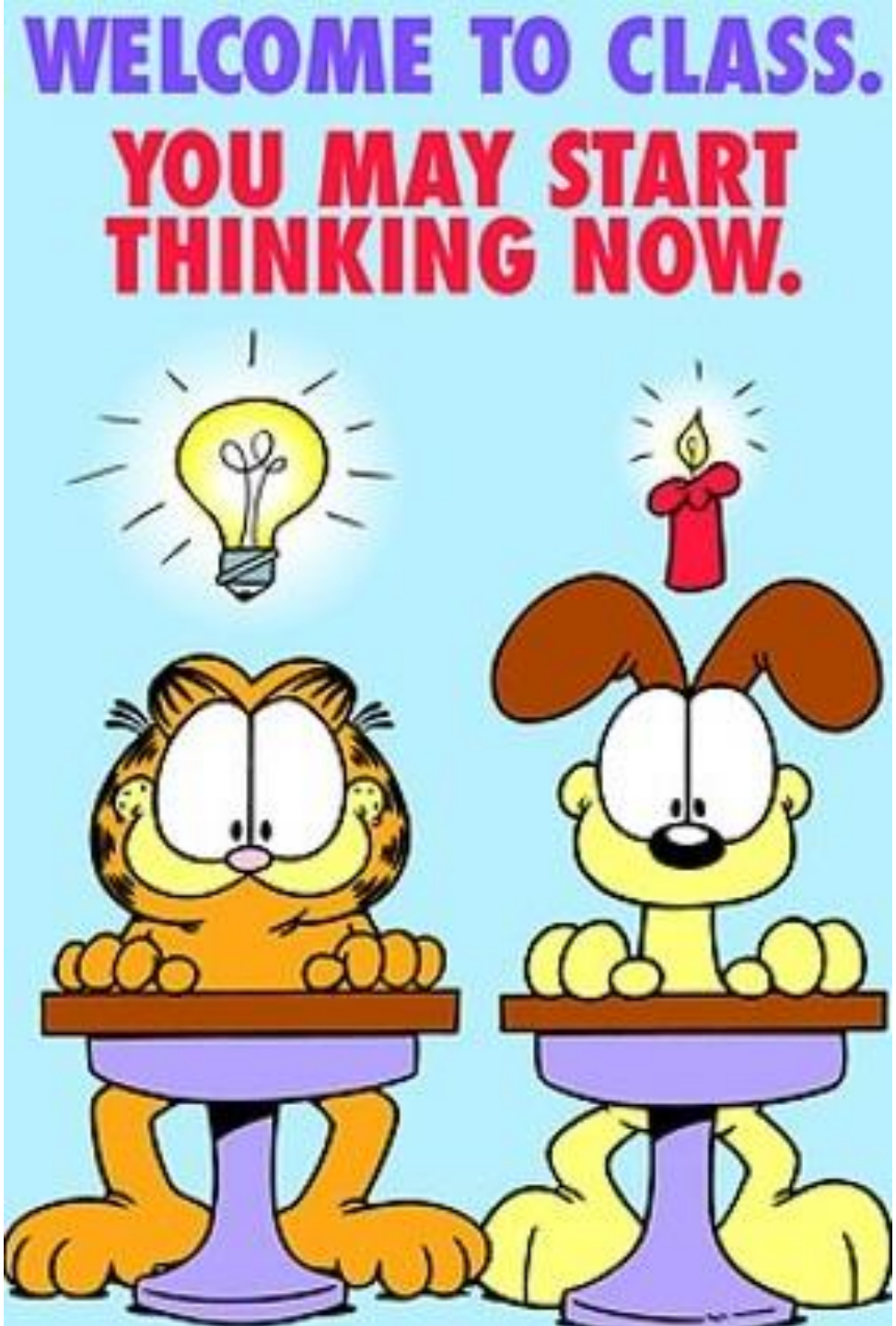

WELCOME TO CLASS.
YOU MAY START THINKING NOW.

Ecology of Aquatic Environments

Ecological Impacts of Pollution: Pesticides

Dr Heather Lally heather.lally@gmit.ie

Learning Outcomes

The learning outcomes for todays lecture are to:

- Explore the global benefits of using pesticides
- Examine their impact on the environment
- Delve deeper using an insecticide case study

Pesticides

Pesticides are substances (poisons) which are used to control organisms (pests) which may adversely affect human health, or organisms which attack food essential to mankind e.g. vermin, insects, nematodes, fungi

- Chemical, physical or biological in nature
- Worth $32 (€26) billion worldwide
- >500 pesticide formulations e.g. dusts (dry and wet), water dispensable granules, aerosols, liquid or solid baits, granules, solutions

In your peer groups

Discuss why pesticides are so important

List the benefits of using pesticides?

