientists*
- NASA's program was built around the "new hammer" model, but I sensed that their work, especially Tucker's could be the basis of actual science – but I was unable to connect the dots
- Young Piers Sellers arrived at Goddard as an NRC Post-Doc with ambitious plans using "SiB" in GCMs and ideas about necessary field experiments

Some Steps Along the Way II

- In 1983 Ichtiaque Rasool (remember him) and Hans-Jürgen Bolle proposed a linkage between the biosphere and the climate system through the "International Satellite Land Surface Climatology Project" (ISLSCP)
  - Key idea: Study the land biosphere in terms of its relevance to the climate program.
  - The need for "vegetation cover" was quantified and specified in terms of its impact on the surface energy budget at 10 w/m^2 for a 50 km grid cell.
  - The climate guys (who represented the intellectual trustees of the NASA program) understood this, and once you could show that biological processes were controlling *their* energy budget, the space-based biospheric sciences had a home in a larger scientific complex
- When I received an invitation and agenda from Ichtiaque to a workshop in Boulder, I felt as though I had been handed the Rosetta stone!
- Ichtiaque was the true godfather of the land-biosphere – atmosphere program
- Piers was the man with the ability to make Ichtiaque's concept a reality
- We had no power, no budget and a disinterested program manager at HQ

Some Steps Along the Way III

- Rasool found money for Piers and me to attend a confab in Hamburg to unite the European plans (formulated at Innsbruck) and the American plans
  - Francoise Becker & Piers fleshed out field experiment plans
- Piers & I bypassed our HQ manager & pitched the idea directly to Shelby Tilford & Bob Watson
  - We received 15K$ to conduct a couple of workshop to flesh out the ideas
- The original planning workshops were as exciting as was Rasool's Boulder workshop

Some Steps Along the Way IV

- With the final collapse of AgRISTARS we (Goddard) had the opportunity to bring some JSC civil servants here. My number one draft pick was Forrest Hall
  - Another winner!
- In 1985 I moved to HQ and began to re-shape the rubble of AgriSTARS into a program that could do real science
- I recruited Diane Wickland – the first ecologist in NASA - the best hiring I ever did

Some Steps Along the Way V

- Finding a hydrology & remote sensing scientist lead took a bit longer
- Sam Goward did th e job part time for a couple of years
- Jeff Dozier came for 6 months
  - Bet you didn't know he was once a NASA HQ weenie!)
- Sharon Nicholson came in for FIFE selection
  - She managed the peer review process and guided me through the selection of winners
- After FIFE 87 Ghassem Asrar responded to my plea for a longer term (2-year) visiting scientist
  - I turned him down – wanted him to remain a productive scientist!
  - Obviously, I changed my mind. Another Great hire!

Things Happened!

- We participated in HAPEX MoBiLHy in France in 1986
- Next came FIFE 87
- KUREX 88 (which is how we got the money for …)
- FIFE 89
- HAPEX Sahel
- BOREAS
- LBA

The Proof is in the Pudding!

- EOS Interdisciplinary Scientists were the prestige positions for non-instrument builders
- The land-biosphere community, which did not exist in 1983, provided ¼ of the IDS teams

EOS IDS Investigators

Getulio Batista/Jeff Richie
Josef Cihlar*
Robert Dickinson
Jeff Dozier*
Yann Kerr/Saroosh Sorooshian
Berrien Moore
David Schimel*
Piers Sellers*

* Participant in FIFE/BOREAS

Did FIFE & BOREAS Change the World?

- You bet!
- Great scientific advances were made
- Many of the scientific findings have been brought into practical use in forecast models & are feeding our understanding of crucial environmental problems
- A scientific community has been formed that did not exist 35 years ago