

Agenda

Wednesday, September 9, 2015
UC Davis Conference Center

Truth or Myth? Neonicotinoids and Their Impact on Pollinators: What is the Science-Based Research?



We

10:10 am

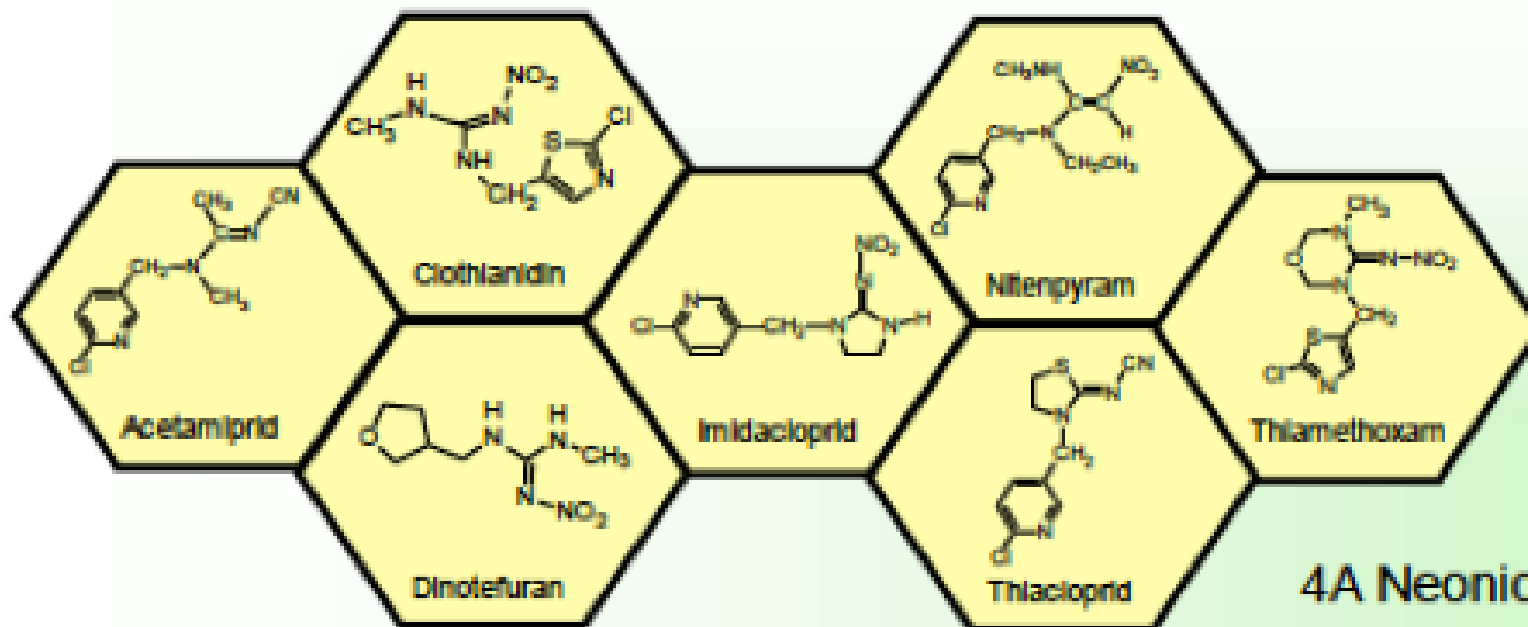
Overview of Current Use of Neonicotinoids and the Role of Pollinators in California Agriculture

Dr. Michael Parrella, *Professor & Chair – Department of Entomology and Nematology*
UC Davis

“Everyone is entitled to their own
own opinions, but not their own
facts”

Daniel Patrick Moynihan (1927-2003)

Group 4: Nicotinic acetylcholine receptor (nAChR) agonists



Daily Democrat

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Bulletin Board

UC hosts conference on widely used pesticide threatened with prohibition

By Jeannette Warnert, Special to The Democrat

POSTED: 08/28/15, 3:35 PM PDT

UPDATED: 1 WEEK, 1 DAY AGO

1 COMMENT

For this reason, the researchers have concluded that neonics are not contributing to colony collapse disorder, the unexplained bee die-off that has plagued commercial honeybee hives during the last decade.