Consider the social, economic and environmental benefits

(10 mins)

Summary of Benefits Pesticides Afford

Class feedback

Social	Economic	Environmental

(10 mins)

Now Consider

What are the key environmental impacts caused by pesticides?

Submit three key impacts per group

Go to www.menti.com
Code **29 60 64**

(10 mins)

Your opinion

Do you think the benefits of using pesticides significantly outweigh the risks?

Take the poll

Go to www.menti.com

Code **63 06 89**

(10 mins)

Insecticide Case Study: Neonicotinoid and The Honey Bee

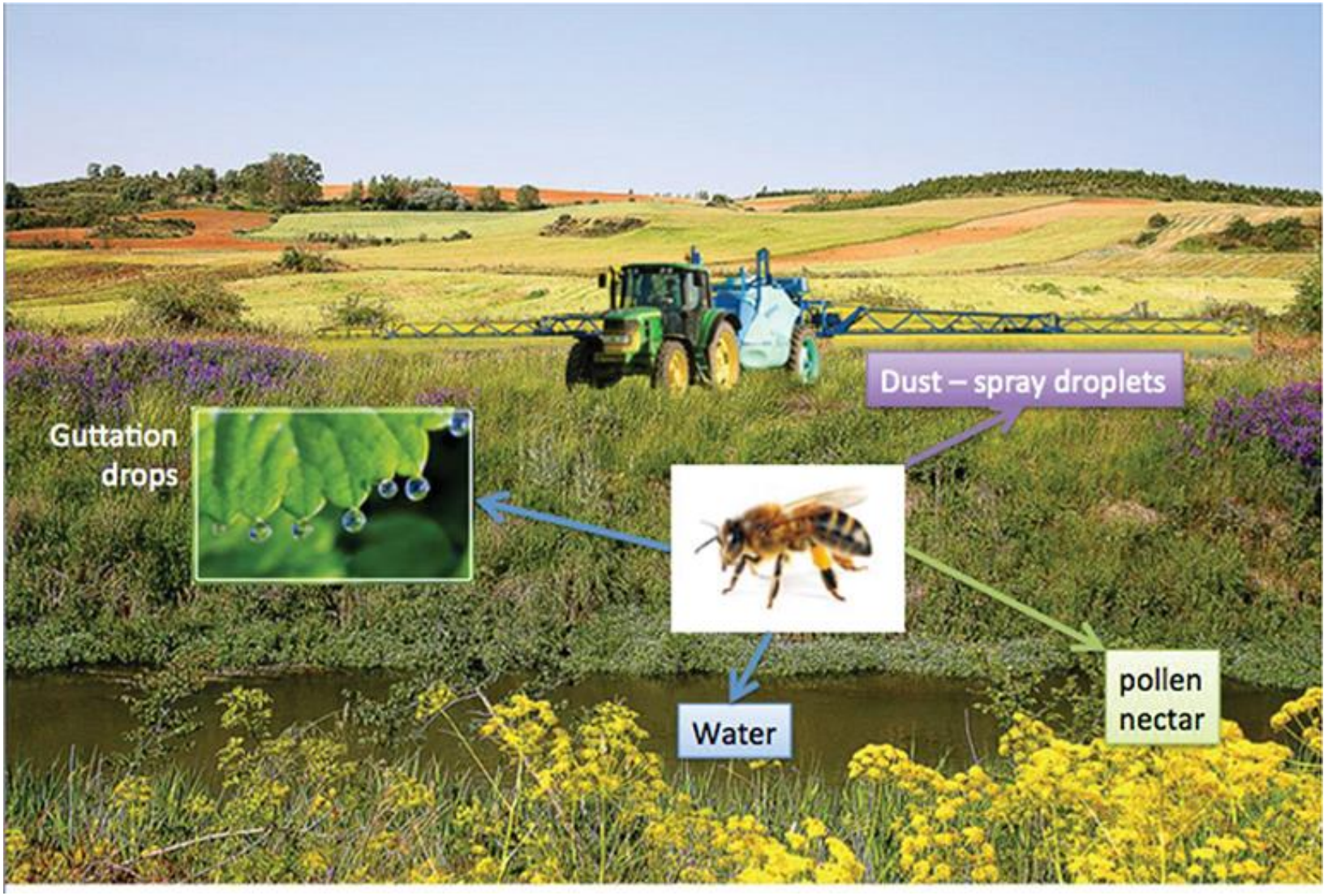
Impact of Neonicotinoid Pesticides on Bees

Colonies have been mysteriously collapsing with adult bees abandoning their hives - **"Colony Collapse Disorder," or CCD**

CCD is implicated with imidacloprid which causes (Decourtye and Devillers 2009):

