



Consider the Creatures

"Consider the birds ... "
(Matthew 6:26)

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Bee wise

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You have to move home. You only have a few days to do it. There are a dozen places to choose from and you have six criteria to consider. Oh, and your ten thousand kids all have to agree. Good luck.

Honey bees have to solve this kind of complex problem routinely. If they don't get it right the colony may well perish. We need them to get it right because they are God's instruments in providing us with almost a third of our food crops through pollination. How do bees do this without even a second thought? And without a first thought either. Individual bees are pretty stupid.



The answer is such a wonder that you may well have great difficulty believing me. However, researchers have very thoroughly and laboriously investigated the matter. So, what I tell you is sober fact. Tom Seeley, the renowned bee expert, puts it in a nutshell, "bees in a honeybee swarm ... achieve their collective wisdom by organizing themselves in such a way that even though each individual has limited information and limited intelligence, the group as a whole makes first-rate collective decisions."¹ Bees and other social insects have been honed by many millions of years of evolution to solve problems that are vastly bigger themselves and, as we shall see, they do it in a quite remarkable way.

Like bees, we humans have problems that are much bigger than us individually. Miller puts it this way. "As everyday life grows more complicated, we increasingly find ourselves facing the same problems of uncertainty, complexity, and change, drowning in too much information, bombarded with too much instant feedback, facing too many interconnected decisions. Whether we realize it or not, we too are

caught up in worlds of collective phenomena that make it more difficult than ever to guide our companies, communities, and families with confidence. These challenges are already upon us, so we need to be prepared."²

Perhaps we can learn something from social insects? Actually, we already have. Social insects have come under intense scrutiny recently and are giving up their secrets. People are using these secrets to deal very successfully with complex and previously intractable problems in such disparate fields as telecommunications, computer network security and airline production. Miller even suggests that the best way to solve big complex problems is to "turn to the experts - not the ones on cable TV but those in the grass, in the air, in the lakes, and in the woods." So, how do bees do it and how can humans apply the principles? Here is a simplified picture of how it works:

Bee wisdom

Hundreds of nest-site scouts (about five percent of the colony) independently search for sites and when they find a promising one, they return to let the other scouts know. They consider nest-site size, location, how sheltered it is and so on. The first step in bee wisdom is to get knowledge from many independent experts. Finding the best nest-site is just too big a problem for a cognitively limited scout to solve individually. The principle is echoed in Proverbs, "For lack of guidance a nation falls, but many advisers make victory sure."³ The scout uses a "waggle dance" to tell the hive where the nest site is. (Bees use the same method to report food sources). The angle of the waggle run to the vertical indicates the direction of the nest-site relative to the path of the sun; the duration of the waggle run indicates the distance and the number of dances how great they thought the site was.

Some scouts will check out sites reported by others. If they concur they will also do a waggle-dance for the site. However, and this is critical, Seeley reports that no "scout bee, not even one that has encountered a wildly exuberant dancer, will blindly follow another scout's opinion by dancing for a site she has not inspected." There are no false scouts in bee communities and scouts are always sceptical of other scout reports. So, there is no chance that the colony will follow a rumour mill. The second step is to let ideas compete with each other based on how well they match up with the evidence. Eventually, one site will get danced for more often than other sites and will edge out the competition. That site will become the location for the new hive.

Worker bees have an important role – do nothing. That is they do nothing *scout* related. Instead, they stick to keeping the current hive and home together. This frees the scouts to specialise on their job. Seeley does not draw attention to this point, but while scouts never blindly follow scouts, worker bees *do*. However, worker trust is always based on a specific *quorum* of *scout* opinion never on the majority *consensus* of *worker* opinion.⁴ Workers accept the judgement of the scouts and follow them to the new nest site. It is too costly and impractical for each and every member of the colony to investigate all possible sites. So, bees have