Intended Outcomes

- To bring people together on both sides of the issue for constructive dialog
- Speakers were selected to provide objective information
- To allow all to ask clarifying questions
- To expand the knowledge upon which opinions and positions are based

That neonic insecticides kill bees is not up for debate. If an unlucky bee flies into a cloud of dust kicked up when coated seeds are planted, she'll die on the spot. What is contested, however, is the severity of the effects that might arise from tiny, sublethal exposures to neonics over the course of a worker bee's six week lifespan as she gathers pollen and nectar that is laced with trace amounts – and what happens when she brings this pollen and nectar back to the hive

Morris, A. 2015. The Bee Killers. Rolling Stone. Issue 1242, Aug. 27, 2015. pp. 50-55, 68.

Overview of Presentation

- Mode of action/use of neonicotinoids
- Importance of pollinators in California
- Good vs. bad science

4

NICOTINIC ACETYLCHOLINE RECEPTOR (NACHR)
COMPETITIVE MODULATORS

A

NEONICOTINOIDS



*Acetamiprid, Clothianidin, Dinotefuran,
Imidacloprid, Nitenpyram, Thiacloprid,
Thiamethoxam*

B

NICOTINE



Nicotine

C

SULFOXAFLOR



Sulfoxaflor

D

BUTENOLIDES



Flupyradifurone

Mode of Action

- The neonicotinoids are a class of insecticides that affects the central nervous system of insects.
- They bind to receptors of the enzyme nicotinic acetylcholine, causing excitation of the nerves, leading to eventual paralysis and death.
- This specific neural pathway is more abundant in insects than mammals, so these insecticides are more toxic to insects.

Performance Profile for Dinotefuran

■ Broad Insecticidal Spectrum

Effective on

- Sucking insects such as aphids, plant bugs, leafhoppers and mealybugs.
- Coleoptera species such as weevils, Colorado potato beetle and flea beetle.
- Diptera species such as leafminer flies.
- Certain Lepidoptera species such as fruit moths and leafminers.
- Other species such as thrips, grasshopper and fire ant.

