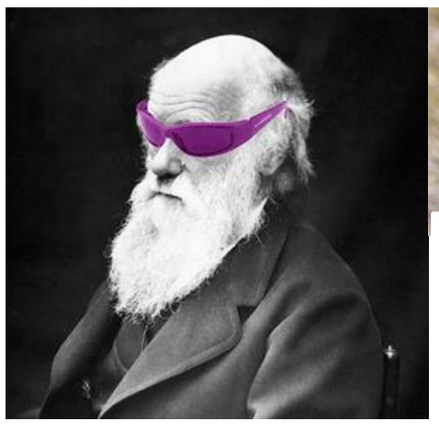
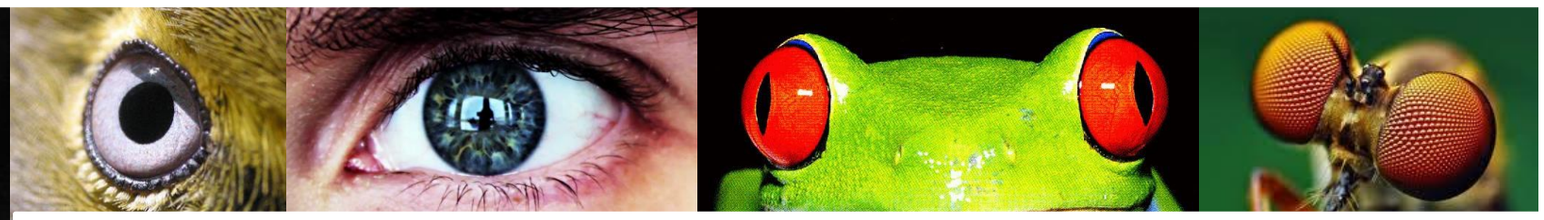