developed a division of labour. Investigating potential hive sites is not done by just any worker. It is left to scouts based on their age, experience and genes. The final step is to admit that there are problems that are too big for just anyone to solve. The vast array of world issues and information on these issues makes it impractical for everyone to investigate everything no matter how clever humans are. Notice that the colony as a whole neither champions mere scepticism nor mere trust, neither only independence nor only dependence. As Seeley says, "what I find most noteworthy about a swarm's skill in decision making is how it arises from a truly ingenious balance between interdependence and independence..." The final step in bee wisdom is humility.⁵ And Seeley, this bee scout, has been applying bee decision-making principles in faculty meetings at his university.⁶ It takes some humility for a professor to let an invertebrate be his mentor! Scripture, of course, links humility and wisdom: "When pride comes, then comes disgrace, but with humility comes wisdom."⁷

Swarm madness

But bees can be duped. They can be made to believe that a human being is their queen. Just coat the person with queen-substance, and the bees will swarm all over him trying to attend to his needs!⁸

Humans, too, can slip into swarm madness. My mother, who had a mischievous streak, showed us how this could be done. We would be walking along a busy street and she would suddenly stop and point to an arbitrary point at the top of a building. Then she would get us to gaze in that direction. Pretty soon others would stop and stare. When a sizeable crowd had developed we would slowly back away and marvel. James Thurber recounts in his autobiography how he and virtually everyone from the East side of Columbus, Ohio fled from a non-existent tidal wave! The trigger? Just one person running.

Considering the prospects for the planet, climate change is one area where humans need to be in touch with reality. And considering the vastness and complexity of the global climate, this is one area where individual humans are cognitively limited. How is the human swarm managing? We do have our scouts. Many thousands of climate scientists have gathered a huge amount of data on climate change. The vast majority agree that global warming is happening and is mainly human caused. Furthermore, those that are unconvinced have substantially less expertise than the convinced.⁹

Remember that in democratic human societies it is the non-scouts, the politicians via the voting public that make policy decisions. In this situation it is vital that the workers listen to the scouts. It would be a marvel in its madness if humans paid more attention to unqualified workers than to scouts. Yet this is exactly what is happening. Take the USA's most widely circulated newspaper, *The Wall Street Journal*. In the last four years it has mentioned one particular non-scientist *more often* in the context of global warming than the Intergovernmental Panel on Climate Change (IPCC).¹⁰ The individual, described as the world's leading global

warming sceptic, is Lord Christopher Monckton. However, his credentials are in journalism and classics and he has not even published one peer-reviewed scientific paper, let alone in climate science. The IPCC is a body of thousands of scientists comprehensively assessing the risk of climate change.¹¹

Imagine that bee scouts were required to give equal time in waggle-dancing for each prospective nest-site as a matter of balanced reporting. A thorough investigation has revealed that this is the situation with the major newspapers in the USA with respect to climate science.¹²

Another way to gauge who the public are listening to is to use Google and Google Scholar (see table below). In regard to global warming, Lord Monckton has six times the presence on the World Wide Web of John Houghton. Monckton also has one hundred times the presence on YouTube as Houghton in the same context.¹³ John Houghton is professor of atmospheric physics at Oxford University and co-chair of the Intergovernmental Panel on Climate Change's (IPCC) scientific assessment working group.¹⁴ Scholars on the other hand are ten times more interested in what John Houghton has to say in connection with global warming than Lord Monckton! In human society the scouts are listening to a climate scout; the workers, however, are largely listening to another worker who has done no scouting in his life! A similar picture emerges if you compare Rush Limbaugh the radio talk show host, and James Hansen, professor in the Department of Earth and Environmental Science at Columbia University and head of NASA Goddard Institute for Space Studies.