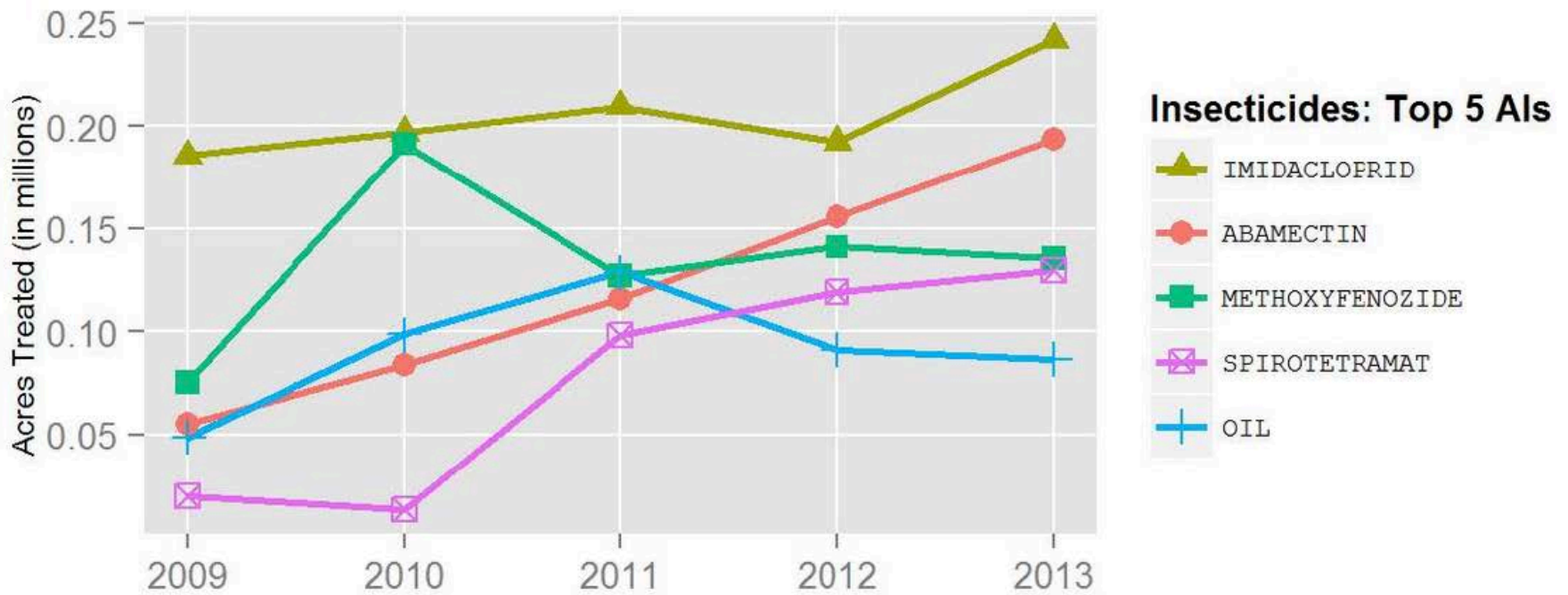
Classification	Species	Activity
Hemiptera	Aphids	++~+++
	Whiteflies	+++
	Mealybugs	+++
	Arrowhead scale	+++
	Indian wax scale	++
	Plant bugs	+++
	Leafhoppers	+++
	Planthoppers	+++
Diptera	Leafminer flies	++~+++
Lepidoptera	Diamondback moth	++
	Cabbage worm	++
	Peach fruit moth	+++
	Citrus leafminer	+++
	Tea leafroller	+++

Classification	Species	Activity
Lepidoptera	Rice stem borer	++
	<i>Adoxophyes</i> sp.	-
Coleoptera	Striped flea beetle	+++
	Colorado potato beetle	+++
	Rice leaf beetle	+++
	Rice water weevil	+++
Thysanoptera	Thrips	++
Orthoptera	Grasshopper	++
	Cricket	++
Hymenoptera	Ants	+++
Acarina	mites	-

Activity: -, poor; +, fair; ++, good; +++, excellent

The top 100 pesticides used by pounds of active ingredients statewide in 2013 (all sites combined).
 Chemical names that end with an “ * ” are adjuvants.

