All Scientists Meeting 9/25-30, 1990 {Speech outlines by John Porter, VCR}

A. Jerry Franklin - past present and future
    1. Past
        a) before LTER - no mechanism for long-term funding
        b) 1979 -RFP for LTER
    2. Present
        a) 18 sites
        b) common features
            1) core topics
        c) LTER is more than the sum of the parts - NETWORK
            1) development proceded slowly
            2) NSF provided motivation
        d) Goals
            1) Identify and understand ecological phenomena which occur over longer temporal and spatial scales
            2) major synthetic and theoretial efforts
            3) info. to society
            4) create legacy of long-term experiments
                a> well documented and designed
        e) Actions
            1) standardize data management
                a> MSI
                b> measuring techniques
                    1> climate
                    2> more being developed eg. tree population studies
                c> parameters and dimensions (GIS)
            2) Communiation and data sharing
                a> core dataset catalog
                b> on-line datasets (protocols)
                    1> for each of the sites
                    2> still controversial
                    3> proprietary issues
                c> question-driven pooled datasets
                d> electronic networking
            3) Tech. Inovation
                a> remote imagery
                b> shared tech. (geo-locator)
                c> cranes in forest
            4) multi-site research and synthesis
                a> individual lead
                b> multi-site experiments
                    1> common litter decomposition experiment
                c> identify network research priorities
                    1> global change
                        a: identified 12 activities
                        b: went outside LTER for 25 sites
                    2> What do we want to do about global change?
                        a: soil warming experiment
            5) integration with larger ecological community
                a> integrate population and community level work
                b> extended network
                    1> provide network services to other groups
                        a: linking with other domestic networks
                    2> within biome
                        a: need to fill in gaps
                    3> additional LTERs
                        a: possibly as many as 4-6 sites
                    4> international networks
    3. Potential of Network
        a) need to move beyond traditional paradigms
        b) COLLABORATION

        - c) networking is hard work -- move beyond traditional individual perspectives
- B. Mary Klutter - NSF issues
    - 1. Presures on scientists and the government
    - 2. Increasingly bitter battle for increasingly scarce resources
    - 3. Fed. Budget
        - a) entitlements biggest part
        - b) intrest increasing
        - c) defense declining
        - d) "all other" shrinking
            - 1) S&L bailout
            - 2) science programs
    - 4. Science budget
        - a) space station 25-30 billion
        - b) superconducting supercollider
        - c) facilities 8-9 bil.
        - d) AIDS research 3 billion/year
        - e) Human genome research - 3 bill.
        - f) doubling NSF 3 bill.
    - 5. NSF is 3% of total R&D and 16% of basic research
        - a) NIH is big in basic research
        - b) DOD big in total research
        - c) NSF is 25% of basic research at universities
        - d) Life sciences 57% of basic research -- largely medical at NIH -- breakdown of life sciences:
            - 1) NIH is 80%
            - 2) NSF is 10%
            - 3) All others
        - e) Environmental Sci. 8%
            - 1) doesn't include biology
        - f) BBS roles
            - 1) anthropology 95%
            - 2) environmental biology 75% funded by NSF only about 75 million total
            - 3) social sciences
            - 4) plant biology 115 million
    - 6. During 1980's
        - a) BBS budget -- only in 2 years got more than requested. 84-85 only years where requested amount was about requested amount
        - b) competitive success rates declined from 32% to 28%
            - 1) varies by program from 10% to 28%
            - 2) BSR individuals 37% -> 23% success
        - c) about 80% went to individual investigators (vs centers, LTER etc.) 27% went to new investigators
    - 7. 1991 request
        - a) doubling proposed
        - b) if request funded, research has 14% increase
        - c) new antarctic LTER supported out of US Antarctic program
            - 1) may be having RFP for additional antarctic LTER
        - d) science education up 23%
        - e) we will probably not get full request of 34 million
    - 8. Summary
        - a) living in the NIH shadow
        - b) Global change deemphasizes biology
            - 1) fixit committees -- federal wide planning process for any priority areas eg. high performance computing (note, biology is positioned to take advantage of these), global change, materials research (much biomolecular)
        - c) NSF/BBS seen as "safety net" for people unsuccessful at NIH
        - d) Relationship to an Nat. Inst. for Environment

