Why do some birds, like these Canadian geese, fly in a V formation?

What causes birds to adopt the V formation?
Do they emit a specific call and suddenly form the “V”?
Is it a learned behavior?

What is the adaptive significance of flying in a V formation?

It might function to help
birds avoid collisions with each other
and stay in visual contact

It might also reduce the high
energetic costs of flight

Note the turbulence generated by this airplane.
Large birds generate similar upward
moving vortices in their wake.
Could they exploit this upwash?

If flying in a V formation helped reduce energetic costs, then what predictions would you make?

Because small birds generate relatively insignificant upwash, they should not fly in a V formation.

The lead bird would not derive any benefit from the V formation. Birds should “share” this position.

There is an optimal location that a bird should adopt, when it is flying behind another bird, to achieve maximal uplift? Birds should adopt this position.

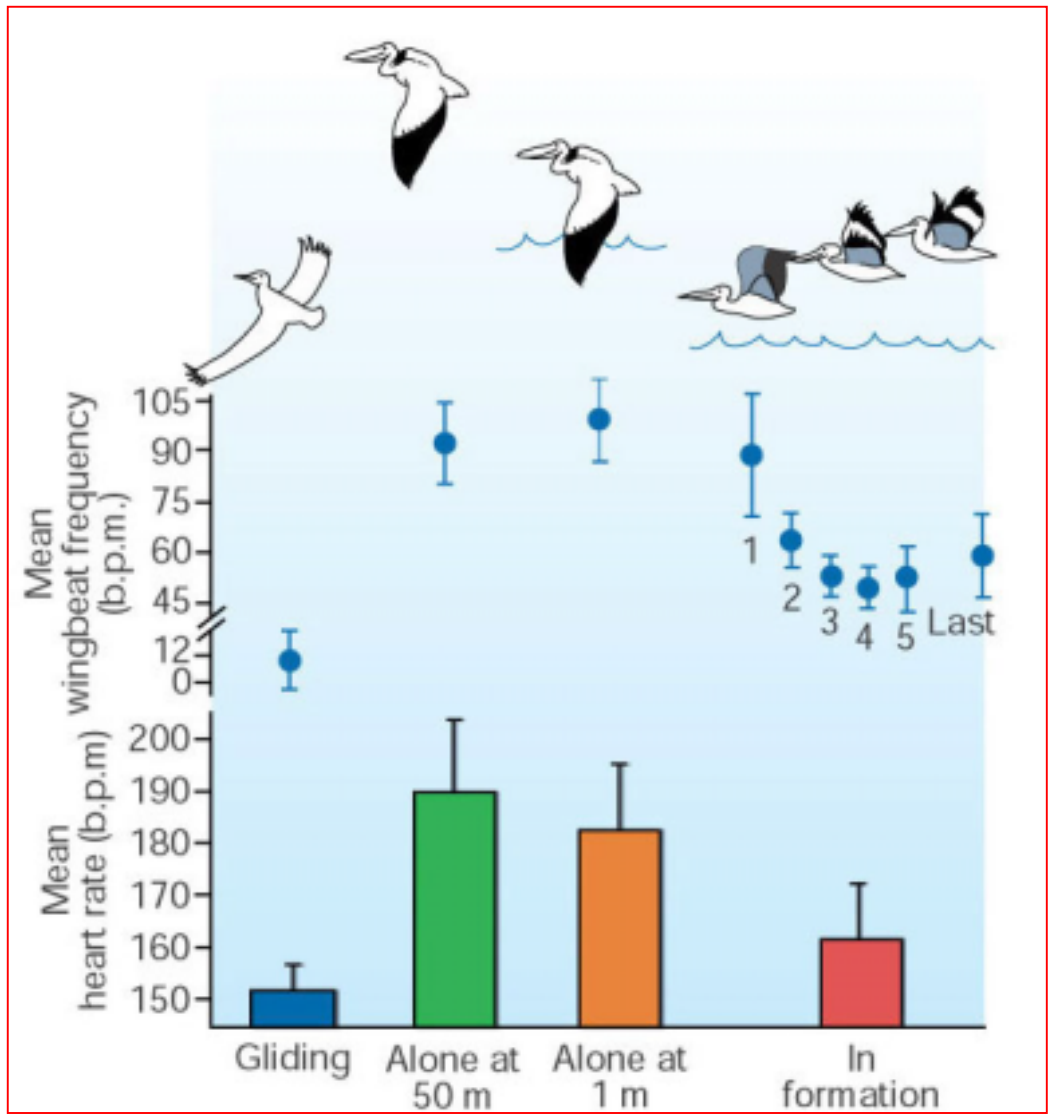
Birds should have lower energetic costs when flying in formation than when flying alone

A group in France (Weimerskirch *et al*.) trained pelicans to fly behind a boat and an ultralight, and monitored their heart rate and wing flapping rate as a measure of energetic expenditure

Wing-beat frequency and heart rate of pelicans engaged in various types of flight

Birds flying over a river following a motor boat cruising at a constant speed of 48 km h-1 flew at an average altitude of 1 m above the water, initially alone at a distance from the boat ('alone at 1 m'), but then joining other birds in formation ('in formation'). Numbering of circles indicates the position in the formation, '1' being the leader. In formation flights, only birds in or behind the third position were used to measure heart rate, to avoid the possible effects of motor-boat turbulence on flight pattern. Wing-beat frequency of the lead and second birds was measured in groups flying far from the boat.

Estimates indicate that flying in formation results in total energy savings of 11.4 - 14%



So, what does all of this evidence tell us about why some birds fly in V formation?

Can we reject the communication or energetic savings hypothesis?