- *Altered mobility* – knockdown, staggering, trembling, tumbling, abdomen tucking, rotating and cleaning of abdomen, rubbing hind legs together, decreased walking
- *Altered foraging and feeding behaviour* – unable to feed
- *Impaired orientation and social communication* – memory loss, does not return for 24 hrs
- *Undermined immunity and decreased longevity*
- *Delayed larval development*
- Colonies are found suddenly empty of adult bees

Impact of Neonicotinoid Pesticides on Bees



Current Usage of Neonicotinoids

In 2013, the European Food Safety Authority (EFSA) issued a declaration that three specific neonicotinoid pesticides posed a **high acute risk to honeybees**

In April 2013, the EU voted for a two-year restriction on neonicotinoid insecticides

- Restricting the use of imidacloprid, clothianidin, and thiamethoxam **for use on crops that are attractive to bees?**
- Eight nations voted against the motion including the UK, **Ireland abstained** ☹
- The European Commission (EC) proposed a two-year ban (1st Dec 2013 – 31st Nov 2015)
- Woodcock et al. 2016 "…there is an increased pop. extinction rate in response to neonicotinoid seed treatment…" and " sub-letal effects …. could scale up to cause losses of bee biodiversity"
- Due for review in 2016!!!!!!! Still no agreement in Oct 2017

Response from Agrochemical Companies

Syngenta, Bayer CropScience and Monsanta are not taking this ban lying down

- Triggered legal action from two of the worlds largest agricultural companies
  - Syngenta, Switzerland – thiamethoxam
  - Bayer CropScience, Germany - all three chemicals

EU ban did not cover the use of newly developed neonicotinoid "Sulfoxaflor"

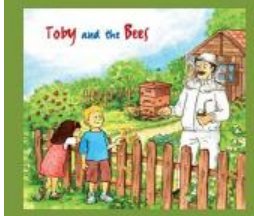
- Authorised by DG Sante (European Health and Food Safety) on 27th July 2015 (Dermine 2015)
- Subsequently been found to be highly toxic to bees
- On 10th Sept 2015, a US federal court suspended the authorisation of sulfoxaflor (Dermine 2015)

Response from Agrochemical Companies

Their corporate spin tactics include (Simon 2014):

- *Pretending to care* e.g. Bee Care Tour
- *Creating distractions*: blame anything but pesticides e.g. *Varroe destructor* (parasitic mite)
- *Spinning science* e.g. funding bee research
- *Blaming farmers*
- *Attacking regulators* e.g. lobbying
- *Targeting children* e.g. books, promoting colouring competitions
- *Buying credibility*: putting experts on payrolls and co-opting groups e.g. British Bee Keepers Association

From Joe Camel to "*Toby and the Bees*"



Taking another page from Big Tobacco's playbook,[61] Bayer published a children's book entitled *Toby and the Bees*,[62] in which a friendly neighborhood beekeeper tells young Toby that the bees are getting sick, but "not to worry" it's just a problem with mites, and there is special medicine to make bees healthy.

Bayer manufactures that "medicine" — miticide Check-Mite Plus (coumaphos) which, along with other miticides, has been shown to interact with other commonly-used pesticides and fungicides to significantly reduce the survival rate of bee larvae.[63, 64] The book fails to mention the role of pesticides in bee declines and the role that neonicotinoids play in making bees more vulnerable to mites and pathogens.

