



Hvordan arbeider forskere egentlig?

I økologi og evolusjon

Min forskning

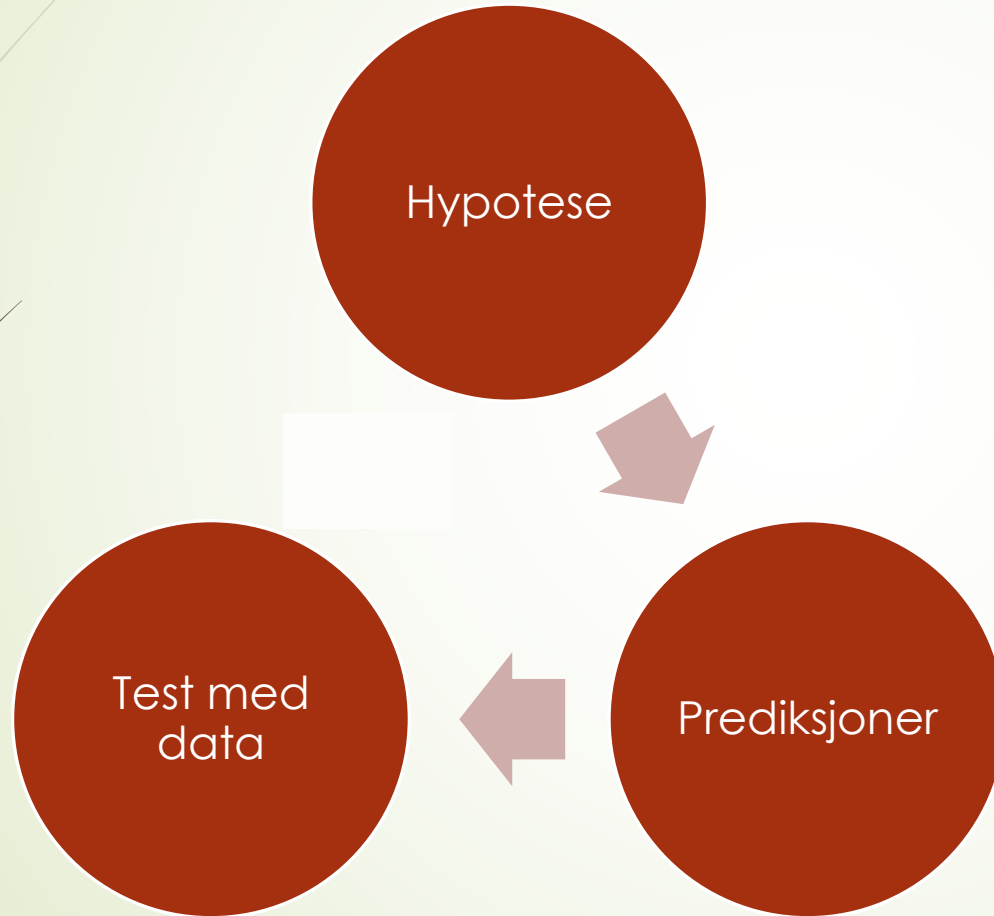
Verden og miljøet dyra bor i forandrer seg hele tiden
–hvordan skal de best takle det?

- Feltarbeid
 - observasjoner
 - Eksperiment
- Teori
 - Se sammenhenger
 - Bygge modeller