Table: Hits on Google and Google Scholar

	Google	Google scholar
"Lord Monckton" "global warming"	268000	93
"John Houghton" "global warming"	48800	933
"Rush Limbaugh" "global warming"	3240000	1240
"James Hansen" "global warming"	864000	2860

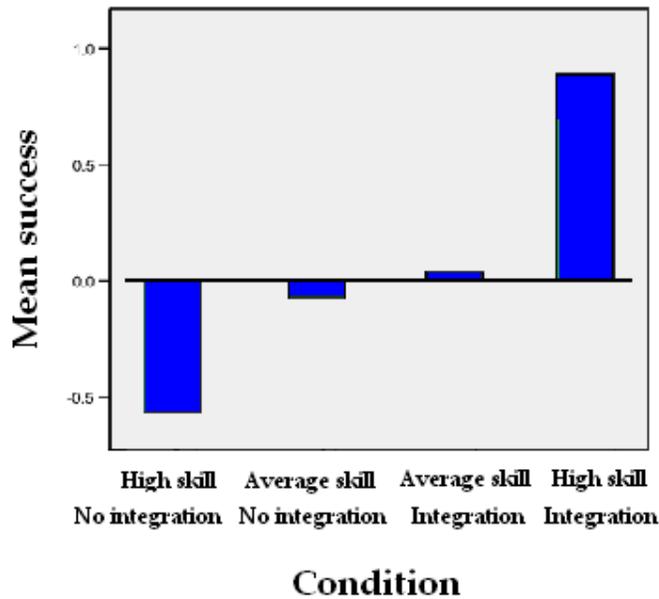
Lord Monckton, Rush Limbaugh and other climate warming deniers have been very successful in fostering swarm madness. Whereas the great majority of climate scientists see global warming as a serious risk to the planet, a minority of the world's public do.¹⁵ How did this happen?

The anatomy of swarm madness

A clever experiment has been done to discover the conditions under which swarm madness appears.¹⁶ Several teams (think little swarms) were given the task of solving a problem that could *not* be solved by any one particular team member. Solution required a range of expertise. The teams varied both in the level of skill of its members and in whether integration of skills took place. In the case of

integration, the members understood and deferred to each other's skills. The results were striking and are reproduced below. You might think that the swarm with the lower skills and no integration would be the least successful. Not so. The swarm that was least successful was the one with *high* skill and no integration! Why did this happen? The key is that the problem was bigger than one expert. When expertise was high and integration non-existent one expert would lord it over the others. When expertise was average but integration happened, the combined expertise was greater and sufficient to solve the problem.

Skill integration and problem-solving success



Notice that in the worst case, the very cleverness of individuals worked against them in finding a solution. When problems are bigger than individuals, we need something else in addition to cleverness to solve them. What this study suggests is that something was discovered a long time ago by bees – humble wisdom.

In human societies, clever individuals that dismiss the skills of others and take others with them is a recipe for swarm madness. This is what Lord Monckton has done. As we have seen, the public are listening to Lord Monckton quite out of proportion to his expertise in climate science. The reason? He has great ability in waggle-dancing. This is how an admirer described him: "He's quicker on his feet than any debater I've seen. He's funny. He's witty. He's ferociously clever and a master of his brief."¹⁷ Before the public, Monckton performs with conviction, confidence, eloquence and charm. He sprinkles his presentations with Latin phrases and abstruse mathematical formulae. He has been invited several times to speak to US congress on climate. He claims to have found a cure for HIV, Graves' disease, multiple sclerosis, influenza and food poisoning and that he won the Falklands war for Britain by persuading the British government to use biological warfare.¹⁸ There is no problem bigger than Lord Monckton. One gets the

impression that for Monckton there is only one division of labour. There is his lordship who knows stuff and then there are others. Monckton is iconic of the sceptic individualist. He will not abide by the consensus because truth is not decided by consensus but by the evidence. Philosopher Mary Midgley points out it may indeed be progress to go from childish dependence to adolescent independence, but this is not yet maturity. Mature people are *interdependent*.¹⁹ It is, of course, climate scientists not experts in the classics that are best able to sceptically evaluate the evidence. It is the conceited worker that thinks he can personally evaluate the evidence better than the great majority of scouts. Monckton has vastly more intelligence than an individual bee. The colony, however, has more maturity and more wisdom.