# Biodiversiteit, gezondheid & welzijn
## een blik door de bril van een gedragsecoloog

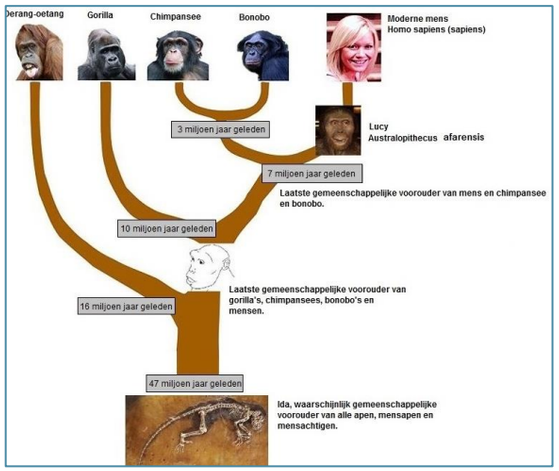

Prof. dr. **Hans Van Dyck**

Behavioural Ecology & Conservation Group

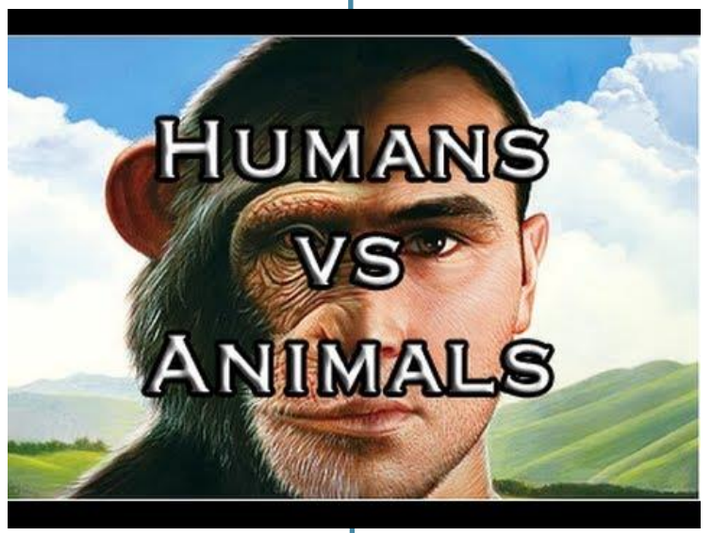


UCL UNIVERSITÉ CATHOLIQUE DE LOUVAIN

# Biodiversiteit




# Ieder zijn (academisch) hokje?

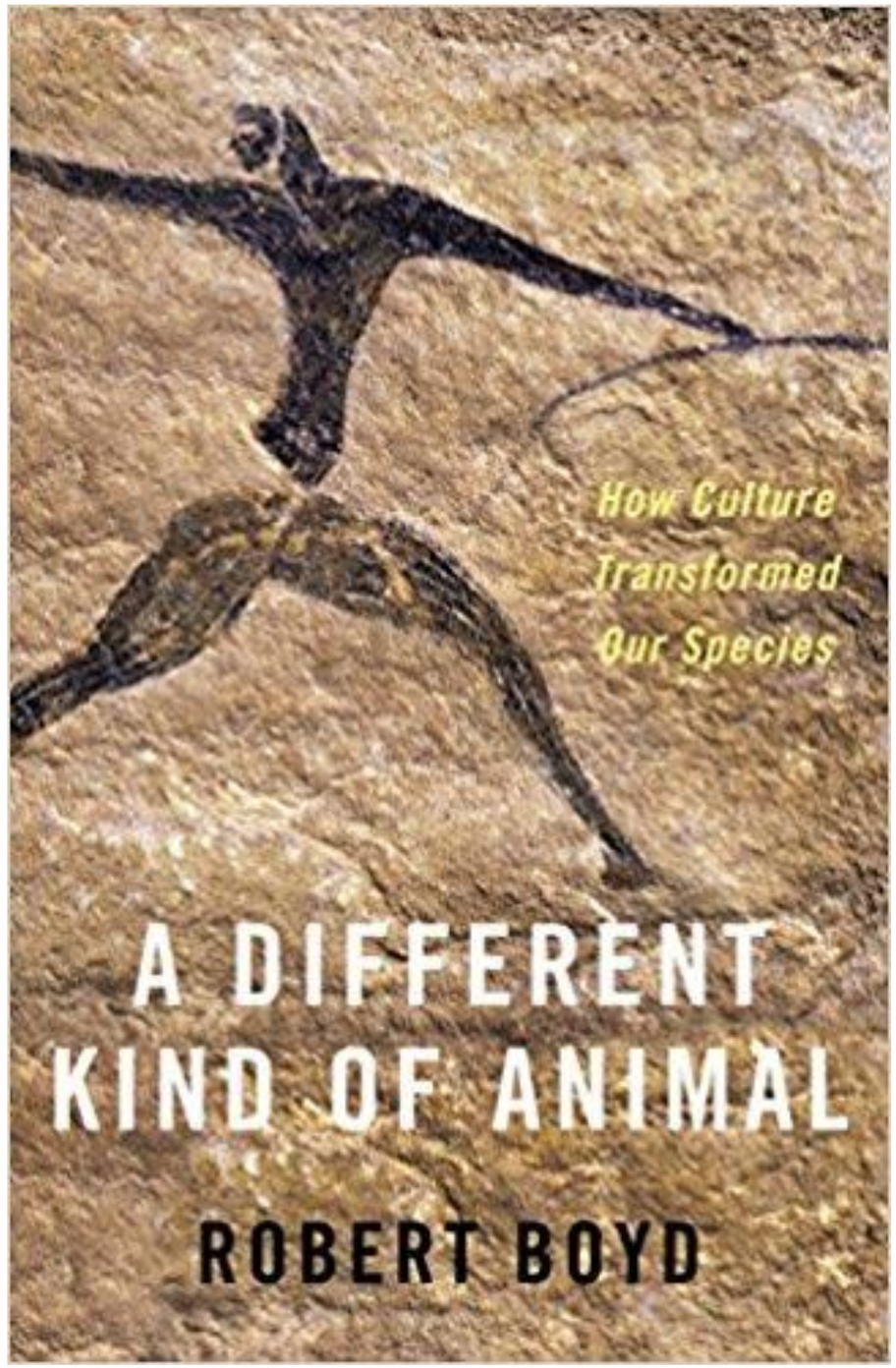



## Dier

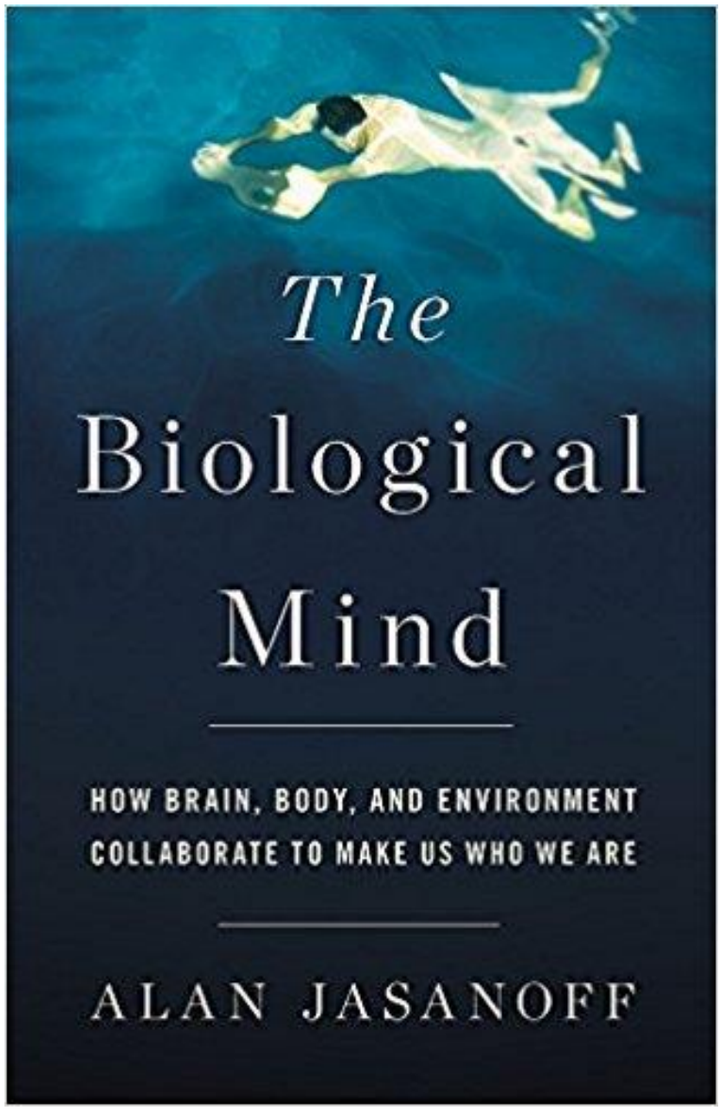
→ Instinct, ingebakken
→ Genetische transmissie
→ “Nature”
→ Ecologie
→ Ethologie
→ Diergeneeskunde

## Mens

→ Ervaring, leergedrag
→ Culturele transmissie
→ “Nurture”
→ Economie
→ Psychologie, sociologie
→ Geneeskunde


How Culture
Transformed
Our Species
A DIFFERENT
KIND OF ANIMAL
ROBERT BOYD

[2018]




[2018]

→ Brein, lichaam & omgeving

# Leefgebied:
# interacties met & prikkels van de omgeving

Ecologische hulpbronnen
(consumables & utilities)

Informatie via zintuigen

- Structureel vs functioneel habitat
- Adult vs juveniel
- Gezonde omgeving
  (gezondheid als ecologisch concept)
- Ecologische valstrik
- Ecologie & evolutie

# Gedrag: genen of omgeving?

## De truc met het ei

eco-evo-devo


Genen
Omgeving
G x O

[epigenetica]

**Interactie met omgeving**

# Gedrag: genen of omgeving?

## De truc met het ei

eco-evo-devo

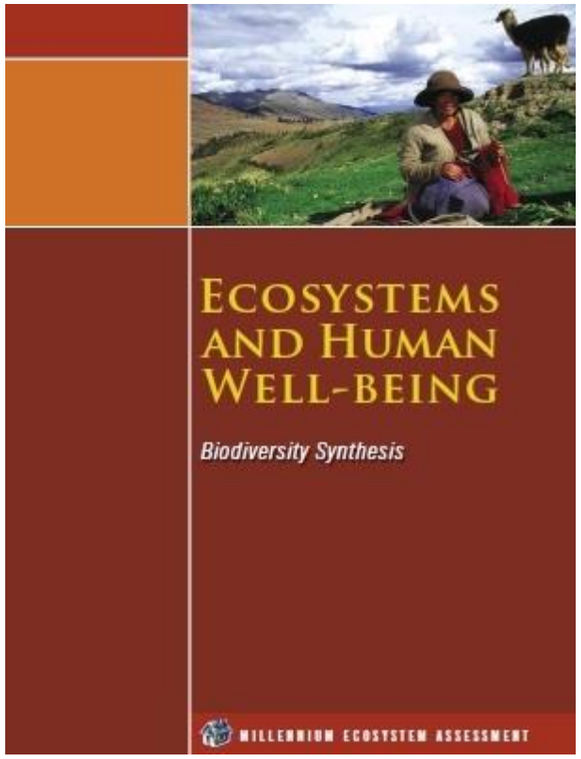

Genen
Omgeving
G x O

[epigenetica]

**Interactie met omgeving**

# Biodiversiteit als dienstencentrum

## [Ecosysteemdiensten]




[2005]

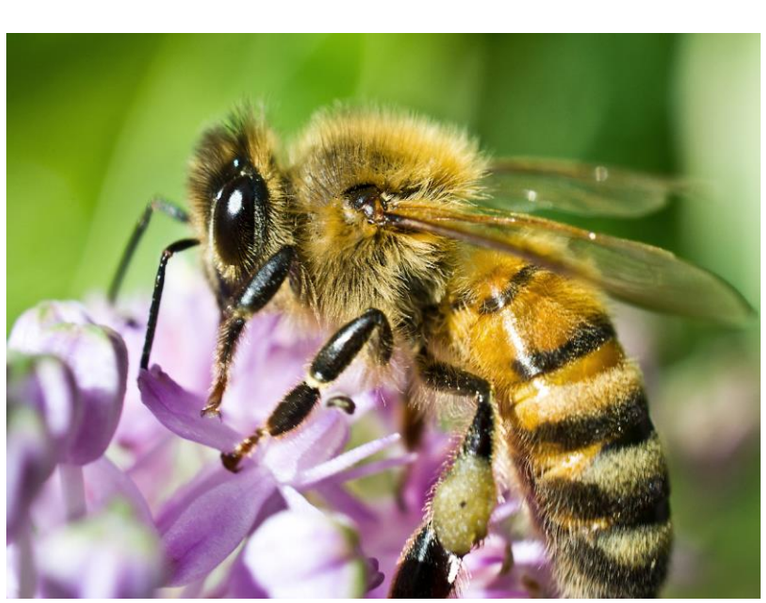

Review

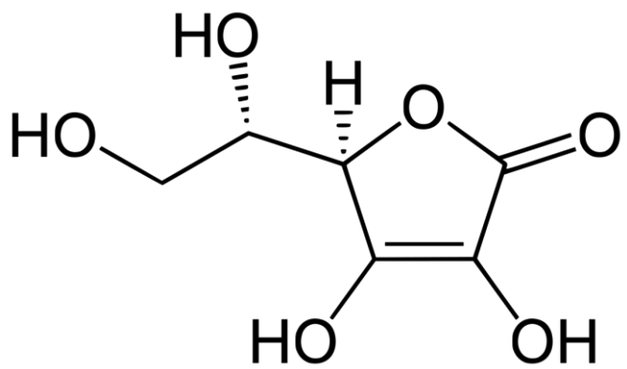
Cell PRESS

# Global pollinator declines: trends, impacts and drivers

Simon G. Potts[1], Jacobus C. Biesmeijer[2], Claire Kremen[3], Peter Neumann[4], Oliver Schweiger[5] and William E. Kunin[2]

[*Trends in Ecology & Evolution (2010)* 25: 345-353]






Ascorbinezuur
(vitamine C)