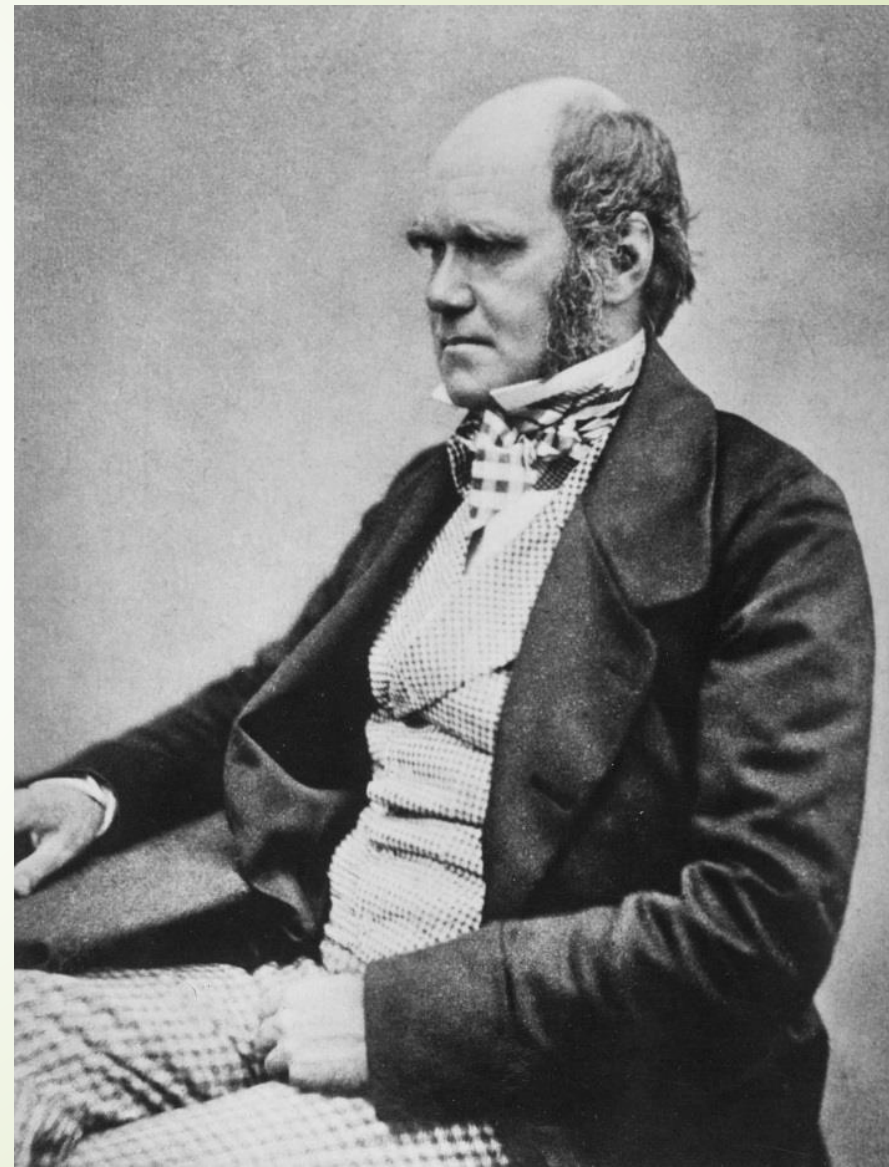
```
40 Highest <- array(0,dim=c(length(I),No,No)) # Tom vektor I over inv
41
42 RHS <- array(0,dim=c(Nm,2)) # Tom vektor I over inv
43
44 #Fitness function---
45 FITNESS <- I.No #maybe this should be xi instead of I??? If so needs moving
46 Investo=I.No #maybe this should be xi instead of I??? If so needs moving
47 For(Mqual in 1:Nm) {
48   Cost <- Cb(Mqual)*(I+cc(Mqual))*Cpars[2,Mqual]*(I+cc(Mqual))+ca(Mqual)-1
49   Cost <- Cb(Mqual)*Investo*1.5 #No:ca(Mqual)#No #change which one you hashtag out!
50   Cost <- X.Cost
51   Lower <- min(Floor(xi),xmax)
52   Upper <- min(Lower+1,xmax)
53   p2 <- 1-p2
54   p1 <- 1-p1
55   if(Lower>xcrit) {
56     Lfood <- min(Lower-y,xmax)
57     Ufood <- min(Upper-y,xmax)
58     Fut <- p1*alpha*Lower*(Lambda*(F.vectors[Lfood,2,2]*pm[2] + F.vectors[Ufood,2,2]*pm[2] + F.vectors[Lfood,2,3]*pm[3])+(1-lambda)*(F.vectors[Lower,2,1]*pm[1] + F.vectors[Ufood,2,3]*pm[3])+(1-lambda)*(F.vectors[Upper,2,1]*pm[1] + F.vectors[Ufood,2,3]*pm[3])) #Linear offspring fitness for use in scenario Benelev, Benslope, Costpos #change which one you hashtag!
59     #need to make fitness 0 if there is 0 investment
60     woff <- wb(Mqual)*(Investo-wc(Mqual))*wpars[4,Mqual]) #offspring fitness function for use in s
61     if(x==0) {
62       woff <- 0
63     } else {
64       woff <- wpars[2,Mqual]+(wpars[1,Mqual]*wpars[2,Mqual])/(1+exp(-wpars[3,Mqual])) #offspring fitness function for use in s
65     }
66     w(Mqual) <- woff*No-Fut #awa(Mqual)
67   } else {
68     w(Mqual) <- 0
69   }
70 }
71 return(w)
72
73 #Program---
74 OVER_INV <- function(X,xcrit,I,xmax,xmin,y,lamba,alpha,F.vectors) {
75   for(i in 1:length(2)) {
76     for(N in 1:No) {
77       RHS[i,N] <- FITNESS(X,N,xcrit,I[i],xmax,xmin,y,lamba,alpha,F.vectors)
78     }
79   }
80   for(j in 1:Nm) {
81     F.vectors[X,1,j] <- max(RHS[,j]) #the highest w value
82     Highest[j] <- which(RHS[,j]==max(RHS[,j]), arr.ind = TRUE)[1,] #The Inv that gave the highest w value, just pick lowest investment if there are several that
```