It is encouraging that philosophers understand mature interdependence in the context of global warming. It has been remarked "Most philosophers who have written on the subject have not scrutinized the science, but instead have appealed to the authority of the Intergovernmental Panel on Climate Change (IPCC)."²⁰ The authors behind this quote were not been complimentary and evidently did not understand where their expertise ends unlike their colleagues!

It is tempting to think that the solution to swarm madness is to merely educate the public. However, research has shown that "Members of the public with the highest degrees of science literacy and technical reasoning capacity were not the most concerned about climate change" suggesting the "insufficiency of a communication strategy that focuses only on transmission of sound scientific information."²¹

Climate scientist John Abraham has nobly taken a lot of trouble to educate the public in refuting Monckton.²² He writes, "I encourage people to view both of our arguments and make their own conclusions. I stand by my work and welcome judgment by the public and the scientific community."²³ But there is a problem. Who is this public? The public is the single mother trying to hang onto her job while raising her children. The public is the scientist trying to juggle researching, teaching and administration in a field *other* than climate. With respect to most matters the public are workers paying tax so that the *scouts* can do the job of judging climate change arguments. Time spent evaluating climate science is time away from their jobs. When everyone tries to do everything, there is a breakdown in division of labour. Wisdom suggests that human society would do well to be as practical as the hive.

Wisdom also suggests that we have grounds to be very sceptical of the assumption that the health of the planet hangs merely on scepticism, intelligence and education. It also hangs on humility, wisdom and trust. A society that champions the former over the latter will produce and idolize the false scouts of the world. Swarm madness will be the beginning of bitter fruit indeed. It was in the context of individuals having different God-given gifts and working together as a group that the apostle Paul wrote, "Do not think of yourself more highly than

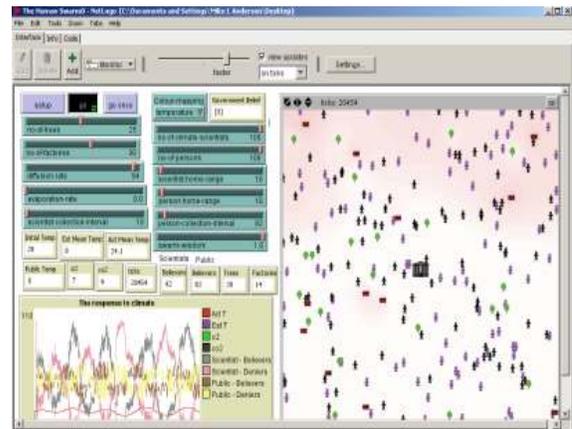
you ought, but rather think of yourself with sober judgment.”²⁴ To put him²⁵ in terms of the swarm, “Are all queens? Are all drones? Are all scouts? Are all workers?” We need a public that know where their expertise ends and other’s begins, when to be sceptical and when to trust. Of course, outside of their fields of expertise, scientists should be viewed with utmost scepticism.²⁶

As the world becomes more complex, we need extra divisions of labour. We need at least two distinct types of waggle dancers - ones that dance for scouts (the scholars) and ones that dance for workers (the general public). We need this special skill because the kind of waggle dance that appeals to the public is different to the kind that appeals to scholars. The public are more affected by charisma, anecdote and humour. Scholars are impressed by numerate, peer-reviewed publications. We need a waggle-dancer that understands the heart of the swarm, understands the science, and has bee wisdom. This waggle-dancer’s first priority is not to take on the task of scientifically proving anything to the public – which is impractical anyway. Instead, his first priority is to communicate to the public what the climate scientists have proved amongst themselves.

