

# Developing and Managing Large Integrated Grants

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# Outline

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- Background
- Act 1: Finding a Fit with the Opportunity
- Act 2: Writing a Winning Proposal
- Act 3: Managing the project

# Background: Carnegie Mellon

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- Medium sized private university (10,000) founded 1900
- Internationally recognized for: Drama, Architecture, Computer Science, Electrical Engineering and Robotics

# Background: Robotics Institute, CMU

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- Created in 1983
- ~500 people working on broad range of technologies
- Growing 10%/year; doubling in size every 6 years
- Approx. \$60M/year budget.
- Largest department at Carnegie Mellon
- Majority of faculty in “soft money” positions
- Funding from DOD, NSF, NASA, corporations
- Long history of collaboration between researchers, universities, users and corporations
- Commonly put together large proposals (> \$1M/year) with multiple institutions

# Personal Motivation

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- Recent USDA funding represents a sea change: provides resources to develop a critical mass to address key national issues
- Leadership at USDA looking for all types of participants
- Opportunity to “raise all ships”:
  - Improve quality of life for agricultural workers
  - Lower environmental footprint
  - Keep the US agriculture competitive
  - Fuel a market for high tech agricultural tools
  - Resurrect Agricultural Engineering as a discipline
- Payback for investing in a non-traditional organization

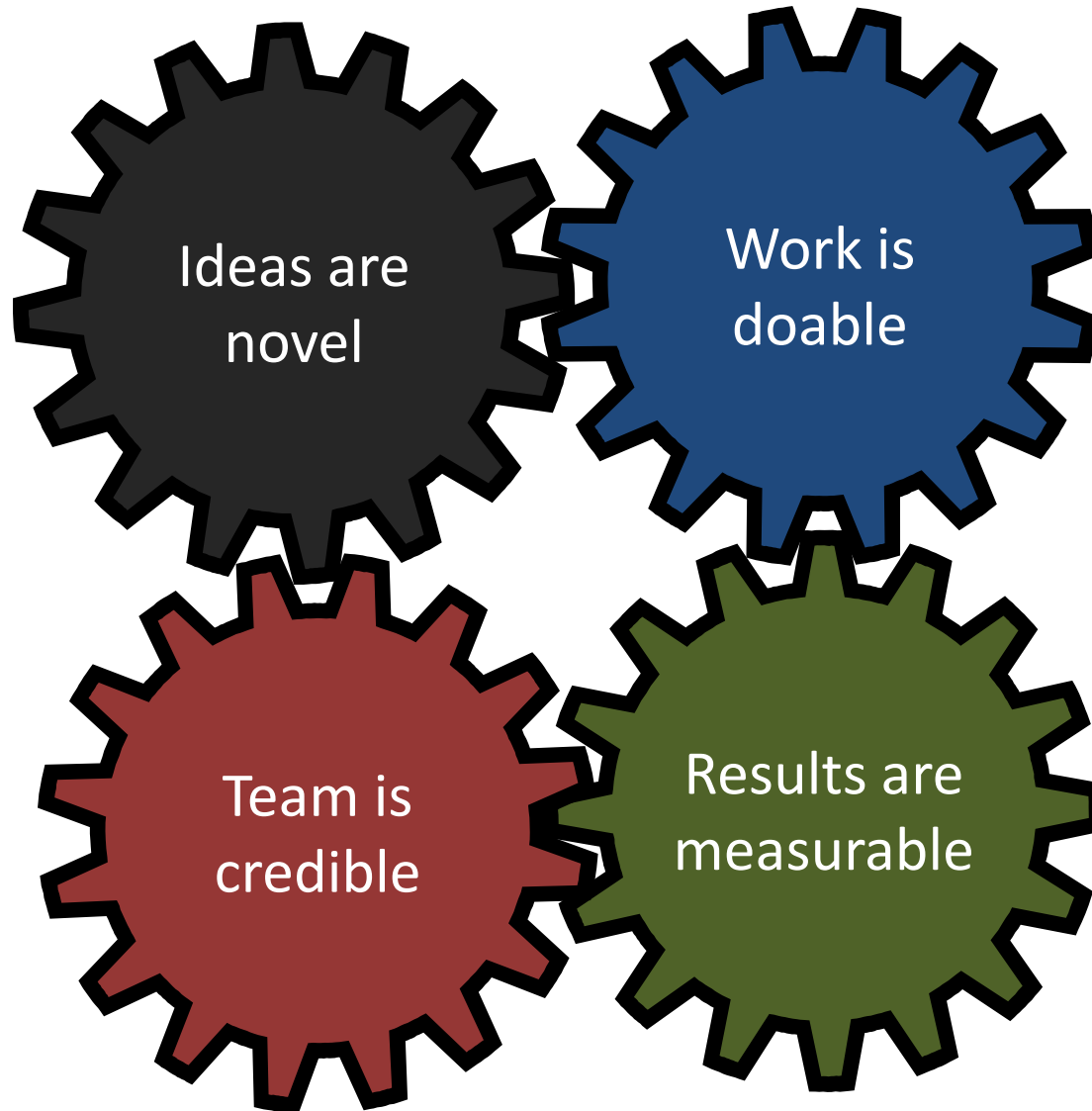
# Act I: Finding a fit with the Opportunity