Forskningsprosessen

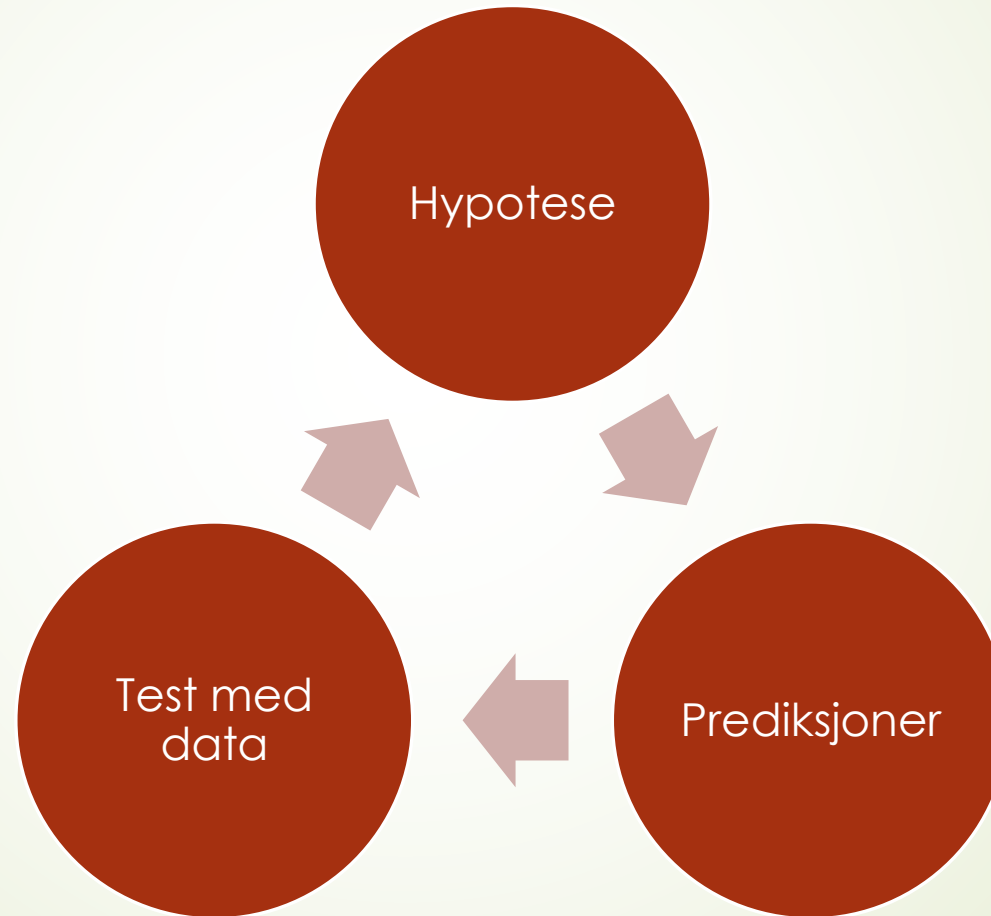


Men er det
så enkelt?