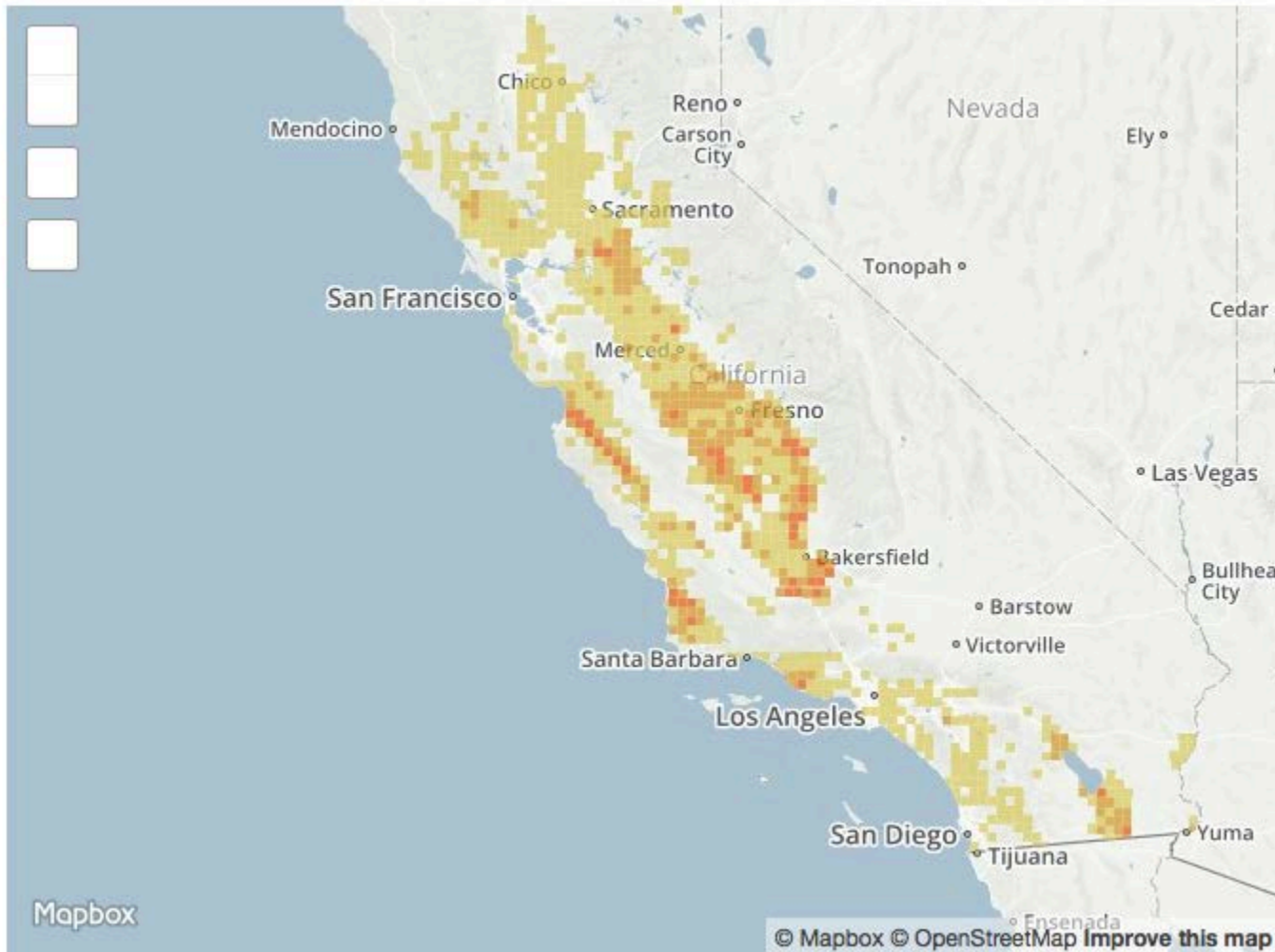
Chemical	Rank	Pounds	Num. Apps.	Acres
SULFUR	1	47,328,636	134,925	5,333,342
MINERAL OIL	2	16,097,618	54,893	1,808,584
PETROLEUM OIL, UNCLASSIFIED	3	15,752,026	19,083	977,352
1,3-DICHLOROPROPENE	4	12,917,296	2,936	71,747
POTASSIUM N-METHYLDITHIOCARBAMATE	5	9,484,467	3,647	46,861
CHLOROPICRIN	6	8,216,249	2,807	59,746
GLYPHOSATE, POTASSIUM SALT	7	5,283,305	84,531	3,120,143
GLYPHOSATE, ISOPROPYLAMINE SALT	8	4,976,140	80,595	2,410,978
METAM-SODIUM	9	4,805,237	753	27,986
CALCIUM HYDROXIDE	10	4,055,721	7,389	189,475
IMIDACLOPRID	45	376,517	74,892	1,549,731