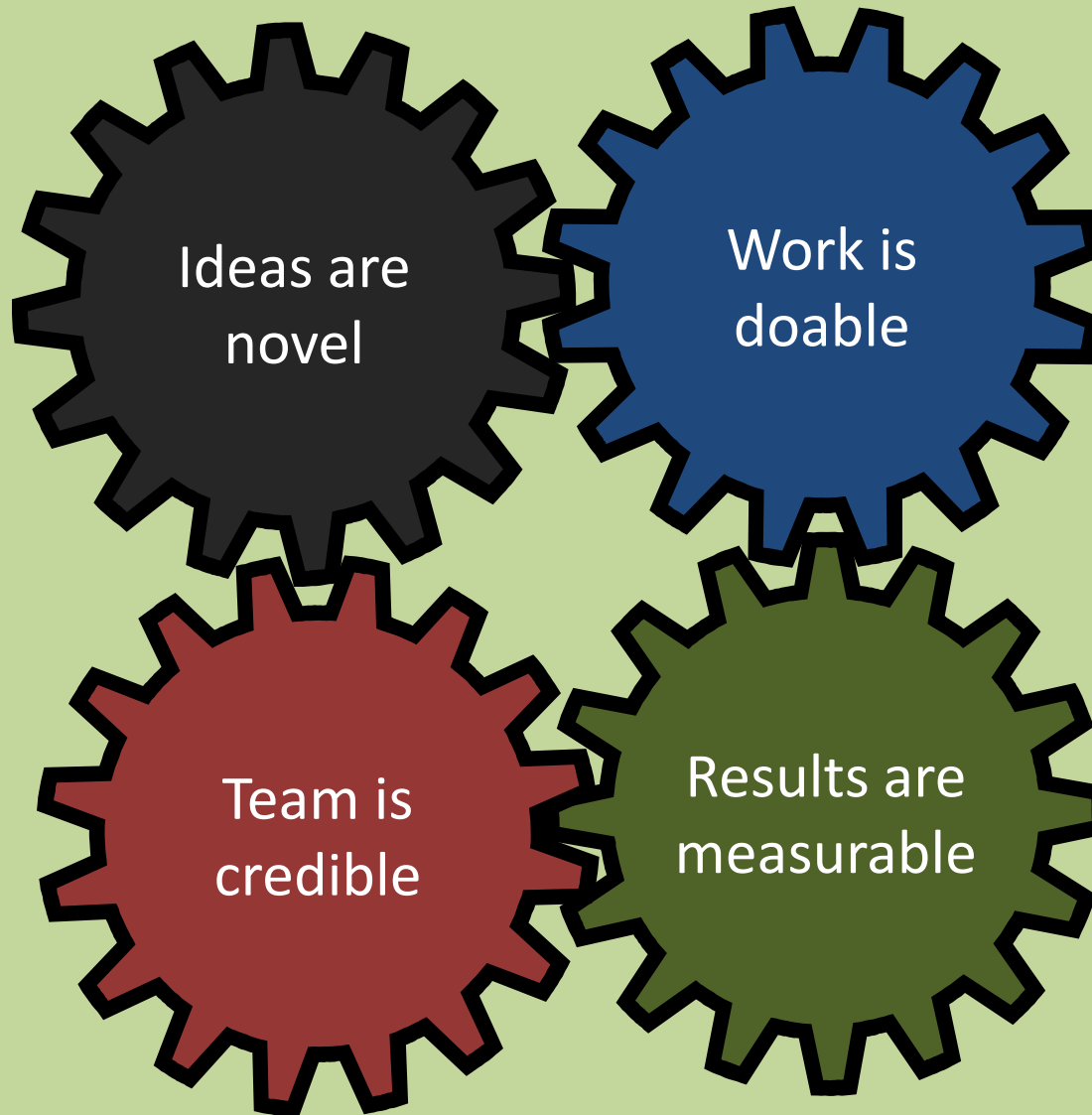
# Make up of ANY successful proposal

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# Make up of ANY successful proposal

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**Funding agency's  
interests and criteria**



# Examples of agencies' interests and criteria

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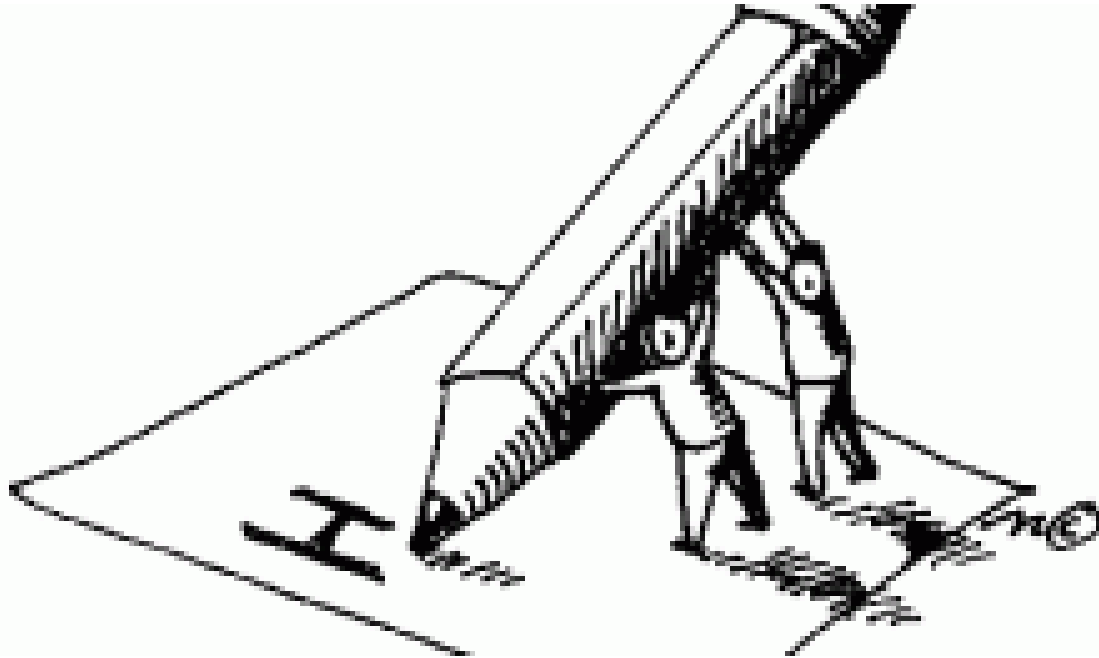
- NSF
  - Intellectual merit
  - Social impact
  - Not big on systems
- DARPA
  - Paradigm shifting technology
  - Military relevance
  - Not big on social impact
- NASA
  - Technologies for extreme environments
  - Space relevance
  - Dual use
- USDA SCRI (large projects)
  - Multi-disciplinary
  - Multi-state
  - Cross-cutting
  - Has significant stakeholder involvement
  - Gets out in the world (e.g. via ag extension)
  - Good chance that the enterprise will grow after USDA funding ends