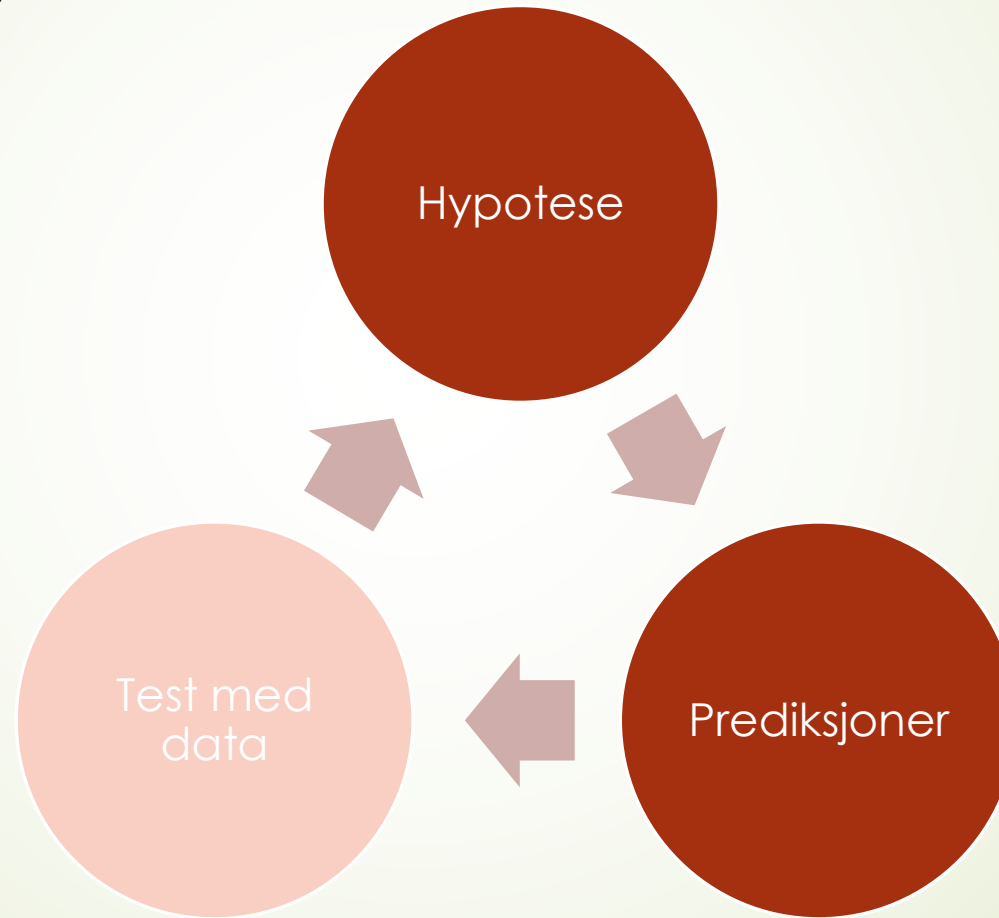
Biologisk forskning i «gamle dager»



Hvilken rolle spiller modeller i økologi og evolusjon?