        1) not known if it will pass to create NIE
        2) low probability of creating new buerocracy
    e) Walgren Brown bill- for creating new directorate in NSF for biology
        1) pulling apart existing programs may not create more money
9. BBS activities
    a) hard choices will be made
    b) analysis of structure of BBS
        1) blue-ribbon task force
            a> 2 major working groups
            b> Judy Myer chair of biological working group
            c> report due on April 1
            d> won't occur until 1993
        2) need to see if there are other ways of doing things
        3) need to do things to get out of NIH shadow
10. Questions
    a) impact of Gram-Ruddman sequester
        1) under Gram-Ruddman, up to 38% reduction 1990 in NSF budget would mean all funds already committed. Continuing projects will only get 50% of funds, at least initially. New projects will be reviewed, but it is not known when they will be funded
    b) given all biologists on Global change committee -- why no money for biology
        1) biology less organized than geosciences -- over 200 separate societies
        2) can be modified in future

C. Caroline Bledsoe - Scientific Networking
1. Interest in global change which has driven activities
2. Rapid formation of integrated groups -- networks to look at global change
3. LTER network
    a) wants to see what we choose to do
    b) balance of structure vs the "doing" of science
4. Why Network
    a) big scientific questions
    b) network resources
    c) synthesis using wider array of information for the network
5. LTER network
    a) what has LTER done?
        1) individual sites
        2) CC/meetings 2 times per year
        3) EXEC committee 4xyear
        4) LTER network office 2 people -> 5 people
        5) Workshops
            a> modeling
            b> GIS
            c> roots
            d> remote sensing
            e> Wide Area Networks
            f> decomposition
            g> stable isotopes
            h> tree mortality
            i> variability
            j> global change
        6) Connected -- Shared e-mail system and address standard
            a> gateways to other networks
                1> DOE
                2> forest service
                3> Omnet

          4> LMER
        b> mail usage increasing rapidly -- over 400 users
        c> bulletin board coming online
      7) Strategic Plan
  6. LTER in US
    a) Other nets
      1) Parknet DOE
      2) Forest service
      3) Nat. Park Service
      4) EPA EMAP (Environ. Monitor/Assess Program)
      5) MAB biosphere reserve network
      6) USGS WEBB
      7) Arctic research
        a> ARCSS-- arctic system science program
        b> ALERT -- gradient analysis -- arctic research transects
    b) CEES Committee on earth and environmental sciences
    c) Global change plan
      1) focuses on atmospheric
      2) are places for ecology
    d) Global change action plan from LTER
  7. LTER in International
    a) National Programs
      1) TIGER -- Terrestrial Initiative in Global Environ. Res. -- British program
        a> carbon cycle
        b> trace gases
        c> water and energy exchange via vegetation
        d> signals and impacts
      2) Chinese ecological research network
    b) International Programs
      1) not yet developed for ecology
    c) International networks
      1) Fennoscandanavian
      2) IGBP
      3) North/south american transect
      4) Tropical soil biology
      5) Savanna Ecology and Management Network
      6) RELAB - latin american botanical
      7) Northern sciences network
        a> International tundra experiment
      8) Taxonomic databases working group (IUBS sub-group)
  8. Still a lot to be done on international networks
D. William Schlesinger - Desertification Modeling
  1. Journada LTER
  2. in last 100 years grassland -> cresote bush and mesquite
  3. linked to overgrazing (some evidence)
  4. islands of fertility develop around shrubs -> patchy
  5. hypothesize that primary production is secondary impact of increasing spatial and temporal variability
    a) uniform (grassland) -> patchy (shrub)
  6. island fertility threshold in stability -- once past thrsehold unlikey to revert as disturbance removed
  7. larger model extrapolates to global scale -- teeter-toter model with human and climate change tip between semi-arid and arid -- positive reinforcements
    a) what goes on locally can, over entire basin, have global effects
  8. models of dynamics -- double rain -> only 20% increase in production, similar for nitrogen. Long term effects
  9. process models-> ecosystem model -> GIS ->transport models

