AUTOTHYSIS

Suicide as a defence strategy

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IMAGINE A creature so committed to protecting its colony that it quite literally explodes to save others. This is not science fiction. It is a real biological phenomenon known as *autothysis.*

What is autothysis?

Derived from the Classical Greek αὐτός/*autos* (self) and θυσία/*thysia* (sacrifice or offering), autothysis is the astonishing process where an organism ruptures its own body, often fatally. It does this to release a sticky, toxic, or corrosive substance that repels or kills predators. This act of apparent biological martyrdom is not only dramatic, it is also uniquely purposeful.

Autothysis is a remarkable act of self-sacrifice seen in some social insects like ants and termites, where individuals explode to defend their colony. These creatures trigger a bodily rupture, often causing special glands to release defensive chemicals that entangle, repel, or kill attackers.

These behaviours are not random. They generally involve specialized glands, such as enlarged mandibular glands (associated with the lower jaw) in some species, or modified salivary glands in others. They also involve precise muscular contractions and behaviours triggered by specific threats.

Historical observations

The phenomenon of autothysis, in a Malaysian ant species, was first described in the 1970s by Ulrich and Eleonore Maschwitz.[1] It was later brought to wider attention through the work of evolutionary biologist E.O. Wilson.[2,3] The ants store sticky secretions in their enlarged mandibular glands, which run throughout the length of the body. When attacked, they burst their abdomen by violent muscular contractions, also bursting the glands and spraying the attackers with the toxic, sticky secretions. The contaminated attackers are unable to move (fig. 1).

Creatures that commit autothysis

There are several species in both the termite and ant orders that use this defensive mechanism. These include:

- *Globitermes sulphureus:* The soldiers of this Southeast Asian termite (also known as the yellow-glanded termite) can store gummy yellow secretions in their enlarged mandibular glands. When these soldiers explode via autothysis, the released material coats intruders and often effectively seals any breach in the nest wall.[4]
- *Colobopsis saundersi:* This Southeast Asian carpenter ant species, commonly known as the Malaysian exploding ant, is the one in which the phenomenon of autothysis was first discovered (when it was still genus *Camponotus*). The secretions released by the exploding workers (ants have no soldier caste) not only trap and deter intruders, they can also help seal breaches in the nest.[5,6]
- *Neocapritermes taracua:* This termite species, found in French Guiana (South America), utilizes older workers for defence. These workers develop copper-rich blue crystals in specialized dorsal pouches resembling ‘backpacks’. Upon autothysis, the crystals mix with secretions from their labial (another type of salivary) glands. This produces a highly toxic chemical reaction, effectively turning the termite into a ‘2-pack’ chemical weapon that kills or incapacitates invaders.[7,8]
- *Grigiotermes* and *Ruptitermes:* These two termite genera are primarily found in South America. The

Fig. 1. AI representation of ants trapped during battle by a toxic, sticky substance. Some species of ants and termites release such chemical weapons by fatally rupturing their bodies to try to save the colony.

workers (there is no soldier caste) perform autothysis. Their toxic, sticky defensive secretions, which dry quickly, rapidly entangle and immobilize attackers. These secretions are stored in frontal glands, which are glands near the head specialized for this purpose.[9]

It's important to note that there are many termite species in which the soldiers use chemical weapons without being capable of autothysis. The most prominent example is the large group of *nasute termites*. Their soldiers (fig.2) use a long, nozzle-like snout to spray a sticky, toxic fluid at enemies. They can do this repeatedly until their stores run out.

Each of these systems involves integrated biochemical pathways, mechanical adaptations, and coordinated behaviours. The complexity of these traits raises critical questions for evolutionary biology.

The evolutionary dilemma

From an evolutionary standpoint, autothysis seems paradoxical at first glance. Natural selection favours individual survival and reproduction, yet autothysis entails certain death without offspring. Evolutionary biologists invoke 'kin selection', the idea that sacrificing oneself to protect genetically similar relatives may be favoured if it increases inclusive fitness. The exploded defender doesn't get to pass on its genes directly. But by protecting the colony it increases the likelihood of the genes for that behaviour being transmitted to the next generation—via its close relatives.[10]

Kin selection may be a reasonable-sounding explanation for *why* such a system, once fully operational, might be favoured by natural selection. And thus it would not be eliminated from the population. But it fails to explain *how* these complex systems could have evolved incrementally step-by-step. Evolving a way to rupture the insect without toxic output, as well as being fatal, is useless. A toxic secretion without a delivery mechanism achieves nothing. The rupture must occur only in response to specific stimuli, or the organism dies in vain. In fact, it could even harm its relatives, thus being *disfavoured* by kin selection.