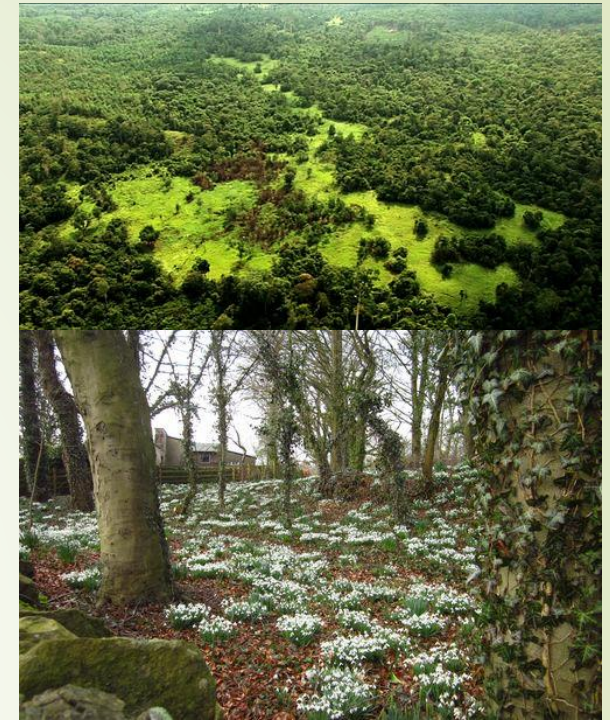
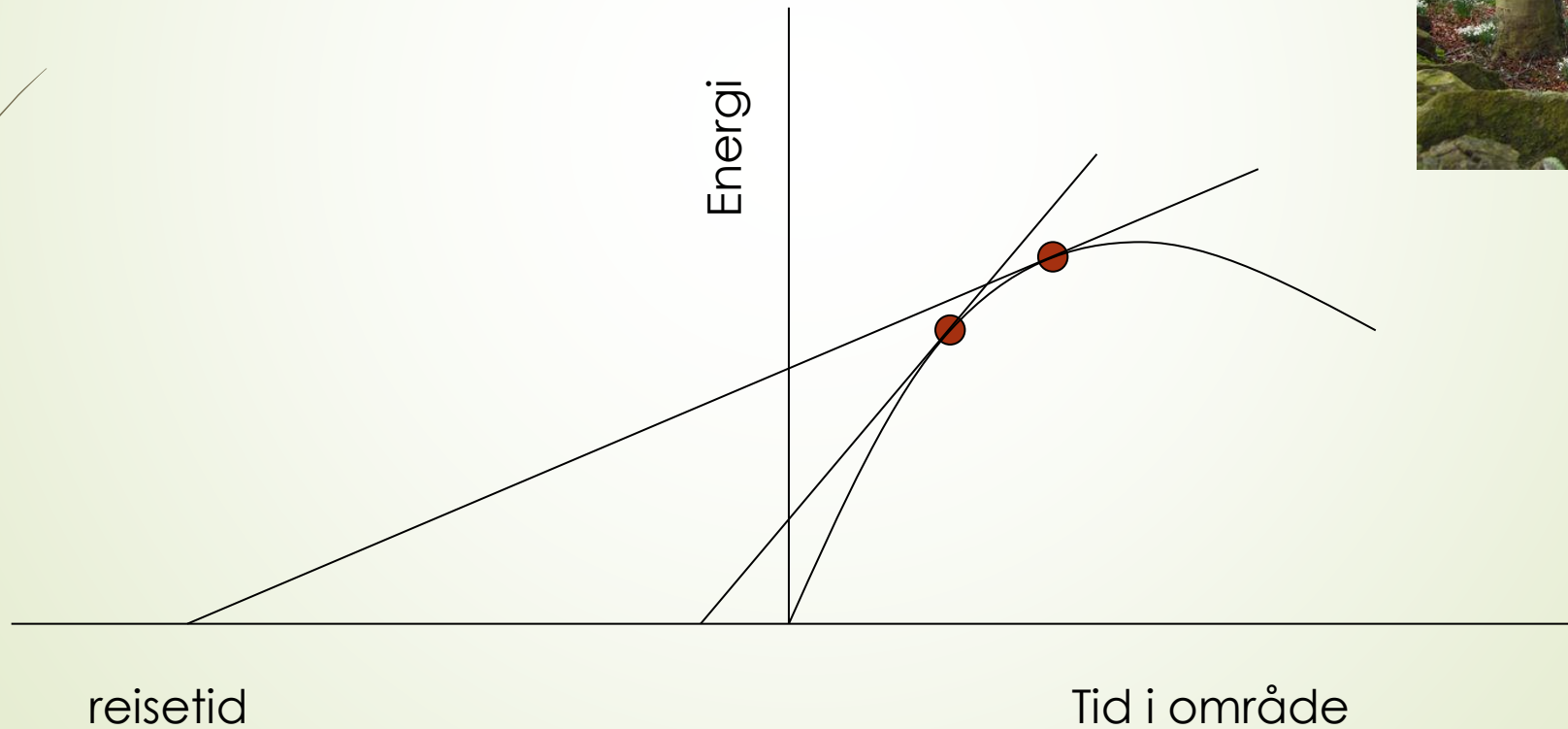
Hvilken rolle spiller modeller i økologi og evolusjon?