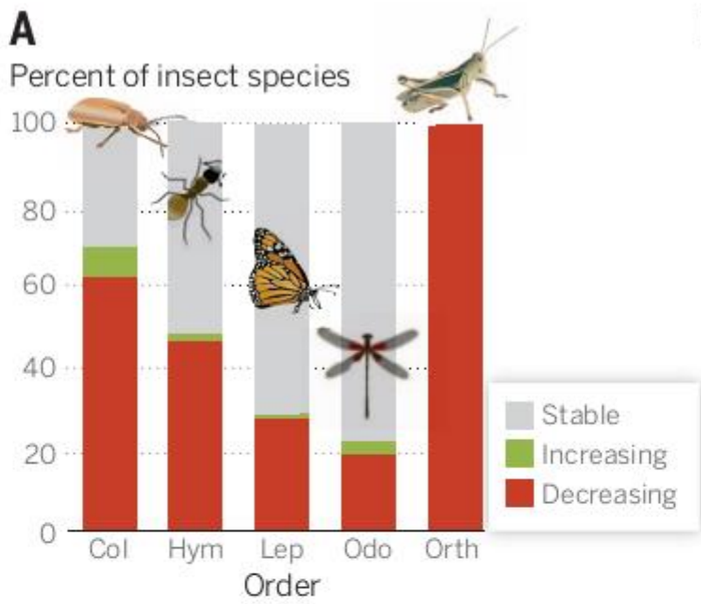
REVIEW

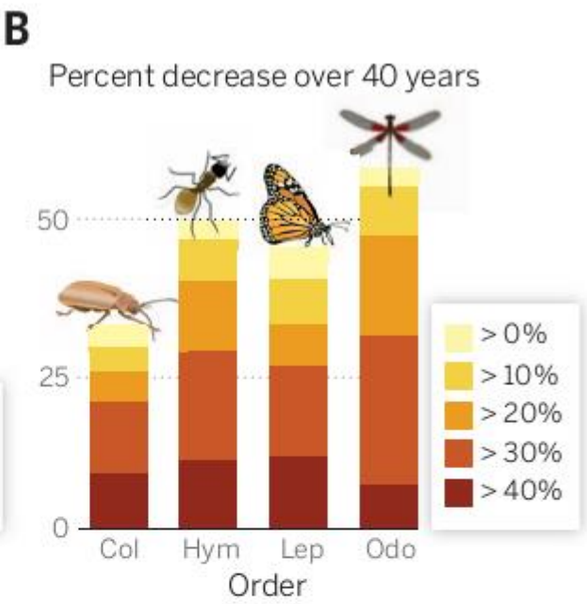
# Defaunation in the Anthropocene

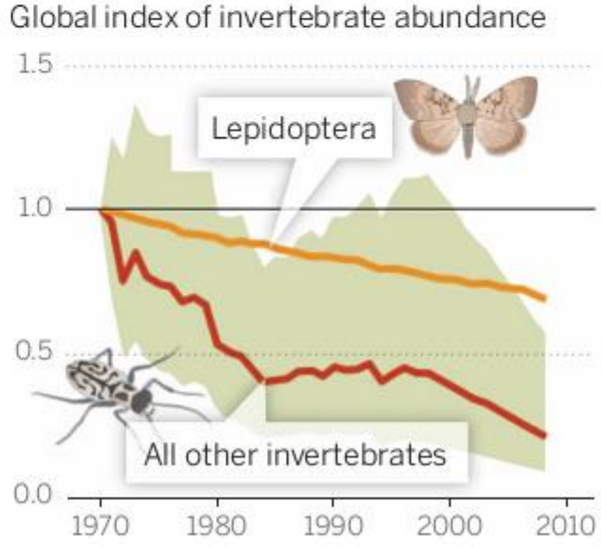
**Rodolfo Dirzo,[1]* Hillary S. Young,[2] Mauro Galetti,[3] Gerardo Ceballos,[4] Nick J. B. Isaac,[5] Ben Collen[6]**

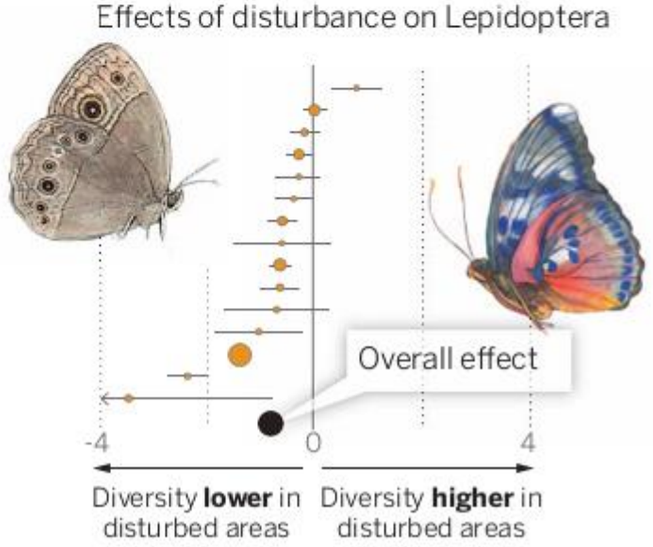
*Science* (2014)
345: 401-406

**Fig. 1. Evidence of declines in invertebrate abundance.** (**A**) Of all insects with IUCN-documented population trends, 33% are declining, with strong variation among orders (*19*). (**B**) Trends among UK insects (with colors indicating percent decrease over 40 years) show 30 to 60% of species per order have declining ranges (*19*). (**C**) Globally, a compiled index of all invertebrate population declines over the past 40 years shows an overall 45% decline, although decline for Lepidoptera is less severe than for other taxa (*19*). (**D**) A meta-analysis of effects of anthropogenic disturbance on Lepidoptera, the best-studied invertebrate taxon, shows considerable overall declines in diversity (*19*).




# Functionele biodiversiteit

Beperkte aandacht in klassieke natuurbehoud



Het belang van « lelijkaards »:
schimmels, bacteriën, wormen, …

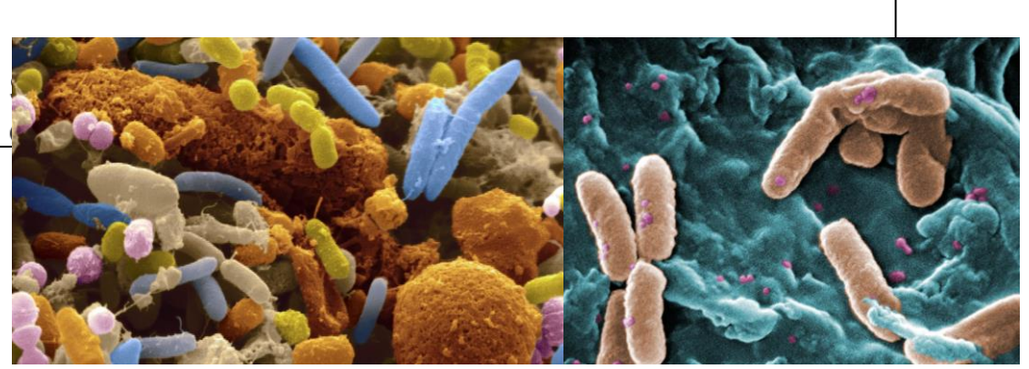
# Samenwerking met micro-organismen

*Genes, Brain and Behavior (2014)* ***13:*** *69–86* doi: 10.1111/gbb.12109

Review

## Microbial genes, brain & behaviour – epigenetic regulation of the gut–brain axis

R. M. Stilling[†], T. G. Dinan[†,‡] and J. F. Cryan[†,§,*]



→« Gut feeling »

→Menselijk lichaam als microbieel ecosysteem

→Nood aan andere kijk op bacteriën

# The Microbiome of the Built Environment and Human Behavior: Implications for Emotional Health and Well-Being in Postmodern Western Societies

C.E. Stamper*, A.J. Hoisington[†,‡], O.M. Gomez*, A. L. Halweg-Edwards[§], D.G. Smith*, K.L. Bates[†], K.A. Kinney[‡,¶], T.T. Postolache[‡,‖,#,**], L.A. Brenner[‡,**,††], G.A.W. Rook[‡‡], C.A. Lowry*[,‡,**,††,1]

[*International Review of Neurobiology* (2016) 131: 289-323]

→ « The built environment is deficient  in terms of both biomass and biodiversity of environmental microbes that are found in the outdoor environment in which humans evolved. »

→ « It is increasingly evident that inflammation is an important determinant of cognitive function and emotional behaviors that are dysregulated in stress-related psychiatric disorders. »