(By the way, we also desperately need public relations officers that are prepared to waggle-dance for the bees themselves. Globally, bee colonies are disappearing at a phenomenal rate. There are likely to be multiple causes, but a critical one is indiscriminate use of pesticides. Here, too, there are the deniers. It is irony indeed that human folly is leading to the decimation of the very creatures that can teach us wisdom!)

Simulating swarm wisdom and madness

It is possible to simulate different decision-making systems and the consequences on climate change (see screenshot). To do this I used a powerful modelling environment for simulating complex dynamic systems called *Netlogo*. I have called the freeware program *ClimateWise*. The user is able to experiment with a host of variables including quorum and majority thresholds and the level of dissemination of science and anti-science. It is available here.²⁷ The program soberingly illustrates that a great deal has to be in place if climate change is to be dealt with effectively.



Spiritual madness

Since humans are spiritual creatures, being in touch with scientific *and* spiritual reality is important for the health of the planet. John Houghton writes, “The average American still doubts the science of climate change, despite the IPCC and the unambiguous statement by the national science academies of the G8 nations

(including the US), plus those of China, India and Brazil... there is widespread suspicion of science, fostered by the feeling that science goes against the Bible. This is very unfortunate; it takes a very small view of God, and a very inadequate view of science."²⁸

As I wrote elsewhere, "How much of our technology is functional and how much of it is a monument to human glory?" This is where people need to look up at Jesus on the tree. "When Jesus prays, "Father, the time has come. Glorify your Son, that your Son may glorify you,"²⁹ he is talking about his crucifixion. While the wicked were cutting down a tree to display Roman glory, the Father was revealing himself. Jesus showed that one can achieve glory without carbon-producing trappings. Instead, he used sacrifice. The God revealed through the cross is the One who made himself nothing. Jesus leaves an enormous spiritual footprint with a tiny carbon one. This is how to impact the planet! How the world needs to worship The Rabbi on the tree for the world's sake!"

The heart of the swarm

Evolution works marvels, but it does not produce perfection. Humans are adapted to biasedly respond to local, concrete, human-sized problems rather than general, global-sized ones. A Doberman-pincher, especially when it is chasing me, seems more real than the problem of global warming. A crying baby comes across as more urgent than the rise in carbon dioxide levels in the atmosphere even though the latter threatens a lot of crying. There is Another who has also had to contend with swarm madness. Perhaps we can learn something about this from Him? Climate change is a little like God. God is not human sized. He is inscrutable. He is eternal whereas we are locked in time. He is omnipresent whereas we are localised. How did humans respond to God? Swarm madness. Instead of following the Unfathomable One, they went after local idols. Instead of worshipping the Creator, they worshipped something they had crafted.

Reaching the swarm

Remarkably, God the Father, with all his omnipotence and omniscience did not choose to deal with the problem of swarm madness on his own. Even he used a division of labour. The Father, understanding the heart of the swarm, dealt with his inaccessibility by coming as a human person. He made himself concrete by embodying himself in Jesus Christ. God was not so high and mighty that he refused to speak to us in less than some theologically technical heavenly language. On the contrary, he humbled himself and spoke in ordinary human language as a human being. The Good News is an anecdote about a carpenter from Nazareth. In so doing, God has forever sanctified popularisation as a holy activity. Would we not do well to take a leaf from Jesus in dealing with global warming and the masses? We need to honour the special waggle-dancers that are committed to translating scout communication to for the workers. And they need to see it as a vitally important, even holy activity.

In the age of the Internet a huge amount of information is made available to the public. However, it is not necessarily the best information that is the most accessible. In this situation it is easy to be beguiled into the conceit that I can evaluate the science of climate change myself. However, with the complexity of the myriad issues facing the world, how necessary it is for me to leave certain things to others better qualified. How necessary it is to have a humble wisdom. For inspiration we can look to lowly creatures – the bees. And we can do no better than look to Wisdom personified. Jesus left the sovereign foreordaining of his death to the Father and his rising from the dead to the Holy Spirit. He acknowledged – no embraced his limitations - even to the point of death for the greater good of the swarm. He was content to leave omniscience³⁰ and omnipresence to the Father and be a preacher in Galilee. And, even after the resurrection, he leaves the telling of the Gospel to the church and conversion to the Holy Spirit. It is a wise and humble swarm that emulates Jesus and his bees.