    -> landscape models
  10. Most powerful apporach will be to regionalize our results via modeling and GIS -- need to do this to be players in global change

E. Mark Harmon - Experimental Legacies
  1. Tree Death and Decomposition -- observational and experimental legacies
  2. Studies 200 year processes
  3. example - Pacific Northwest forests
    a) old permanent plots back to 70 years at 5 year intervals
    b) data was almost lost
    c) biomass levels out at 140 years
    d) mortality increases with age -- will be 2-300 years before dead material rots -- dead material only starts to equilibrate when biomass levels out
  4. mortality
    a) chronosequences -- tend to be relatively dirty du to diferent sources of error -- too dirty to test models
    b) 200 year log decay study
      1) 550 logs placed out and followed over time
      2) document using photos of log slices
      3) insect exclosures
      4) 4 major components need to be broken down
      5) take time to penetrate
    c) can find out interesting stuff in the short term -- don't need to wait for end to have interesting stuff to look at (e.g., modelling)
    d) puts short term observations into temporal context
    e) need to ask if we shouldn't be more systematic in leaving legacies for future generations of scientists

F. Judy Myer - Streams
  1. Streams are interesting ecosystems
  2. many modes of variation -- many represented within the LTER network -- facilitating collaboration
  3. Common threads
    a) response to climatic events
      1) El nino -> higher flow
      2) prolonged drought (coweeta)
    b) nutrient dynamics
      1) comparison of Coweeta and Andrews streams. Very different N:P (N limiting AND, P limiting CWT)
      2) ARC netrient addition
        a> P addition indirctly adds to more bacteria, faster decay, more insects and fish
        b> some "top down" effects eg. fish eat insects
    c) decomposition of organic matter
      1) ARC - allocthonous input, leaf chemistry -- influecned by moose which affect plant species composition
      2) CWT - insect removal experiment - twice as long where insects removed
    d) transport of organic matter
      1) biotic control structures (branch dams etc)
    e) impact of animals on ecosystem function
      1) CWT insect removal

G. Phil Robertson - belowground processes - spatial scaling of soil processes
  1. focus on denitrification
    a) very variable -- log normal when plotted vs soil properties
    b) variable on very small scale -- Coefficients of variation >200%

- 2. What is control?
  - a) direct
    - 1) O2
    - 2) Carbon
    - 3) Nitrate
  - b) indirect
    - 1) H2O etc
  - c) more indirect
    - 1) minerology
    - 2) plant community structure
    - 3) disturbance etc.
- 3. Is scale of control different
  - a) new math techniques for quantifying variability with scale -- geostatistics
    - 1) semivariace statistic -- autocorrelation measure
      - a> get for different intervals
      - b> plot semivariagram -- teils you
        - 1> is there pattern
        - 2> at what scales is it patterned
        - 3> also allows interpolation
- 4. example from KBS
  - a) before establishing experimental plots (to see what blocking needs to be done etc.)
  - b) took around 600-2000 samples
  - c) elevation strongly autocorrelated
  - d) PH only autocorrellated at sale of <40m
  - e) soil biology autocor. only to 5 m
  - f) bacteria -- no spatial autocorrelation except at scales below those measured
  - g) soil N -- 15 m max scale
- 5. disturbance -- how does it change scales
  - a) some similar patterns
  - b) others less strongly scaled in disturbed
- 6. Hopefully cross-variate analyses will see that spatial variation can be related
- 7. Many processes controlled at small scale -- don't ignore smaller scale activities