# Naar een holistische kijk op gezondheid

## [ Naar een biodiverse kijk ]

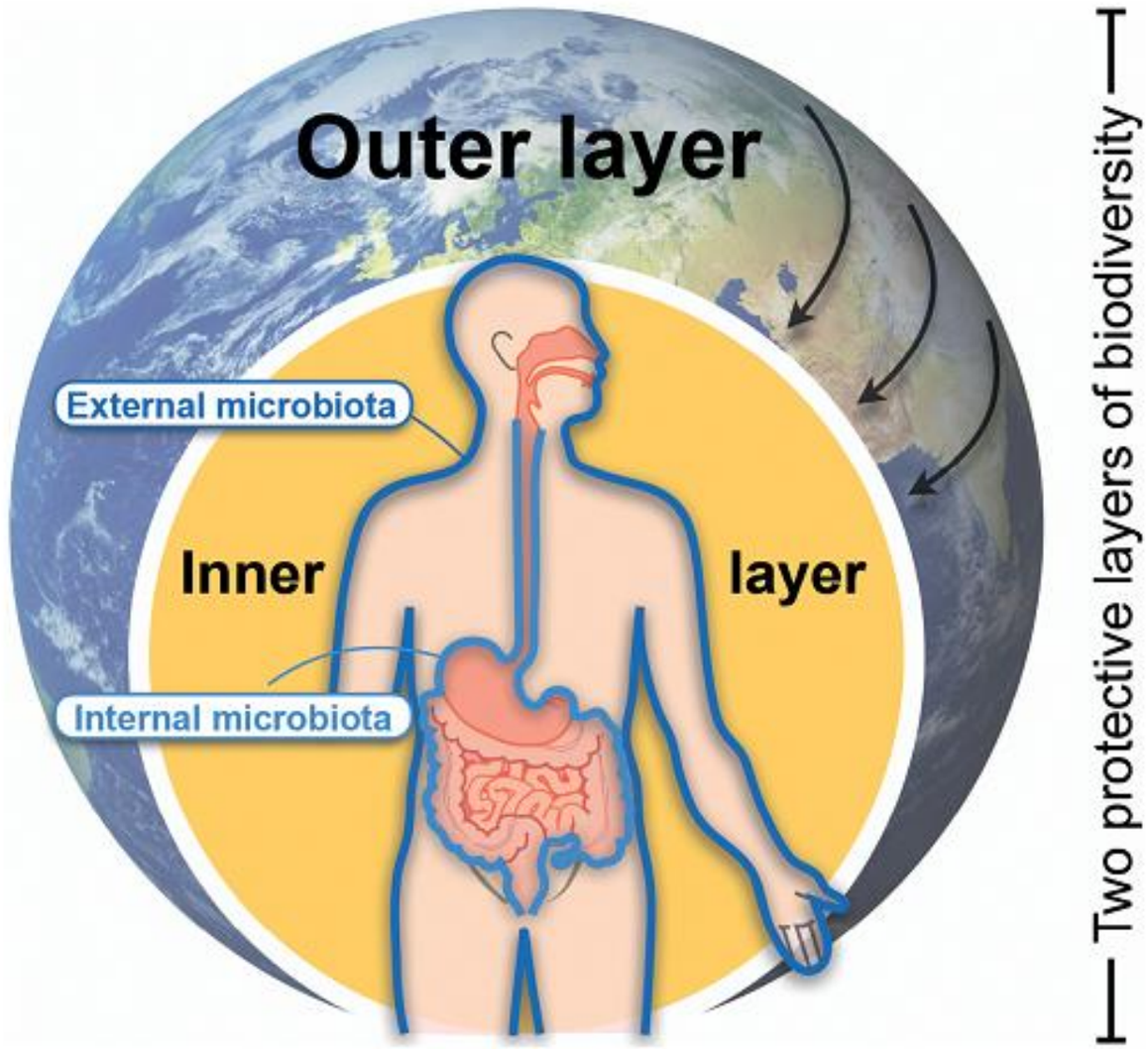



**Fig. 1.** We (humans) are protected by two nested layers of biodiversity, consisting of bacteria (and other micro-organisms) residing in our bodies (both on the external and internal surfaces) and the one surrounding us in the environment we live in. The diversity and composition of the inner layer is dependent on microbial colonisation from the outer layer; a process that is under the influence of our behaviour, lifestyle, environmental management, land-use planning, etc.

**[Ruokolainen L. et al. 2017. *Ann. Zool. Fennici* 54: 39-49]**

# Biodiversiteit → Mens

Ilkka Hanski

109 (2012): 8334-8339

## Environmental biodiversity, human microbiota, and allergy are interrelated

Ilkka Hanski[a,1], Leena von Hertzen[b], Nanna Fyhrquist[c], Kaisa Koskinen[d], Kaisa Torppa[a], Tiina Laatikainen[e], Piia Karisola[c], Petri Auvinen[d], Lars Paulin[d], Mika J. Mäkelä[b], Erkki Vartiainen[e], Timo U. Kosunen[f], Harri Alenius[c], and Tari Haahtela[b,1]

[a]Department of Biosciences, University of Helsinki, FI-00014 Helsinki, Finland; [b]Skin and Allergy Hospital, Helsinki University Central Hospital, FI-00029 Helsinki, Finland; [c]Finnish Institute of Occupational Health, FI-00250 Helsinki, Finland; [d]Institute of Biotechnology, University of Helsinki, FI-00014 Helsinki, Finland; [e]National Institute for Health and Welfare, FI-00271 Helsinki, Finland; and [f]Department of Bacteriology and Immunology, Haartman Institute, University of Helsinki, FI-00014 Helsinki, Finland

Contributed by Ilkka Hanski, April 4, 2012 (sent for review March 14, 2012)

Science of the Total Environment 571 (2016) 680–687

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

## Urban greenness influences airborne bacterial community composition

Gwynne Mhuireach [a,b,c,d,*], Bart R. Johnson [a,b], Adam E. Altrichter [c], Joshua Ladau [e], James F. Meadow [c], Katherine S. Pollard [e,f], Jessica L. Green [c]

SCIENTIFIC REPORTS

OPEN

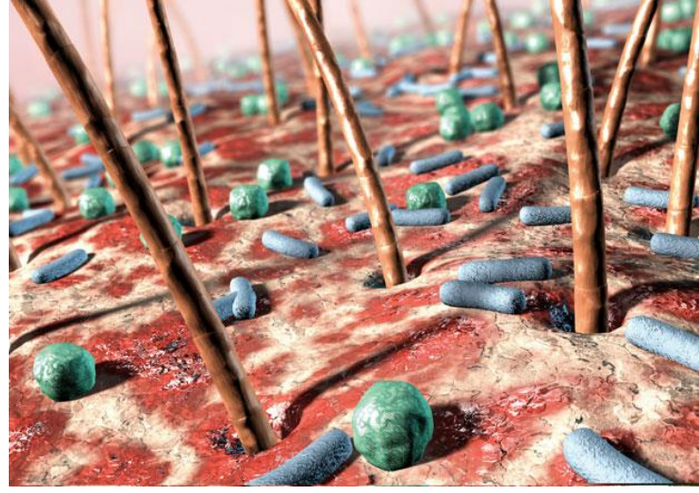
# Urban environment predisposes dogs and their owners to allergic symptoms

Emma Hakanen[1], Jenni Lehtimäki[1], Elina Salmela[2,3], Katriina Tiira[2,3], Johanna Anturaniemi[4], Anna Hielm-Björkman[4], Lasse Ruokolainen[1] & Hannes Lohi[2,3]

Received: 20 June 2017
Accepted: 11 January 2018
Published online: 25 January 2018

Our companion-animals, dogs, suffer increasingly from non-communicable diseases, analogous to those common in humans, such as allergic manifestations. In humans, living in rural environments is associated with lower risk of allergic diseases. Our aim was to explore whether a similar pattern can be found in dogs, using a nation-wide survey in Finland ($n = 5722$). We characterised the land-use around dog's home at the time of birth as well as around its current home, and described several lifestyle factors. The severity of owner-reported allergic symptoms in dogs was estimated with a comprehensive set of questions, developed by experts of canine dermatology. Also, the prevalence of diagnosed allergies in dog owners was recorded. The results indicate that allergic symptoms are more prevalent in urban environments both in dog owners and in dogs (accounting the effect of dog breed). Several factors related to rural living, such as bigger family size and regular contact with farm animals and other pets, were also protective against allergic symptoms in dogs. Interestingly, allergic dogs were more likely to have allergic owners than healthy dogs were. Therefore, we suggest that the mutual presence of allergic symptoms in both species indicates common underlying causal factors of allergic diseases.

