

CONNECTIONS: COINCIDENCE—CORRELATION— CAUSATION

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In *The Kingbird* Decennial Index 1991-2000 Donald A. Windsor (2003) helps us to distinguish the difference between data, information and knowledge. In the present article, I would like to apply and extend his discussion. Using an article I wrote in 2004, I will illustrate the connection between these terms, and explore further the meaning of the phrase “correlation does not imply causation.” I would also like to echo former *Kingbird* editor Windsor’s suggestion that whenever possible we try to move “data to information to knowledge,” in other words, to higher levels on the “Wisdom Ladder” (Schuler 2007).

Let’s look at the article “Northbound Migratory Phenology of Northern Flicker in the Adirondacks” (Gretch 2004) to see what level on the “wisdom ladder” it rises to. I collected data on the emergence of ants from their subterranean winter dormancy, and on the arrival of the Northern Flicker (*Colaptes auratus*), and that satisfies the first level, the raw data level. Then I gave the data meaning by connecting the dates of emergence of ants with the arrival dates of Northern Flicker over a number of years. I was able to show a correlation between the two phenomena, that they were synchronous, and that satisfies the information level. I then spent some time interpreting the correlation to show that the 42° F temperature isotherm seemed to predict both phenomena, and that satisfies the knowledge level.

I showed correlation, but had I shown causation? Let’s break it down a little further to find out. According to Feldman (2007), “The most common way to argue for a general causal claim is by establishing a correlation.” But Feldman points out that **correlation without causation** is possible via no fewer than four mechanisms:

- 1.) By **reverse causation**. This would be like saying that the migration of the Northern Flicker is the cause of the 42° temperature isotherm—absurd in this case, but reverse causation must always be eliminated as a factor.
- 2.) By **coincidence (chance)** or **accident**. In my article I really only correlated three years of data. I suggested that this limited data set needed to be expanded before my hypothesis could be confirmed with more certainty. It is possible that with such limited data, it is merely by chance that the two phenomena appear to be closely associated/correlated.

- 3.) By “**tag along**” factor. Suppose there is another factor that tags along with the 42° isotherm that is actually the cause of this correlation. Factors as diverse as humidity levels, cloud cover, wind velocity, or air quality could conceivably be correlated with the isotherm and have unanticipated effects on flicker migration.
- 4.) By **common cause**. Rather than temperature and ant emergence directly influencing flicker arrival, it is possible that each is independently influenced by some other factor, for example, length of day. The last paragraph of the article, suggested by *The Kingbird* editor Shaibal S. Mitra, speaks to that possibility. It states, “Still the data I have presented so far do not prove that temperature itself is the factor that determines flicker migration. What is needed is a series of years in which the arrival of flickers corresponds more closely to the temperature (and the emergence of ants) than to the average date of 19 April.”

The inclusion of that final paragraph is an example of the next and highest level of human processing beyond data, information and knowledge—wisdom. I relied on the wisdom of the editor, Dr. Mitra, who has extensive expertise in phenology, to make my 2004 article more objective and complete.

Of course there is also the possibility that a number of factors (confounding factors) could be collectively responsible for the northbound migration of the Northern Flicker, for example the availability of food (ants etc.), temperature, and length of day combined.

Another thing that we must be aware of is that the human brain has evolved to detect patterns, even where they may not exist. We automatically, and often unconsciously, look for an explanation for why things happen (Henig 2007). We must be careful, and realize that 7 in 10 of us, for example, believe in angels, even though there is no proof that they exist. We can very easily believe in what we want to believe. There is even a name for it: **apophenia** - the experience of seeing patterns or connections in random or meaningless data (Wikipedia 2007). How many people do you know who place special significance or meaning on various numbers like 7, or 6, or 666? Or who may not admit they believe in numerology or magical thinking, but nonetheless find themselves unconsciously being influenced by an entertaining movie like “The Number 23” starring Jim Carry. Humans are very suggestible, after all.

A critical look at the narrative of “Northbound Migratory Phenology of Northern Flicker in the Adirondacks” shows that I did in fact come close to validating what I wanted to see: that the 42° isotherm was the main indicator for emergence of ants and also the arrival of the flickers. I wrote, “It seemed logical that this connection would be a strong one, since the diet of the flicker is high in ants (Gretch 2004).” This is what is called **hindsight bias** or, sometimes, the **I-knew-it-all-along-effect** (Wikipedia 2007). Others call it **confirmation bias**. Confirmation bias is selectively highlighting evidence that supports what you

expect to find (Grimes 2007). After critiquing my own article I now realize how faulty logic and expectation can unconsciously creep into one's thinking.

To conclude, let us be cautioned by a bit of sage philosophy from Alexander Pope (1688-1744) in his "Essay On Man."

With too much knowledge for the Skeptic side,
Born but to die, and reas'ning but to err;
Alike in ignorance, his reason such,
Whether he thinks too little, or too much:
Chaos of Thought and Passion, all confus'd;
Still by himself abus'd, or disabus'd;
Created half to rise, and half to fall;
Sole judge of Truth, in endless error hurl'd;
The glory, jest, and riddle of the world!

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