H. John Magnuson - cross site comparisons

- 1. tried to compare diverse systems
- 2. needed to find general parameter -- chose variablity
- 3. need to find the general area occupied by each site
- 4. variability workshop
  - a) got together with data in hand
- 5. parameters
  - a) Extent and aggregation of measurements
  - b) Abiotic and biotic
  - c) Temporal vs spatial and other variability
  - d) diffences among landscapes in thier inherent variabliity
    - 1) deserts vs lakes
- 6. Analysis
  - a) Used interannual variability
  - b) Landscape variability
  - c) did 2 way ANOVA of location vs time -- got mean squares for each
  - d) broke variables into categories and calculated median variances for each class
  - e) potential pitfalls
    - 1) only had 5 years of data, so needed to see if 5 years is enough to estimate variabillity -- seemed to be based on sites with longer records

        2) had to deal with different sizes -- checked to see if variability correlated sith site size
        3) had to look at taxonomic aggregation -- variability declined with lumping
    f) components
        1) climatic and chemica variabiltity lower plant and animal variability
        2) are LTER more variable temporally or spatially -- Inter year less variable than spatial variability (lots of interaction too)
        3) variability varied between sites -- especially spatially
        4) deserts vs lakes -- expected interanuall variability to be higher in desert and spatial variability to be higher in lakes
            a> deserts were generally more variable than lakes over time
            b> dead heat in spatial variability
        5) Is variablitity within a site related to position in the landscape? was at NTL -- topographic gridient mirrored in variability. Found similar results at other sites using hydrolic forcing
    g) Temporal coherence among lakes
        1) onlu a few variables are coherent (water level was) biology generally were NOT.
7. Summary - Implications and Surprises
    a) Diverse systems can be compared
    b) variability is an interesting system property
    c) rich comparisons require multi-level hierarchical data
    d) need standardized parameters
        1) BUT can be derived statistics -- not raw data
    e) Long-term research MUST deal with spatial heterogeneity

A. William Odum - Introduction
  1. Bring in people from outside ecology
    a) atmospheric
      1) temporally
        a> short-term - meterologist
        b> long-term - climatologist
      2) spatial
        a> micro
        b> mesoscale 1km-10km -- Roger Pielka
        c> synoptic 100 km
        d> global -- Bruce Hayden

B. Bruce Hayden -- Global Warming: What All Scientists Should Know
  1. Physics
    a) CO2 absorbs infrared radiation
  2. Metaphysics (as in global circulation models
    a) all else equal, more CO2 makes it warming
  3. Still caution flags being raised
    a) some think could cause global cooling
  4. Data
    a) Temperature went up .3-deg between 1850-1900
      1) climate stations tend to be near (warm) cities
      2) relatively small number of telegraphic met. stations
    b) 1960s Temperature peaked then declined .4-deg
      1) "human volcano" idea -- smoke increases reflectance -> cooling
    c) 1980s - started up again in 1985
    d) alternate "warming mania" and "glacial depression"
  5. Trace gases supply 32-degrees
    a) doubling gases leads to increase -- CO2 should lead to 2.75-deg increase
    b) estimates of CO2 doubling decreasing with time
    c) new generations of global circulation models show smaller effects
  6. Effects expected based on models
    a) greatest warming in high latitudes
      1) weaker westerly
    b) bottom warms, top cools -- changes stability of atmosphere
      1) storms decrease
    c) warmer nights more than days
  7. Circulation models are experiments -- CO2 is manipulated and all else is left constant -- an experimental, not a predictive system
    a) initial conditions can be important
  8. Measurement problems
    a) change the landscape you change the temperature
    b) selection of stations is important
      1) hard to get truely rural
      2) antarctic data shows no warming
  9. Daily temperature ranges decreasing (could be CO2 rich effect or cloud rich effect)
  10. Model output is +1.7 degrees, but data indicates only about .22
  11. Need to more about clouds
    a) GCM predicts more high clouds, fewer low
      1) should lead to more heating
      2) 5% increase in lower clouds would = CO2 doubling
    b) more clouds in high latitude
    c) moderate 15-35% increases in clouds would cancel out 2xCO2
    d) Data on cloud cover is reverse of prediction of GCM

- e) SO2 good cloud nucleus -- albedo drops as distance from shore increases
- f) cloud cover has increased by about 10%