[2018]



SCIENTIFIC REPORTS

OPEN

Received: 01 November 2016
Accepted: 28 February 2017
Published: 31 March 2017

# Patterns in the skin microbiota differ in children and teenagers between rural and urban environments

Jenni Lehtimäki[1], Antti Karkman[1], Tiina Laatikainen[2], Laura Paalanen[2], Leena von Hertzen[3], Tari Haahtela[3], Ilkka Hanski* & Lasse Ruokolainen[1]

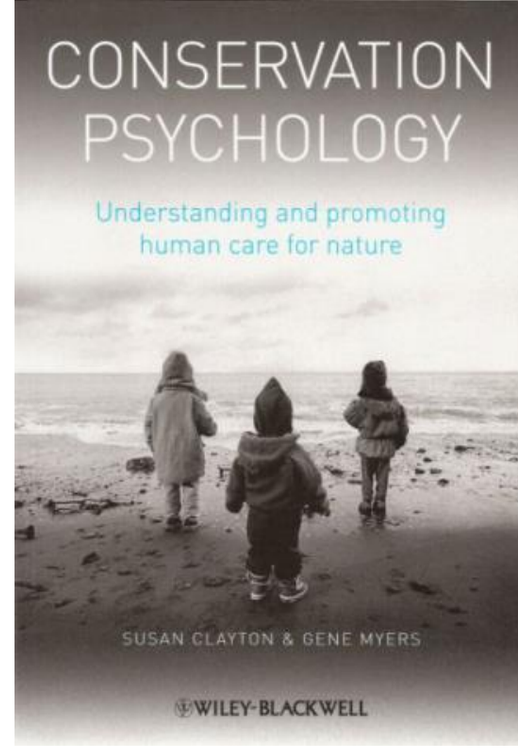
The composition of human microbiota is affected by a multitude of factors. Understanding the dynamics of our microbial communities is important for promoting human health because microbiota has a crucial role in the development of inflammatory diseases, such as allergies. We have studied the skin microbiota of both arms in 275 Finnish children of few months old to teenagers living in contrasting environments. We show that while age is a major factor affecting skin microbial composition, the living environment also discriminates the skin microbiota of rural and urban children. The effect of environment is age-specific; it is most prominent in toddlers but weaker for newborns and non-existent for teenagers. Within-individual variation is also related to age and environment. Surprisingly, variation between arms is smaller in rural subjects in all age groups, except in teenagers. We also collected serum samples from children for characterization of allergic sensitization and found a weak, but significant association between allergic sensitization and microbial composition. We suggest that physiological and behavioral changes, related to age and the amount of contact with environmental microbiota, jointly influence the dynamics of the skin microbiota, and explain why the association between the living environment skin microbiota is lost in teenager.

[2017]

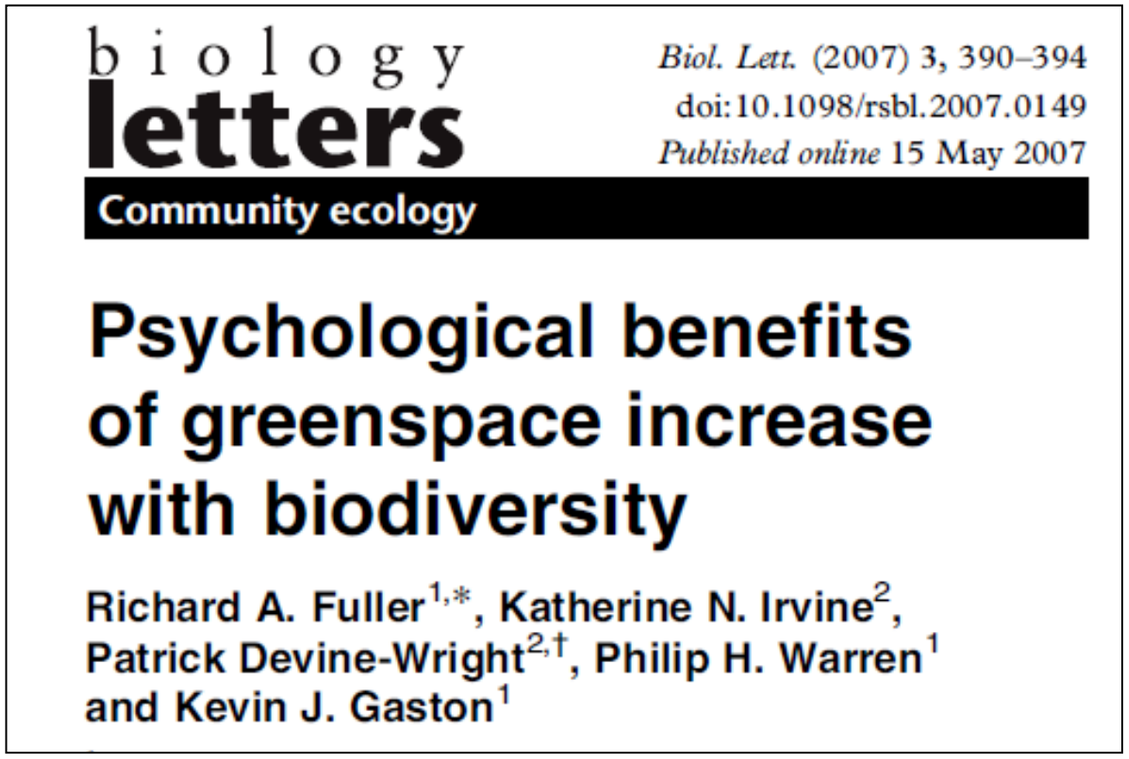
# Biodiversiteit & psychologie

→ Naast fysieke ook psychische invloed

→ Zingtuiglijke prikkels




[2012]



biology letters

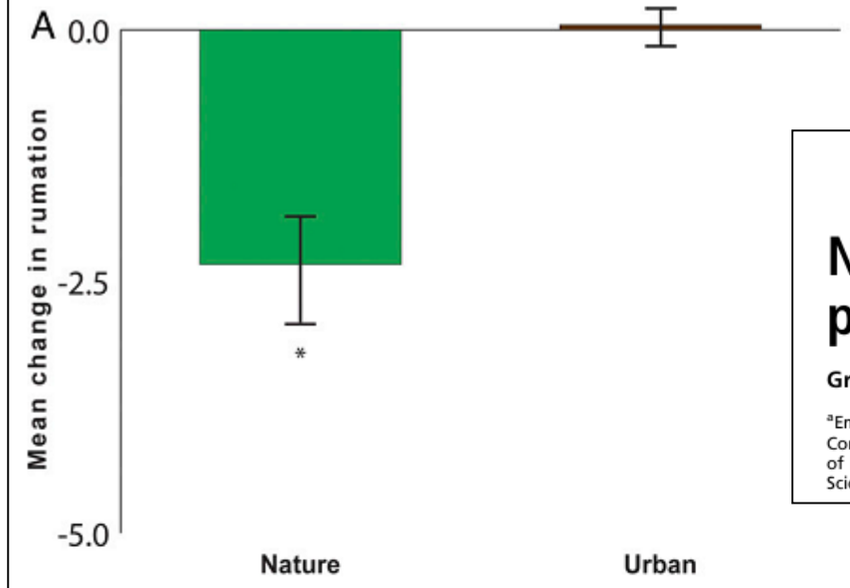
*Biol. Lett.* (2007) 3, 390–394
doi:10.1098/rsbl.2007.0149
*Published online* 15 May 2007

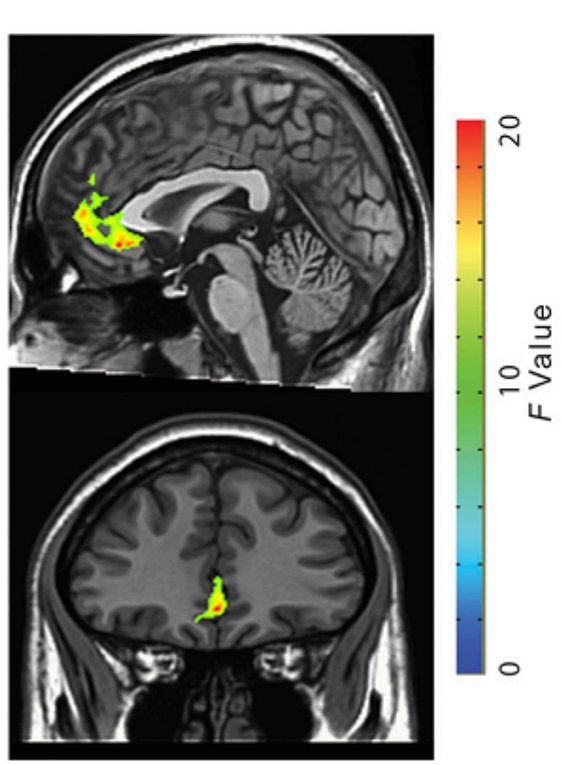
Community ecology

**Psychological benefits of greenspace increase with biodiversity**

Richard A. Fuller[1,*], Katherine N. Irvine[2], Patrick Devine-Wright[2,†], Philip H. Warren[1] and Kevin J. Gaston[1]

→ "Restoration of stress"