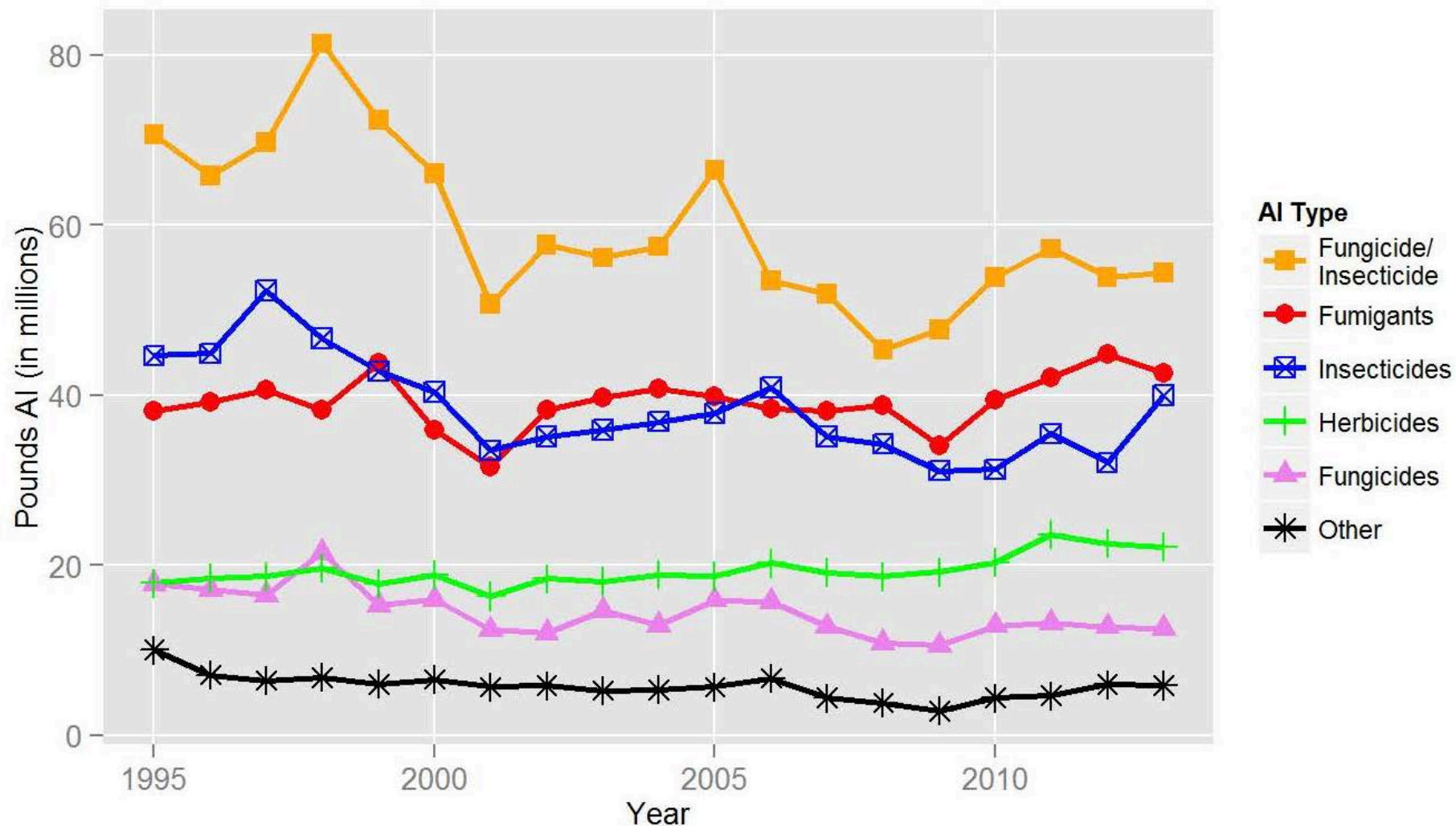


Top five pesticide active ingredients applied to wine grapes in California in 2013



Townships in California with High Use of Neonicotinoid Insecticides, 2010





194 million pounds of pesticide active ingredients were applied in California in 2013