12. Storms
    - a) models predict fewer
        1) don't include hurricanes
        2) does indicate sea surface warming that could mean more hurricanes
    - b) data shows more
13. Pressure
    - a) GCM -- high latitudes get lower pressures
14. Most data does not match models closely -why
    - a) not carbon economy -- carbon polymer economy also sulfur, nitrogen, phosphorous
        1) Carbon - rapid increase tracking world population
        2) Nitrogen - similar increase
        3) Methane also increases
        4) Sulfur (non-sea) increase with peaks for volcanoes -- human volcano idea may not be too far off
            - a> causes cooling about equal to CO2 warming
        5) Particulates -- increases also lead to cooling
15. What will really happen?
    - a) more CO2
    - b) more clouds
    - c) reduce temperature ranges (damped extremes)
    - d) changes in growing season
16. Will we have climate change?
    - a) Yes -- we have for a long time
    - b) Will it be a function of a single factor -- NO
        1) GCM's will be incorporating other factors

C. William Launroth

1. LTER in ideal position for climate change
    - a) we don't need to say if it is changing
    - b) we worry about what is response of systems to whatever changes (increases or decreases) occur

D. Roger Pielka -- Linkages Between Mesoscale Atmospheric and Ecological Processes

1. Modeler -- add caveats to those given by Bruce Hayden
2. Importance of Landscape
    - a) equilibrium temperature very sensative to changes in albedo
        1) 1% change in albedo leads to about 1-deg change
        2) landscape character controls albedo
3. modification of boundary layer
    - a) bare soil vs tree canopy reflectance and H2O models
    - b) adding water to air gives effective increase in temperature (can detect effects of irrigation above fields)
4. get gradients across transitions (e.g., sea breeze)
5. scales of variation smaller than GCM cells
6. Effects of irrigation-- example in Colorado
    - a) 30-40% increase in water vapor
    - b) lower temperatures over irrigated
    - c) more turbulance over dry
    - d) irrigation may lead to more storms etc.
7. model indicates that landscape gradient can produce winds
8. Model of prairie gradient (forest/prairie boundary)
    - a) generates wind from forest to prairie
    - b) planting wheat increases wind
9. model of land use covers
    - a) wind urban to grass in western system, reverse in eastern (forest/city) system

10. Landscape variablity effects 30-300 km can be as large as GCM changes
    a) GCMs miss a lot in patchy landscapes
11. Effect of transpiration
    a) changes in planetary boundary layer structure
12. Daisyworld model
    a) white and black daisies - can lead to equilibrium temperture
    b) nonlinear systems
        1) fixed point -- used in Lovelock theory
        2) periodic
        3) chaotic -- get if use realistic non-linear functions
13. New directions
    a) computer power is developing to run meso-scale GCM models
        1) not practical --YET
    b) Feed GCM output into model into mesoscale model and feed that into ecosystem models and feedback to mesoscale
        1) need 2-D ecological models
14. Conclusions
    a) landscape variability can produce equivlent of sea-breeze
    b) man has affected landscape
    c) effects should already be as large as CO2 effects
    d) need mesoscale/GCM models
15. Eco-scale processes may be as important as global gasses in affecting climate

E. Bazzaz
1. we know CO2 is going up -- has direct affects on ecosystems with or without temperature rise
2. major direct effects -- review in annual review of Ecol. and Systematics
    a) photosynth. increases for all, more for C3 plants
    b) increase in water use efficiency
    c) increase in sustained growth (after long-time acclimate)
    d) more evident when other resources are available
    e) change in allocation -- more to roots
    f) leaves tend to be thicker
    g) effects on phenology (both ways)
    h) reproductive allocation differs (both ways)
    i) increase in C:N ratio of tissues, especially leaves
        1) would decrease decomposition rates
        2) thicker litter
        3) increased levels of herbivory -- up to 20% to get more N
        4) insect herbivores grow more slowly
3. Direct affects differ strongly among species and thus could change competitive interactions