# Scale of proposals

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- Winning proposals convey different messages at different scales
  - Small: project is exploratory; we have a hypothesis that is worthy of being explored
  - Medium: preliminary data are encouraging; we will conduct an in depth study on a topic
  - Large: We are already separately successful; we bring together a coalition of experts to conduct the definitive study on a theme
- How to play at different levels:
  - Start small yourself
  - Play with the big players by bringing something special to the team
  - Be the kingmaker before you reluctantly agree to be at the top

# Act 2: Writing a Winning Proposal



# Challenge of large proposals

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- Scope can be so wide that no single person is an expert in all of the topics, BUT
- Proposal needs to show an integrated approach, can't be piecemeal
- **WHOLE MUST BE GREATER THAN THE SUM OF THE PARTS**

# Developing a large SCRI proposal

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- Develop good links with industry being served
  - Months/years before CFP is issued
- Jointly define problems to be solved and prioritize them
  - Start with open problems that the stakeholders want solved
  - Not what can be done with your favorite approach
- Identify core team
  - Go for the “dream” team, not your friends team
  - Best partners are complementary, not the people who do more of what you do
  - Include plant scientists, engineers, extension personnel and companies
  - Recruit secondary players only as needed
  - Recruit strong advisory panel
- Identify key thematic areas
  - Each theme should have a clearly identified leader

# Developing a large SCRI proposal (cont.)

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- Find matching funds
  - Growers, industry consortia and equipment manufacturers
  - Make sure to verify match eligibility with USDA, especially for equipment
  - Match commitments must be firm
  - Always “overmatch” as some items may not be accepted at award time
- Develop storyboards for each theme
  - Circulated and revised frequently among/by team members
  - Don't write any text before storyboard is complete
- Core team produces proposals and carries it to finish line

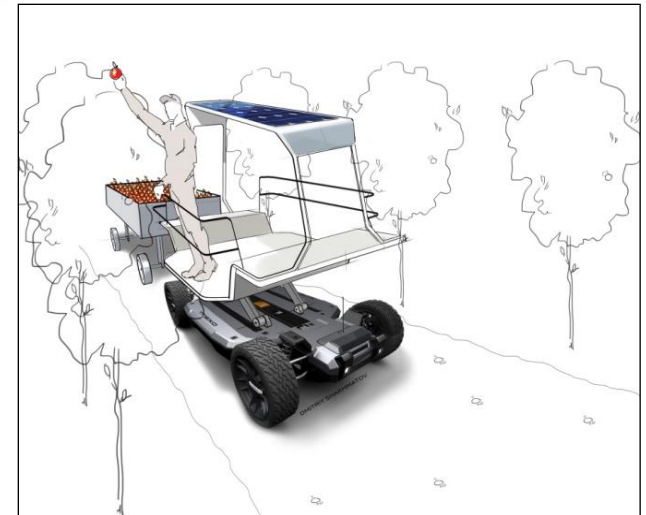
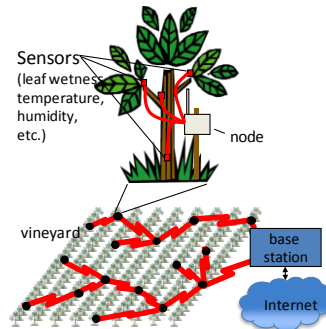
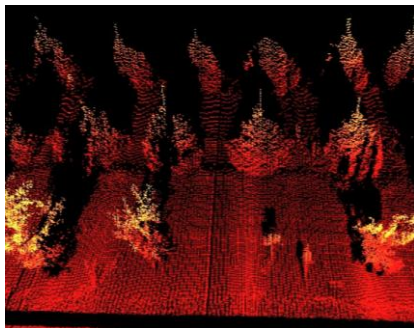
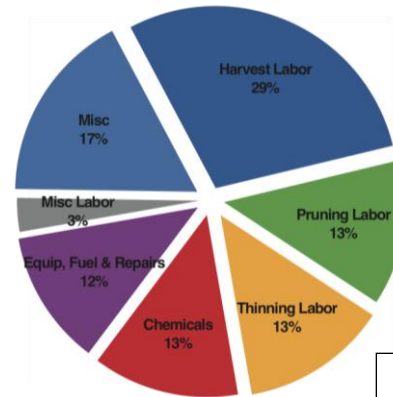
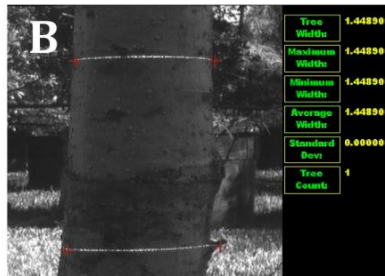
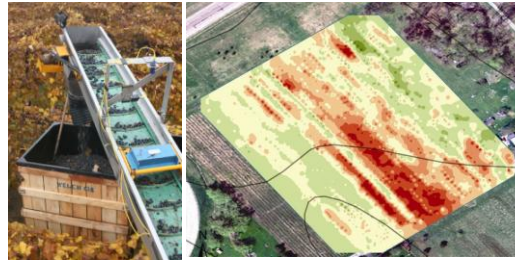
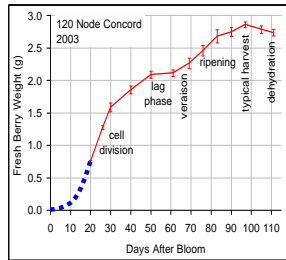
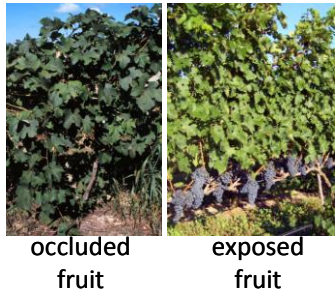
# Storyboard structure