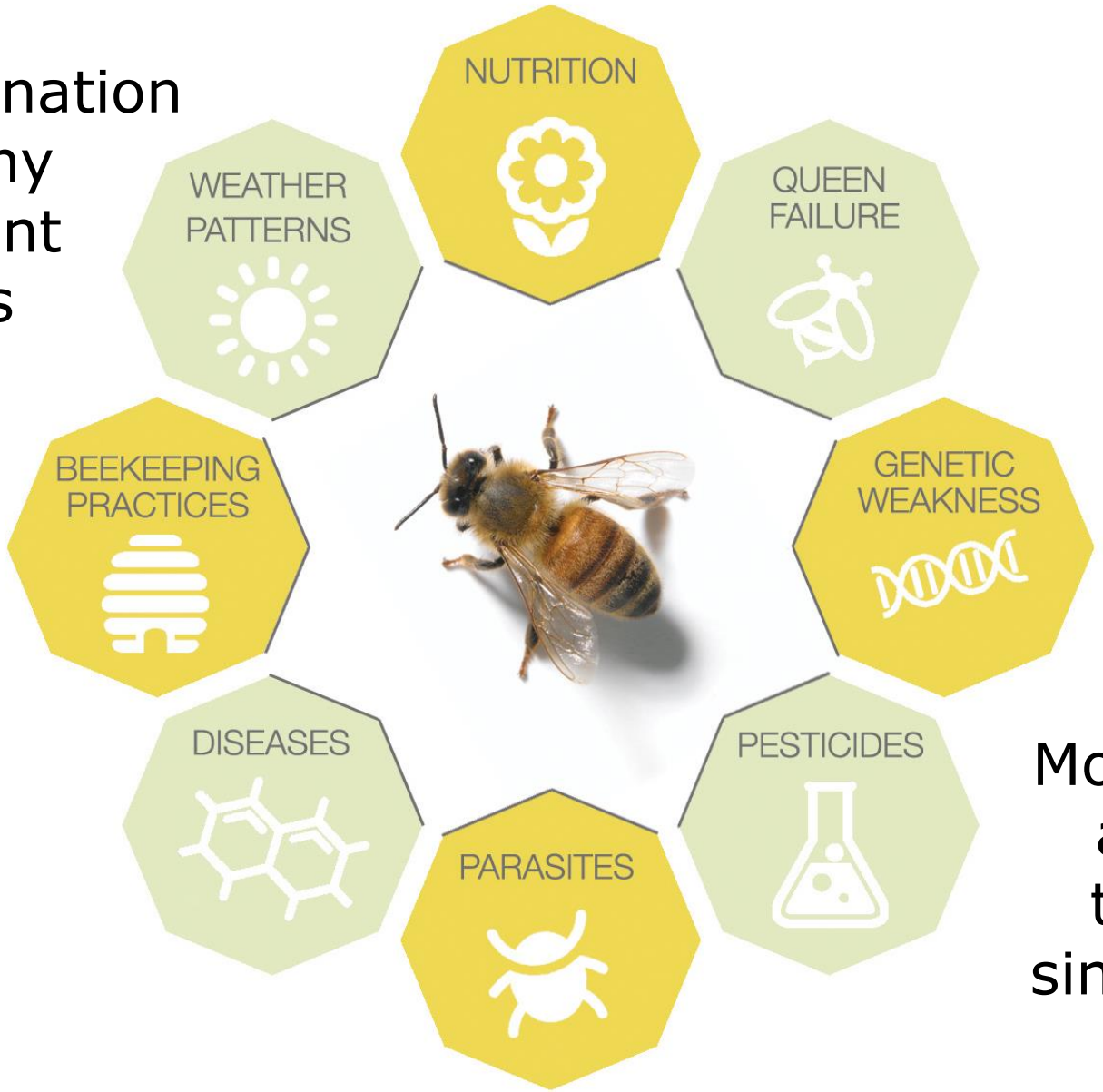
New Twist to Dominant Market Share

In Sept 2016, Bayer bought out Monsanto for $66 billion dollars (**all-cash**)

- $128 a share
- Largest cash transaction EVER
- Now the largest seed and pesticide company **in the world**

The Reality for Honey Bees

Combination of many different factors



Most scientists agree that there is no single cause of CCD

That's a Wrap

Key benefits included: ……..

Major impacts on the environment are …….

The case study highlights that chronic exposure can have a major negative effect on honey bees

- This has major implications for global food production
- And therefore for mankind

Efforts by local and European governments have so far been in vain due to intensive lobbying from the agrochemical companies

References

Arias-Estévez, M., López-Periago, E. and Martínez-Carballo, E., Simal-Gándara, J., Mejuto, J-C., García-Ríougenio, L. (2008). The mobility and degradation of pesticides in soils and the pollution of groundwater resources. Agriculture, Ecosystems and Environment 123: 247–260.

Decourtye, A. and Devillers, J. (2009). Ecotoxicity of neonicotinoid insecticides on bees. In Thany, S.H. (eds) Insect Nicotinic Acetylcholine Receptors. Landes Bioscience.

Dermine, M. (2015). PAN Europe challenges the European Commission in Court to stop the new bee-killing pesticide Sulfoxaflor. Pesticide Action Network (PAN) Europe. http://www.pan-europe.info/press-releases/2015/10/26-october-2015-pan-europe-challenges-european-commission-court-stop-new-bee

Goulson, D. (2013). An overview of the environmental risks posed by neonicotinoid insecticides. Journal of Applied Ecology 50: 977–987.

National Biodiversity Data Centre (2015). All-Ireland Pollinator Plan 2015-2020. Series No. 3, Waterford.

Simon, M. (2014). Follow the honey: 7 ways pesticide companies are spinning the bee crisis to protect profits. Friends of the Environment and Bee Action. http://www.eatdrinkpolitics.com/wp-content/uploads/FollowTheHoneyReport.pdf

Woodcock, B.A., Isaac, N.J.B., Bullock, J.M., Roy, D.B., Garthwaite, D.G., Crowe, A. & Pywell, R.F. (2016). Impacts of neonicotinoid use on long-term population changes in wild bees in England. Nature Communication. Doi:10.1038/ncomms12459

Classroom Feedback for your Lecturer

On your speech bubble post-it indicate how your thoughts regarding this lecture

(5 mins)

Thank you