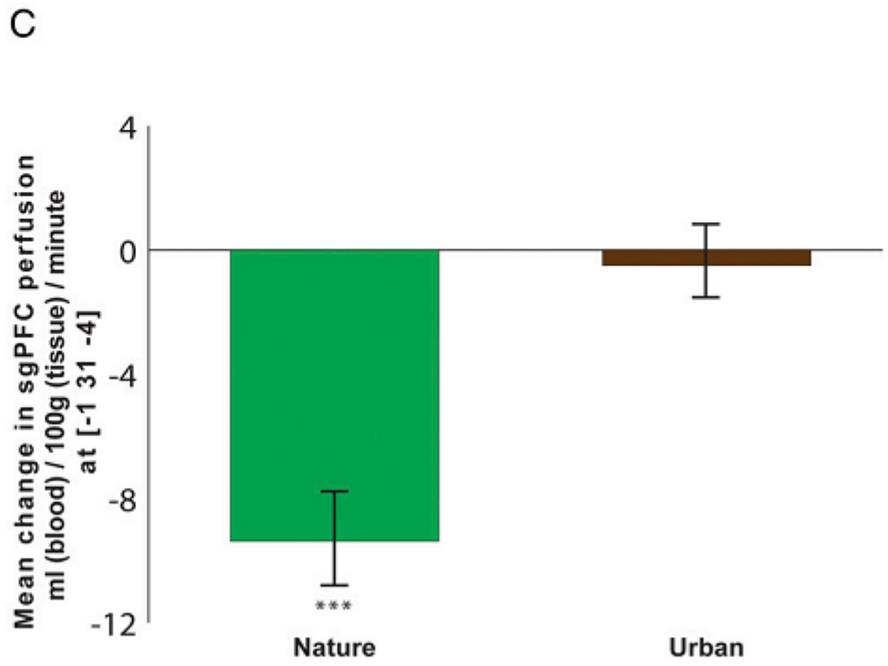




**Fig. 1.** The impact of nature experience on self-reported rumination and blood perfusion to the sgPFC. (*A*) Change in self-reported rumination (postwalk minus prewalk) for participants randomly assigned to take a 90-min walk either in a natural setting or in an urban setting. (*B*) A time-by-environment interaction in blood perfusion was evident in the sgPFC. *F* map of significant interactions at a threshold of $P < 0.05$, FWE corrected for multiple comparisons. (*C*) Change in blood perfusion (postwalk minus prewalk) for participants randomly assigned to take a 90-min walk either in a natural setting or in an urban setting. Error bars represent SE within subjects: $*P < 0.05$, $***P < 0.001$.

CrossMark click for updates

# Nature experience reduces rumination and subgenual prefrontal cortex activation

Gregory N. Bratman[a,1], J. Paul Hamilton[b], Kevin S. Hahn[c], Gretchen C. Daily[d,e,1], and James J. Gross[c]

[a]Emmett Interdisciplinary Program in Environment and Resources, Stanford University, Stanford, CA 94305; [b]Laureate Institute for Brain Research, School of Community Medicine, Tulsa, OK 74136; [c]Department of Psychology, Stanford University, Stanford, CA 94305; [d]Center for Conservation Biology, Department of Biology, and Woods Institute, Stanford University, Stanford, CA 94305; and [e]Global Economic Dynamics and the Biosphere, Royal Swedish Academy of Sciences, and Stockholm Resilience Centre, Stockholm 114 18, Sweden

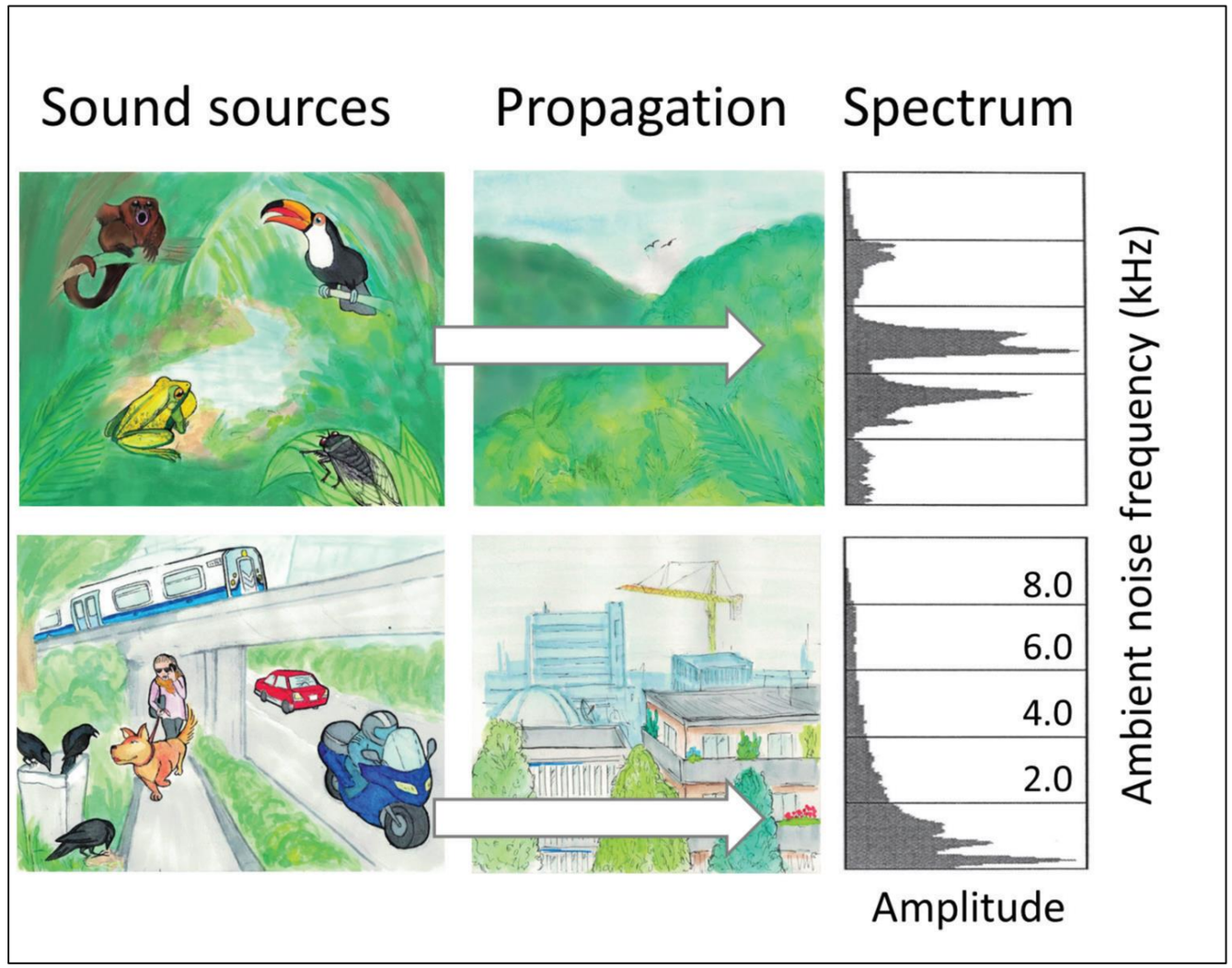
PNAS

112 (**2015**): 8567-8572

# Fundamentele veranderingen in leefmilieu

Lichtvervuiling

Artificial Light at Night (ALAN)

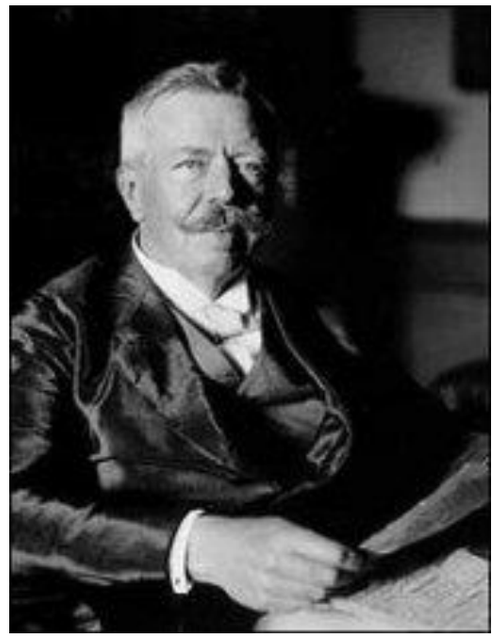



Geluidsverandering

Stilte- lawaai / soundscape

# « Umwelt »-concept

- “Umwelt”: de specifieke zintuigelijke belevingswereld van een organisme (soort/individu)
- Oud idee uit de ethologie