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- Problem
  - Must be agnostic to solution
  - No jargon—something a grower would say
- Benefits
  - For the grower (improved quality, increased yield, reduced labor, lower environmental footprint, etc.)
- Approach
  - Key ideas: stress novelty of ideas
  - Rationale: Why the ideas are worth considering
- Team Expertise
  - List partners, especially outreach and commercialization
- Schedule over the project
  - Activities, milestones, success criteria
  - This turns into Statement of Work
- Each storyboard has compelling graphics



# A picture is worth a thousand words!



# People involved

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- Project director
  - Sets overall strategy, parallelizes tasks
  - Selects collaborators and negotiates their budget allocation
  - Sets proposal outline and page budgets
  - Has final word on conflicts
- Proposal manager
  - Integrates contributions from team
  - Makes sure all requirements from solicitation are met
- Review (“red”) team
  - Not the researchers who write the proposal
  - Performed sufficiently early so comments can be incorporated
- Get university behind project
  - Will need to sign off on match
  - Will need to cooperate on submission

# How CASC was put together

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- Started discussions with Penn State/apple growers 9 months before proposal deadline
- Identified movers and shakers in the industry, attracted them
- Started and stayed with a single project lead
- Created an outline of the proposal
- Refused to accept text already written
  - No writing until outline accepted
- Each leader required to articulate (max. three slides)
  - Problem: agnostic to solution (e.g. need to count fruit)
  - Approach: how the problem is solved (e.g. use computer vision)
  - Milestones: concrete results (e.g. build a mobile sensor)
  - Criteria for success: quantitative (e.g. count 95% of visible fruit)

## How CASC was put together (cont.)

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- Once picture clear, leaders wrote in a structured way with fixed page limits
- Core group of people wrote front end and back end
- Conducted “Red Team” review by others who have written large proposals and run large projects
- Sections turned into statements of work for subcontractors
- Got much help from budget offices at PSU, OSU and WSU

# Act 3: Managing the Project



# Typical Elements of a Large SCRI Project

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- Participants have different cultures
  - Work moves at a different pace at each institution
  - Motivation/criteria for success varies
  - Integration between groups is difficult
- Many threads
  - Not all will be successful
- No one person understands all technical details
- Reporting structure is distributed
- Validation comes from a combination of third parties