Verbale modeller

Kanteffekter reduserer populasjonsveksten i populasjoner som befinner seg i områder med kanter som er lange i forhold til det indre arealet

Grafiske modeller



Matematiske modeller

Analytiske løsninger

Terninger har n sider, alle har lik sannsynlighet for å havne opp, så sannsynligheten for hver side er $1/n$. (Når det er 6 sider, er sannsynligheten for en 6-er $1/6$)



Simuleringer

Kast terningen 10 000 ganger.
Nummer 6 er observert 1613 ganger
Sannsynlighetsestimat er $1613/10000 = 0,1613 \sim 1/6$

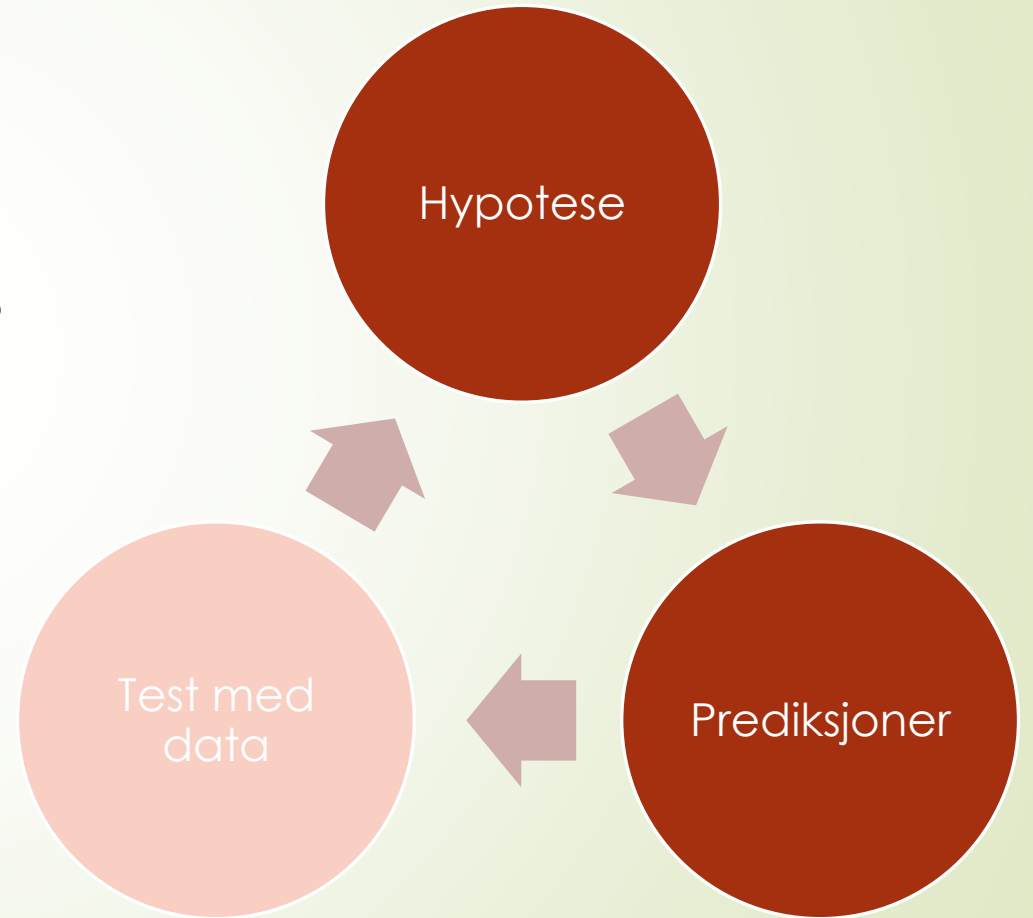


Numeriske løsninger

En normal terning har 6 sider, hver har lik sannsynlighet for å havne opp, så sannsynligheten for hver side er $1/6$.