INSECT POLLINATION OF CULTIVATED CROP PLANTS

Agriculture Handbook No. 496

McGregor, S. E. 1976

Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE

Top 5 Agricultural States in Cash Receipts, 2013

State	Rank	Total Value <i>Billion Dollars</i>
California	1	46.4
Iowa	2	31.2
Nebraska	3	23.6
Minnesota	4	22.3
Texas	5	21.6

Crop and Livestock Commodities in which California Leads the Nation ^{1/}

Almonds	Figs	Melons, Cantaloupe	Pluots
Apricots	Flowers, Bulbs	Melons, Honeydew	Pomegranates
Artichokes	Flowers, Cut	Milk	Raspberries
Asparagus	Flowers, Potted Plants	Nectarines	Rice, Sweet
Avocados	Garlic	Nursery, Bedding Plants	Safflower
Beans, Dry Lima	Grapes, Raisins	Nursery Crops	Seed, Alfalfa
Beans, F.M. Snap	Grapes, Table	Olives	Seed, Bermuda Grass
Bedding/Garden Plants	Grapes, Wine	Onions, Dry	Seed, Ladino Clover
Broccoli	Greens, Mustard	Onions, Green	Seed, Vegetable and Flower
Brussels Sprouts	Hay, Alfalfa	Parsley	Spinach
Cabbage, Chinese	Herbs	Peaches, Clingstone	Squash
Carrots	Jojoba	Peaches, Freestone	Strawberries
Cauliflower	Kale	Pears, Bartlett	Tomatoes, F.M.
Celery	Kiwifruit	Peppers, Chile	Tomatoes, Processing
Chicory	Kumquats	Peppers, Bell	Triticale
Corn, Sweet	Lemons	Persimmons	Vegetables, Greenhouse
Cotton, American Pima	Lettuce, Head	Pigeons and Squabs	Vegetables, Oriental
Daikon	Lettuce, Leaf	Pistachios	Walnuts
Dates	Lettuce, Romaine	Plums	Watercress
Eggplant	Limes	Plums, Dried	Wild Rice
Escarole/Endive	Mandarins & Mandarin Hybrids		

^{1/} California is the sole producer (99 percent or more) of the commodities in bold.

Pollination & California Agriculture

- Bees provide pollination service to more than 100 commercial crops, from fruits, nuts, vegetables and oilseed to fiber, biofuel and the alfalfa that is fed to livestock
- There's a widely stated phrase in agriculture that you can thank a pollinator for one out of three bites of food you eat (Claire Kremen, UC Berkeley).

<http://www.defenders.org/magazine/spring-2015/pollinator-predicament>

Applied vs. Basic; Good vs. Bad - Science -

Defining good and bad

Bad science is often easy to spot: poorly-controlled experiments, bias or mistakes in interpretation, selective use of data to support a pre-determined viewpoint, etc.

Look for bad science wherever there is very strong and specific self-interest. Bad science is a big problem but it is usually exposed – eventually.

Good science is harder to define.

Five Tenets of Scientific Inquiry

- 1) Science is a human endeavor;** sociology, politics, psychology, and similar aspects of human nature all have a profound influence on how science is conducted.
- 2) Science follows certain rules and guidelines called the scientific method;** i.e. hypotheses are formulated from observations, and theories develop from these hypotheses
- 3) Facts versus belief;** “fact” in a scientific context is a generally accepted reality but still open to scientific inquiry, as opposed to an absolute truth or belief, which are not, and hence are not a part of science.

Five Tenets of Scientific Inquiry

5) Acceptance of scientific ideas is based on a process of publication and peer review; to become a legitimate theory (but still not established fact), a hypothesis must be subjected to the approval of a scientist's peers and published in an accredited scientific journal. Most significantly, this helps to maintain science as a process

6) Replication is vital to good science; for the scientific community to accept a finding, other investigators must be able to duplicate the original investigator's findings.