Jakob J. von Uexküll (1864-1944)

- Omgeving – informatie – signalen
- Resultaat van evolutie en ontwikkeling van organisme
- Belang voor organismen en natuurbehoud

[Van Dyck 2012. *Evol. Appl.*]

**[1909]**

Journal of Environmental Psychology 38 (2014) 1–9

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep

# The influence of urban green environments on stress relief measures: A field experiment

Liisa Tyrväinen [a], Ann Ojala [a,*], Kalevi Korpela [b], Timo Lanki [c], Yuko Tsunetsugu [d], Takahide Kagawa [d]

**Fig. 1.** Subjects filling in the questionnaires in Alppipuisto (urban park).

**Fig. 3.** Viewing session in Helsinki city centre.

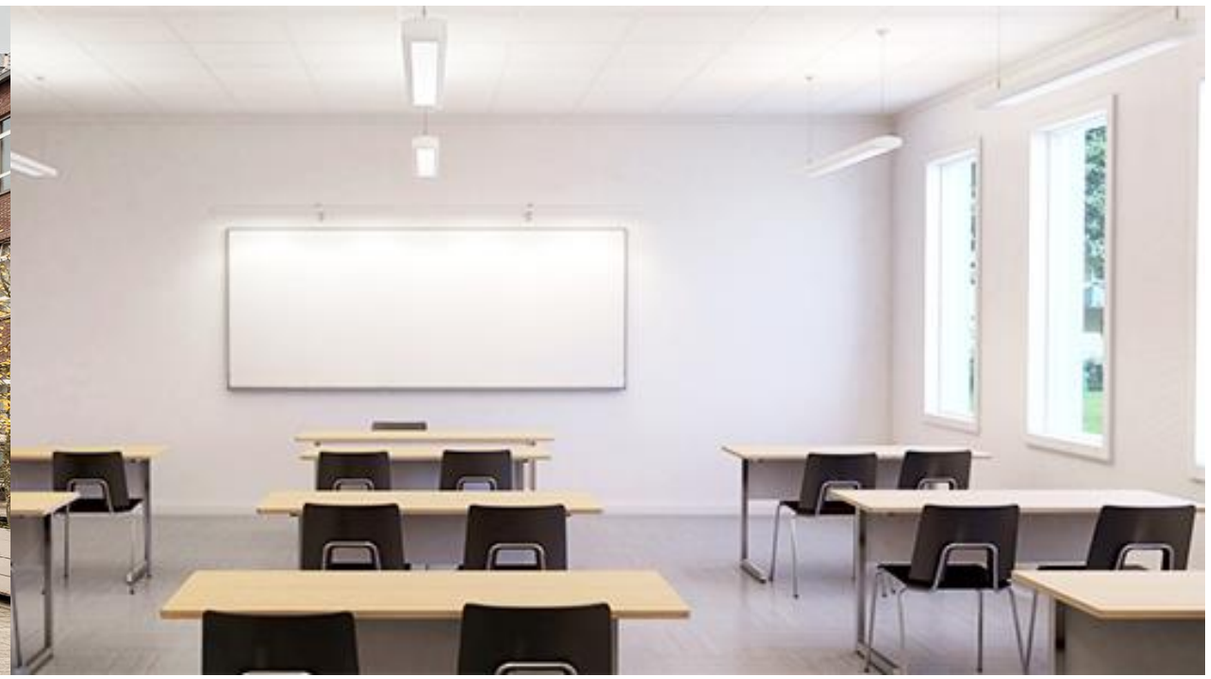
# School als onderdeel van een functioneel habitat

[112 (2015): 7937-7942]

PNAS

## Green spaces and cognitive development in primary schoolchildren

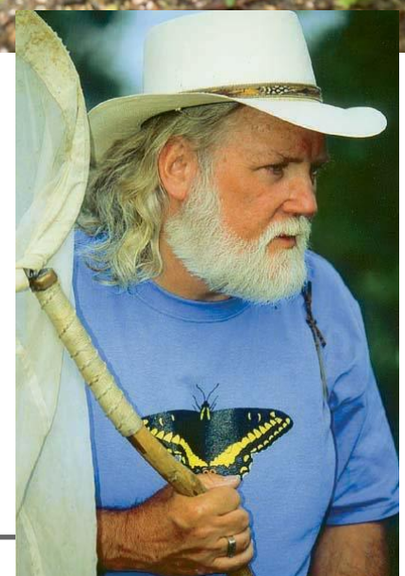
Payam Dadvand[a,b,c,1], Mark J. Nieuwenhuijsen[a,b,c], Mikel Esnaola[a,b,c], Joan Forns[a,b,c,d], Xavier Basaga
Mar Alvarez-Pedrerol[a,b,c], Ioar Rivas[a,b,c,e], Mónica López-Vicente[a,b,c], Montserrat De Castro Pascual[a,b,
Michael Jerrett[g], Xavier Querol[e], and Jordi Sunyer[a,b,c,h]



# Als natuurcontact zeldzaam wordt…

[Soga M. & Gaston K.J. 2016. Extinction of experience: the loss of human-nature interactions. *Front. Ecol. Environm*. 14: 94-101]

**Extinction of experience** syndroom
Robert (‘Bob’) Pyle



# Nood aan natuurcontact: sociale dimensie

“We found that people with less local greenspace, and those living in more deprived neighbourhoods were more likey to be categorised as infrequent visitors of natural environments”

[Boyd F. et al. 2018. *Landscape and Urban Planning* 175: 102-113]

# Idee van « enrichment »

Psychologische verrijking van een uitgeklede omgeving

dS De Standaard

Meest recent Binnenland Buitenland Opinie Economie Cultuur Sport Life&Style Beroemd&Bizar Meer ▼

Abon

‘Negentig minuten wandelen in de natuur leidt tot meer rust in de hersenen.’ © Fred Debrock

# Verrijk onze mensenkooi

We hebben van Joke Schauvliege wel wat meer speelbos gekregen, maar Hans Van Dyck mist vooral natuur en biodiversiteit in het Vlaanderen waar geen boswachters rondlopen. Geef de stedeling

[Opiniestuk De Standaard 30/12/2017]