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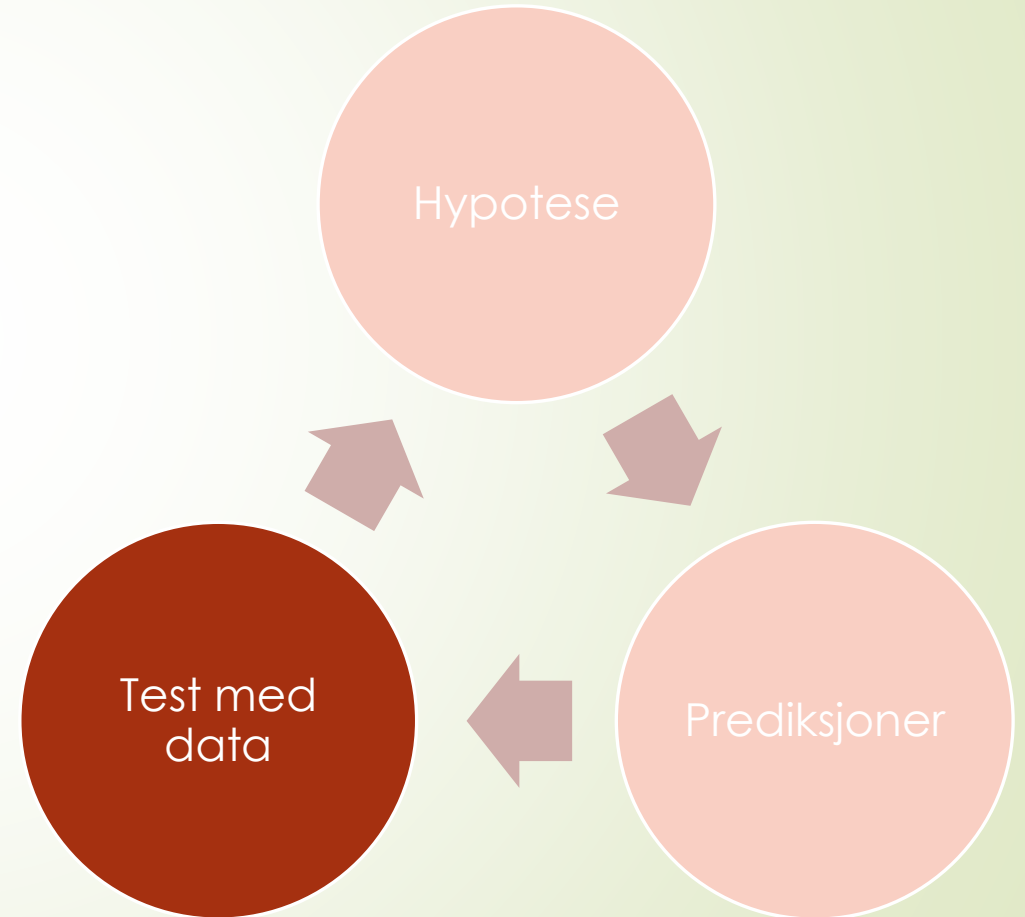
Og hvor mye internasjonalt samarbeid er det?



Hvilken rolle spiller data? Og hvor mye internasjonalt samarbeid er det?

- ▶ Tidsserier
- ▶ Eksperimentelle studier
- ▶ Folkeforskning (citizen science)

- ▶ Store empiriske studier fra hele verden
- ▶ Meta-studier – sammenstille resultater



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RESEARCH

HUMAN IMPACTS

Moving in the Anthropocene: Global reductions in terrestrial mammalian movements

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CONSERVATION

Recovery of large carnivores in Europe's modern landscapes

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The conservation of large carnivores is a formidable challenge for biodiversity conservation. Using a data set on the past and current status of brown bears (*Ursus arctos*), Eurasian lynx (*Lynx lynx*), gray wolves (*Canis lupus*), and wolverines (*Gulo gulo*) in European countries, we show that roughly one-third of mainland Europe hosts at least one large carnivore species, with stable or increasing abundance in most cases in 21st-century records. The reasons for this overall conservation success include protective legislation, supportive public opinion, and a variety of practices making coexistence between large carnivores and people possible. The European situation reveals that large carnivores and people can share the same landscape.

Large carnivores are among the most controversial and challenging group of species in the modern and crowded world. Their reintroduction and reestablishment, because of their low fecundity and long lifespan, are particularly difficult and costly. In addition, their reintroduction is often left for viable and ecologically functional populations (6). As the two main drivers of the current biodiversity crisis—human overpopulation and overconsumption—show no sign of reducing, an intuitive forecast could be that large carnivores will persist only in highly managed protected areas and that regular translocations being made to achieve (with regular translocations being made to achieve) a variety of practices making coexistence between large carnivores and people possible. The European situation reveals that large carnivores and people can share the same landscape.