# CASC model

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- A federation of research groups
  - Manage results, not methods
- Clear definition of yearly and interim goals
  - Year 1: straight from proposal
  - Years 2-4: small reassessments based on prior year's findings
- Regular progress assessment
  - Progress report meetings alternate with showcase meetings
  - Two interim reports per year
  - Annual report -- Not a collation of interim reports
  - Annual *in loco* visit to all groups
- Clear integration path
  - Semi-annual and yearly field experiments
- Budget for subgroups reviewed yearly
- Cut efforts that fail even after a lot of feedback
- Look to extension studies and industry consortia to validate problems and success



# Roles of the PD and PM

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- Project Director
  - Set the pace of the project
  - Establish goals
  - Negotiate subcontracts
  - Control budget (macro)
  - Communicate with stakeholders
  - Make final decisions on project-related matters including cutting themes
- Project manager
  - Ensure SOW is being pursued and goals are being met
  - Prepare and issue reports
  - Organize and run meetings
  - Issue and oversee subcontracts
  - Control budget (micro)
  - Consult with USDA on project-related matters

why  
what

how  
when  
where  
whom

# Yearly and interim goals

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- Ideally, already in the proposal
- Goals must be
  - relevant (to the client!)
  - challenging
  - realistic/achievable
- Goals must include at a minimum
  - activities (verb)
    - develop system, execute field test, test algorithm, etc.
  - deliverable (substantive)
    - software, hardware, field test, database, report, etc.
  - success criteria (numeral)
    - quantitative measure of success

# Example: Reconfigurable Mobility

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Activities	Deliverables	Success Criteria
1. Develop a pared-down, robust, easy to maintain vehicle	1. Autonomous vehicle whose only non-stock modifications support off-board use: sensors for safety and row following and control computers.	1. Less than one hour of maintenance per 10 hours of operation
2a. Develop a complete user interface for scaffold mode (user on-board vehicle) 2b. Develop a simple user interface for pace mode (user not on-board vehicle)	2. Interface and instructions for autonomous vehicles to be usable by non-technical workers	2. 100 km of autonomous APM operation completed by non-technical personnel (system designers not present)
3a. Support Penn State in automating Darwin string thinning system 3b. Collect biological and engineering measurements on autonomous string thinning	3a. Blossom removal comparison between control, human-controlled Darwin and autonomous Darwin 3b. Quantified engineering performance, e.g. visible canopy intersected	3. Autonomous thinner performs as well or better than human operator

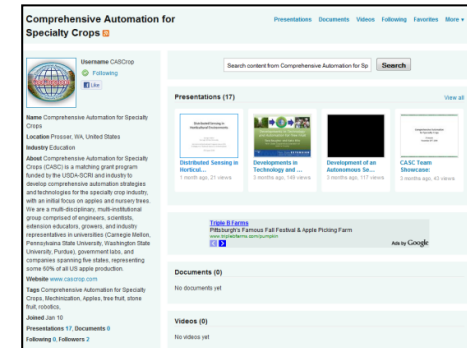
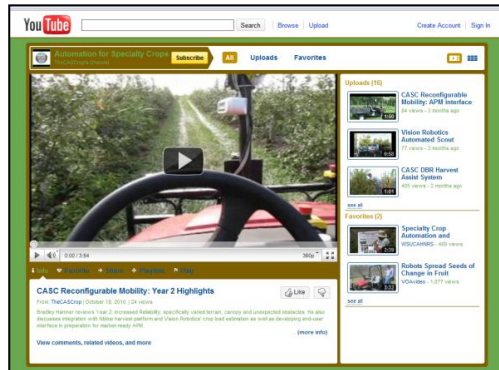
# Meeting and reporting schedule

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Month	1	2	3	4	5	6	7	8	9	10	11	12
Progress Report/ Showcase Meeting	PRM	SM	PRM	SM	PRM	SM	PRM	SM	PRM	SM	PRM	SM
Advisory Panel Meeting						APM						APM
Interim/Yearly Report			IR					IR				YR