# Biodiversiteit & menselijke gezondheid

Evidence-based reviews

- CBD-WHO 2015
- The Lancet 2015
- WHO 2016
- IEEP 2016
- WHO217
- IPBES 2018

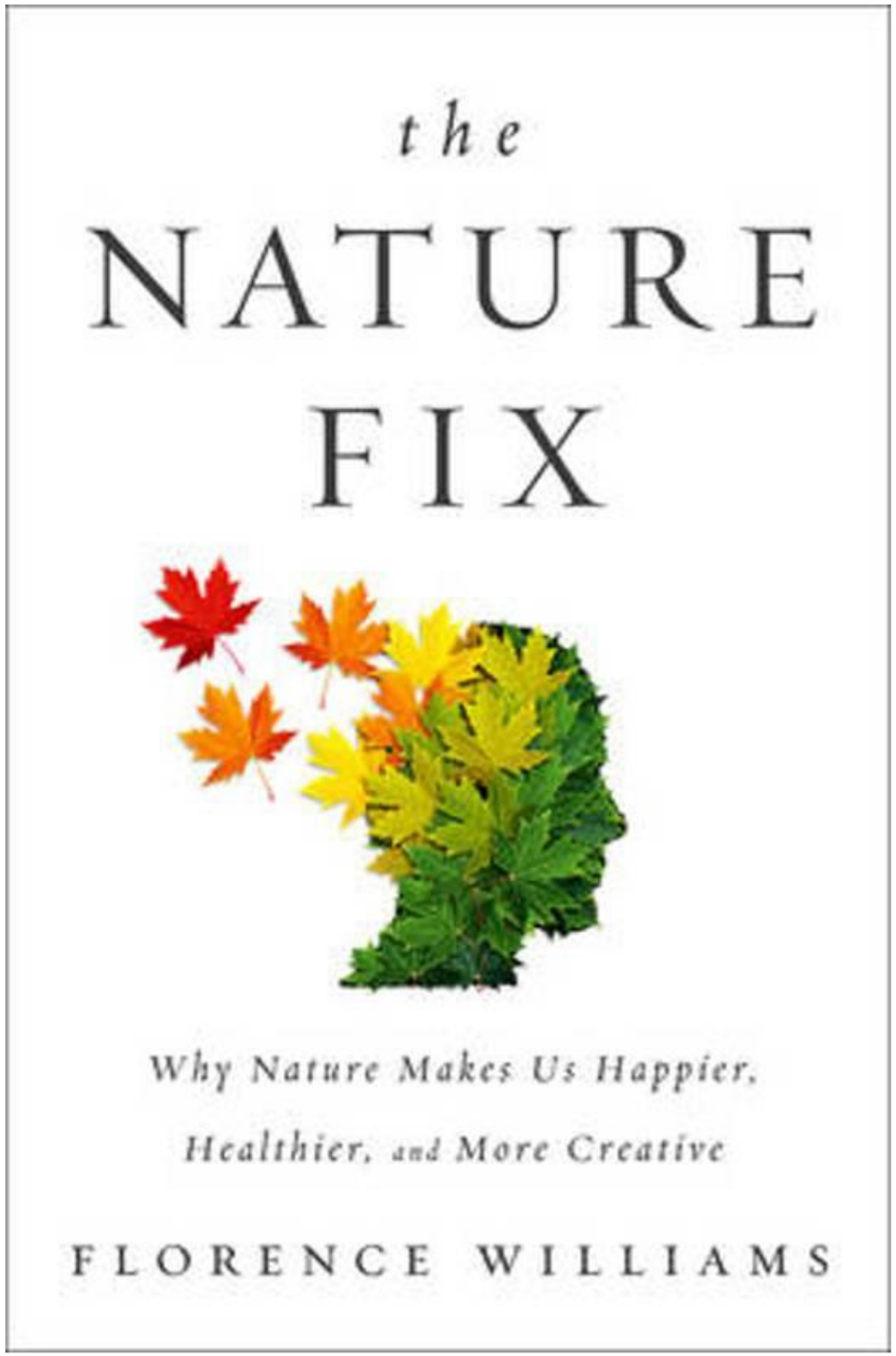
Convention on Biological Diversity

World Health Organization

Institute for European Environmental Policy

ipbes
Science and Policy for People and Nature

Hoge Gezondheidsraad
Conseil Supérieur de la Santé


the
NATURE
FIX
Why Nature Makes Us Happier,
Healthier, and More Creative
FLORENCE WILLIAMS

[2017]

Omgevingsstimuli

- Abiotisch
- Biotisch
- Sociaal


Bewust/onbewust

Fysiek/Psychisch

Darmflora/Ecosysteem

Genen – Milieu – Genen x Milieu

| Land | Aantal inwoners/ km² (in 2014) |
|---|---|
| | |
| Nederland | 406 |
| België | 342 |
| U.K. | 261 |
| Duitsland | 226 |
| Italy | 204 |
| Denemarken | 129 |
| Frankrijk | 102 |
| Spain | 94 |
| Sweden | 21 |
| Finland | 15 |
| Norway | 15 |

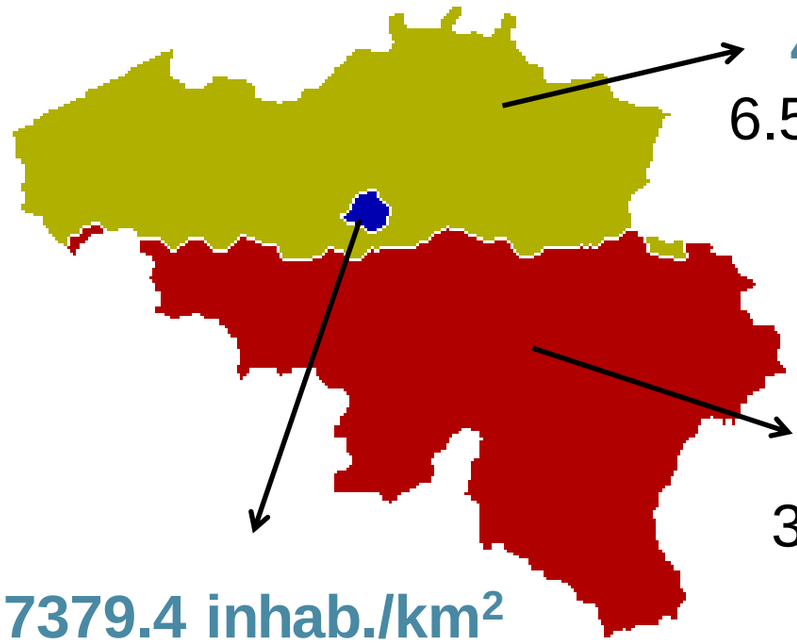
dS De Standaard Meest recent Binnenland Buitenland Opinie Economie Cultuur Spor

HOME > NIEUWS > BINNENLAND

## België steeds meer verstedelijkt

03/08/2007 om 00:00 door svh | Bron: belga

**27/01/2018** **372.0 inhabitants/km²**




- In 2015 is 27,2 % oppervlakte Vlaanderen bebouwd
- Toename met 28% t.o.v. 1990

# Nieuwe kijk op belang natuurgebied, speelbos, stadsplanning & ‘betonstop’

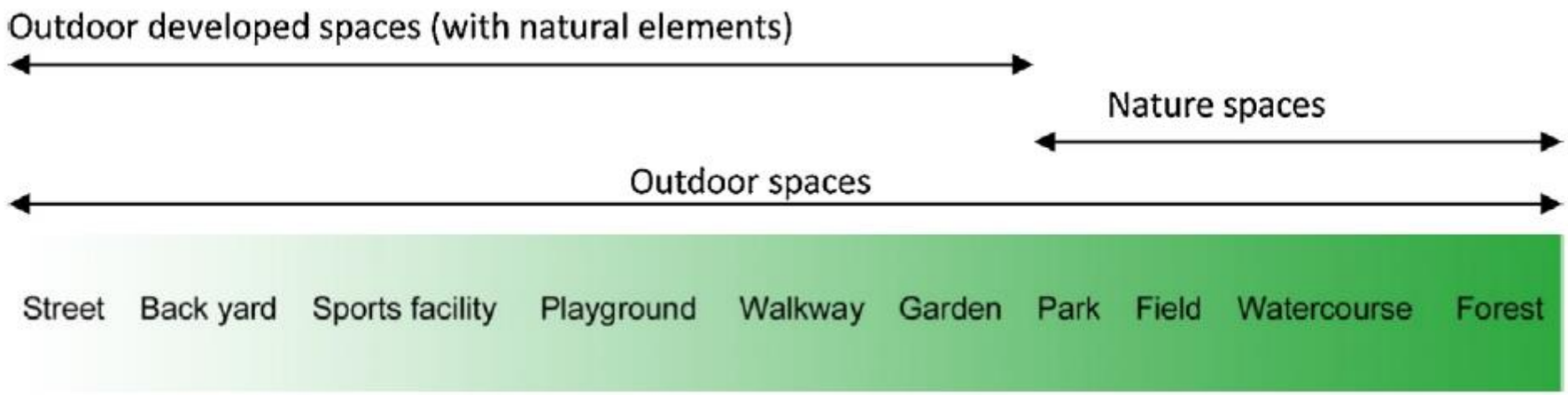



**Fig. 1.** Play environment along the nature continuum with examples of typical outdoor spaces nearby home.

Contents lists available at ScienceDirect

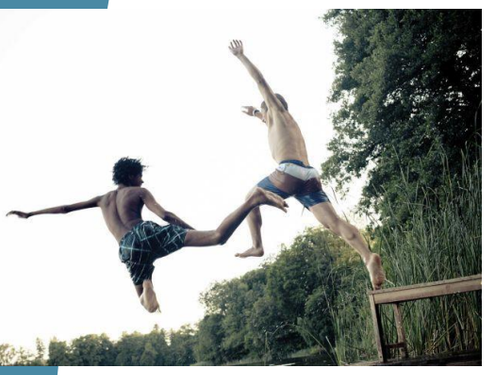
Urban Forestry & Urban Greening

journal homepage: www.elsevier.com/locate/ufug

Children and nearby nature: A nationwide parental survey from Norway

V. Gundersen[a,*], M. Skår[a], L. O’Brien[b], L.C. Wold[a], G. Follo[c]

17 (2016):116-125



# Take home messages

- Biodiversiteitscrisis + urbanisatie
  = minder natuurcontact

- Minder natuurcontact = ingrijpende verandering voor *H. sapiens* (fysieke & mentale gezondheid)

- Rol microbiële biodiversiteit

- Omgevingspsychologie doorheen een biologische lens

- Creativiteit en innovatie voorbij klassieke hokjes
  → Functioneel leefgebied voor jonge en minder jong soortgenoten

# Dank voor uw aandacht