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We found strong negative effects of the human footprint on median and long-distance displacements of terrestrial mammals (Fig 2, Fig. 3A, and table S3). Displacements of individuals (HFI = 1) were shorter than displacements of individuals living in areas of low footprint (HFI = 0) by a factor of 4. For example, median displacements of individuals in areas of low footprint versus areas of high footprint were 3.3 times as long as those in areas of high footprint. The effect was significant with 8 hours or more

Integrering av modeller og data

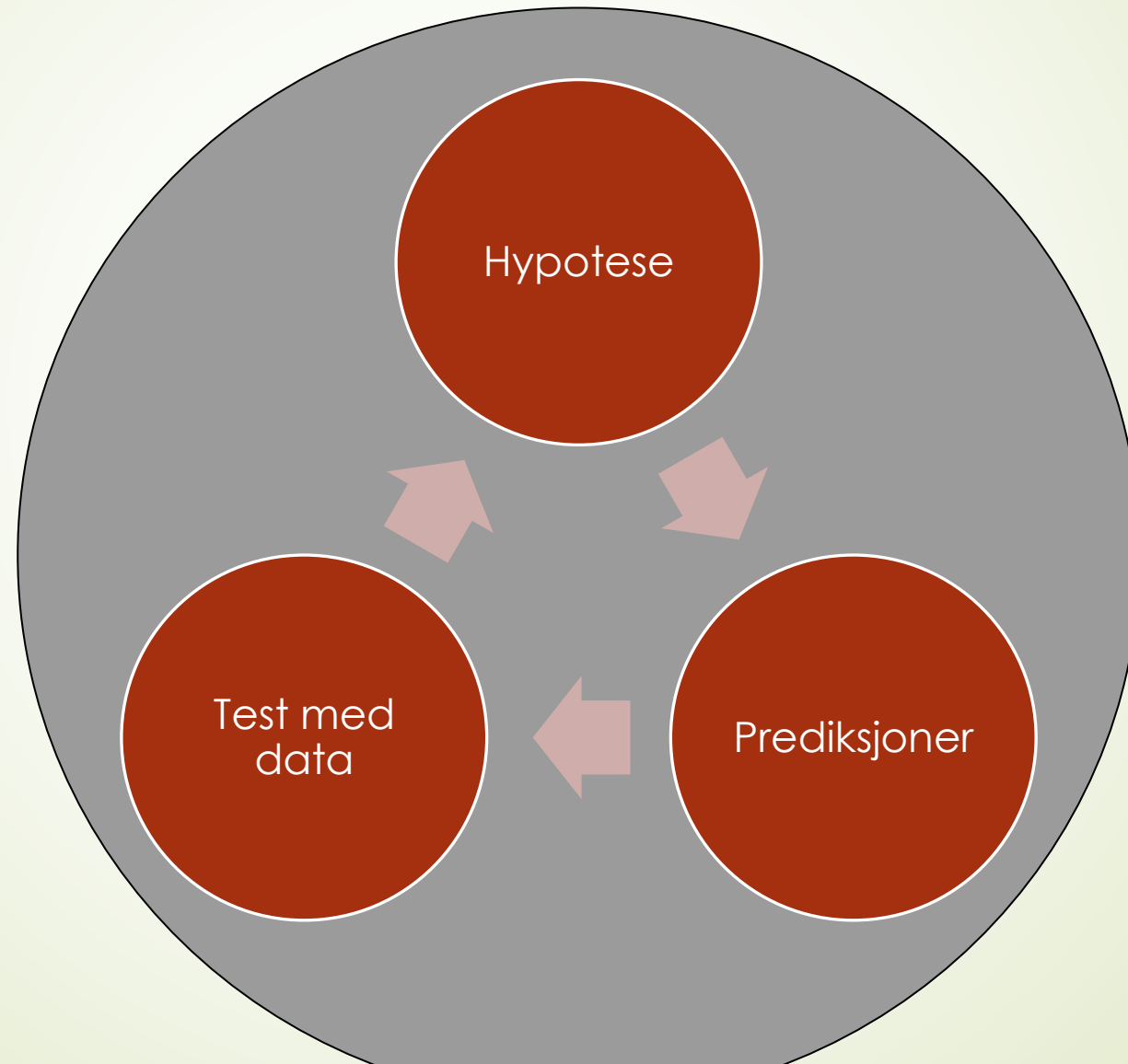




Foto: P. H. Olsen



Foto: Nathan Rank

Samarbeid mellom
empirikere og teoretikere

Takk for meg!



Foto: Wikipedia / Mnolf