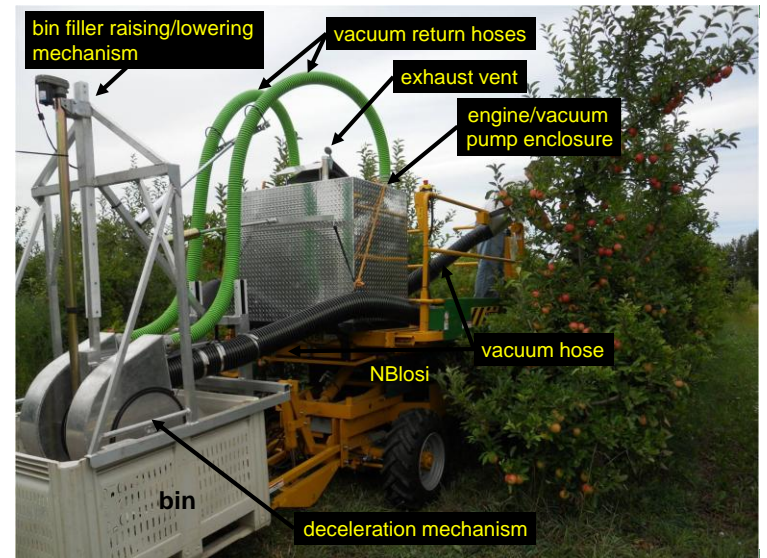
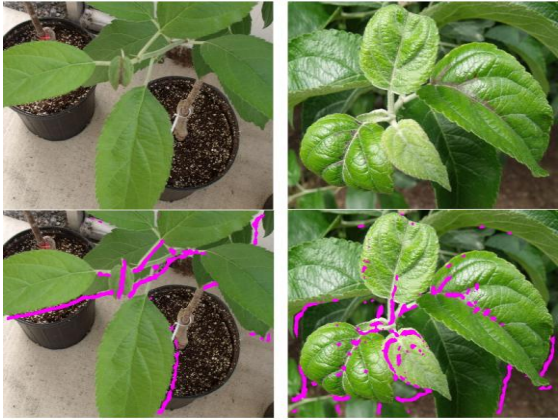
# Outreach tools

- Web site: <http://www.cascrop.com>
- YouTube: <http://www.youtube.com/user/TheCASCrop>
- Slideshare: <http://www.slideshare.net/CASCrop>
- Facebook: <http://www.facebook.com/cascrop>





# Selected results



# Feedback at end of Year 1

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- GOOD

- Delineated tasks
- Participation of advisory panel
- Team of very competent senior scientists and engineers
- Collaborators very enthusiastic, especially the extension people
- Field testing, especially two weeks in field in WA
- Emails are keeping advisory panel engaged
- Project is lots of fun for many of us
- Undergrads and lay people love to hear about this project
- Having a project manager

- NOT AS GOOD

- No open discussion at meetings due to presence of stakeholders
- Not enough time for consideration or discussion of showcase
- Depth of communication and understanding is not as good as it could be
- Meeting structure/frequency could be improved
- Reporting structure/frequency could be improved
- For economists and biologists, not much may happen month to month
- Apparent expectations of monthly reporting are inappropriate
- Culture of project is quite different from what some team members are used to



# Staying successful

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- Motto: “Keep the program sold”
  - Funding is not an entitlement
  - Make your client look good
  - Provide continuous, easy to explain, reliable evidence that you are succeeding
- Who is the client?
  - Industry associations
  - Growers
  - USDA program manager

# Summary: Winning

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- Start discussions with industry early
- Land usage has great match potential, but cash contributions are the way to tell if the industry is really serious
- Outline! Don't write until content is clear
- Set metrics (criteria for success) to clarify that your project will be beneficial
- Proposal should read like it was written by a single entity
- Get industry leaders on your advisory panel
- Perform a "Red Team" review of your proposal by people not involved in writing

# Summary: Managing

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- Get experienced people to manage proposal and run project
  - Distinct need for a Proposal/Project Manager at 50% effort for a CAP
- Set/review goals for each team every year. Be clear on criteria for success. Use this for setting Statement of Work for each institution.
- Make expectations (reports, meetings, field trips) explicit
- Cut themes that are not working
- Keep program “sold”: Involve advisory board and program manager continuously

Thank you.

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