If you found this article helpful please give it to someone else.

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Notes

¹ Seeley, T. D. (2010) *Honeybee Democracy*. Princeton University Press, Princeton, p. 7.

² Miller, P (2010) *Smart Swarm*. Penguin Books Ltd, London.

³ Proverbs 11:14

⁴ There is evidence that the quorum threshold has been honed by evolution to be an optimized trade-off between speed and accuracy.

⁵ Of course, bees are not nearly sentient enough to be truly humble or wise – they merely illustrate the virtues.

⁶ Seeley, T. (2010) *The Five Habits of Highly Effective Honeybees*. Princeton University Press, p. 219.

⁷ Proverbs 11:2. See also James 3:13.

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- ⁸ The remarkable thing about the King of Kings is that he had none of the trappings associated with earthly kings. Jesus's divinity shone through anyway.
- ⁹ Anderegg, W.R. L., Prall, J.W., Harold, J. and S. H. Schneider (2010) [Expert credibility in climate change](#). Proceedings of the National Academy of Sciences. June 21, 2010, doi: 10.1073/pnas.1003187107.
- ¹⁰ An advanced search on the *The Wall Street Journal's* archive (<http://online.wsj.com>) received 1750 for the former and 1672 hits for the latter. Accessed 4 July 2012.
- ¹¹ http://en.wikipedia.org/wiki/Intergovernmental_Panel_on_Climate_Change
- ¹² Boykoff, M.T and J. M. Boykoff (2004) Balance as bias: global warming and the US prestige press. *Global Environmental Change* 14: 125–136
- ¹³ 1310 and 12 results respectively. Accessed 9 July 2012.
- ¹⁴ http://en.wikipedia.org/wiki/John_T._Houghton
- ¹⁵ <http://www.gallup.com/poll/147203/Fewer-Americans-Europeans-View-Global-Warming-Threat.aspx#2>.
- ¹⁶ Woolley, A. W., Gerbasi, M., Chabris, C.F., Kosslyn, S. M., and J. R. Hackman (2007) What Does It Take to Figure Out What Is Going On? How Team Composition and Work Strategy Jointly Shape Analytic Effectiveness. The Group Brain Project. Technical Report No. 4.
- ¹⁷ <http://blogs.telegraph.co.uk/news/jamesdelingpole/100042295/id-rather-have-monckton-in-a-foxhole-with-me-than-monbiot/>
- ¹⁸ <http://www.guardian.co.uk/environment/blog/2009/dec/10/viscount-monckton-ukip>.
- ¹⁹ Midgley, M. (1989) *Wisdom, Information and Wonder*. Routledge, pp. 117-125.
- ²⁰ Irwin, W. and B. Williams (2010) An Ethical Defense of Global-Warming Skepticism Reason Papers 32 : 7-27
- ²¹ Kahan, D.M. et al (2012) The polarizing impact of science literacy and numeracy on perceived climate change risks. <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate1547.html>
- ²² <http://www.stthomas.edu/engineering/jpabraham/>
- ²³ <http://www.skepticalscience.com/abraham-reply-to-monckton.html>
- ²⁴ Romans 12:3.
- ²⁵ 1 Corinthians 12:29.
- ²⁶ It should be emphasised that we are all workers in most things and scouts in very few.
- ²⁷ http://ccl.northwestern.edu/netlogo/models/community/ClimateWise1_2
- ²⁸ Interview with Sir John T. Houghton, Caspar Henderson Reason and Light column, New Statesman, 15 May 2006, <http://www.newstatesman.com/200605150065>.
- ²⁹ John 17:1.
- ³⁰ Matthew 24:36.