Since evolution permits no planning or foresight, this points to irreducible complexity: a set of components that must function together or not at all. These are: specialized gland(s) or storage structure(s); defensive secretions/chemicals; triggering mechanism; body rupture mechanism; appropriate release and delivery systems.

Evolutionary theorizing might be able to speculate backwards a short way to some simpler ancestral version of some or all components. But only so much simplification is possible before it reaches a point where it must be conceded as irreducibly complex. That is, where any further reduction in (or removal of) any component would make the whole system non-functional.

Thus, the integrated nature of autothysis systems reflects intentional design. Evolutionists attempting to counter a design argument might use one of several approaches.

Fig. 2. The soldiers of the nasute termite species *Nasutitermes corniger* do not bite, but can spray chemical weapons from their 'snout nozzle' repeatedly without self-sacrifice.

1. **Variation across species.** Evolutionary biologists often point to the diversity of autothytic behaviour across species as evidence of a gradual, stepwise evolution. But from an irreducible complexity perspective, that's not so convincing. A half-working system, like an insect that explodes but releases nothing harmful, would be worse than useless. If all the parts don't work together, the whole thing fails. It's hard to conceive how nature could 'test' such a dangerous idea in stages.
2. **Repurposing old tools ('exaptation').** One popular idea is that the insects already had glands for other jobs, like cleaning or fighting germs, and evolution simply repurposed them for defence. But turning a gland into a self-destruct mechanism isn't a small tweak. It would need new chemicals, new behaviours, and modified, sometimes even new, body components. For example to protect the storage reservoir from the toxic or corrosive effects of the chemical weapons now contained. Again, all working together. If even one part is not present and functioning as it needs to, the system is likely to backfire. Literally!
3. **The use of the oldest workers.** In the South American species, only the older workers explode. Evolutionary biologists point out that this makes sense; older insects are less valuable, so sacrificing them is less costly. This might explain why selection doesn't remove the genes for this behaviour. But it doesn't explain how the system evolved in the first place. Whether young or old, the insect still needs a fully working explosion system to be useful in the defence

of the colony. It is actually a common fallacy in evolutionary thinking to think that demonstrating that 'X' is useful to a species means that X originated by evolution. If X (or perhaps its less specialized predecessor) was created and designed, one would *expect* it to be useful.[11]

4. **Built to break.** Some of these species have special weak spots in their bodies that help them burst in just the right way. It may be possible to imagine that sort of thing coming about by a series of genetic accidents (mutations, the fuel in evolutionary theory). But again, it only helps if there's something dangerous to release. A breakable body without a weapon is just a flaw. And a weapon with no way to release it is a waste of resources. The evolutionary process would come to an end well before it achieved the selection benefit currently on show.

Reflections on nature and Scripture

The living world is replete with intricate defence (and attack) systems. Most of these would have become established following the Fall, when sin and death entered a previously 'very good' world. Insect death could well be in a different category to the death of animals, though; insects may not be 'alive' in the biblical *nephesh* sense. It seems living creatures (*nephesh chayyah*) are those which have sentience. This includes the capacity to experience suffering, which is hard to establish with certainty in insects.

Either way, such intricate systems suggest the hand of a Designer. In this fallen world, with its constant threat of death, we see mechanisms of astonishing complexity that enable life to persist, in this case through cooperation and sacrifice. Such defence mechanisms serve a protective function, demonstrating God's provision even in adversity.

Of course, whether alive in the biblical sense or not, insects are not moral agents. However, the self-sacrifice exhibited through autothysis reminds us of higher truths. John 15:13 says, *"Greater love has no one than this: that someone lay down his life for his friends."* Yes, these insects are acting on programmed instincts, not actually making (or having) any choice. Nonetheless, this biological display of sacrificial defence of one's fellows resonates with the Gospel—Christ's giving of Himself for fallen humanity.

Autothysis, then, is more than a strange footnote in entomology. It is a living illustration of design, purpose, and provision. And it is a challenge to materialist explanations of life. Autothysis, viewed in human terms, seems tragic on the surface. Yet we can view it as reflecting a deeper narrative, one where sacrifice serves a greater good. And where even the smallest lives are equipped with purpose by a Creator who understands both beauty and brokenness.

References and notes

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