On intelligence in Creatures 2

By Venithil

What is the biggest issue with creature learning process and survival ability in Creatures 2? In many ways, creatures in that game are more complex than they ever were in the first one, and equally complex as they are in the third one. They have a whole variety of needs mental and physical, and often several ways to satisfy each. During the initial period of their lives they are frequently quite bright and a pleasure to teach, no matter the breed, but at some point, something usually goes wrong. And because of how often that period is just a single hour, most people already know how that particular quirk was christened.

There were a lot of efforts and attempts to lessen and eliminate that problem, and a lot of frustrations caused by our Norns, Grendels, and Ettins going from these lovable creatures that were a joy to have to bibbling fools who stubbornly refused to take care of their needs.

The problem is multi-faceted, as is the number and kinds of solutions. And it'd probably take a single person a lot of time to ask the right questions, search for answers, and be satisfied with the ones they've obtained as well as sure they are correct.

But even many years later the games still interest people, and it's worth knowing why so many problems can arise.

Part 1 – Eem extmly hungry, get food... eem pull weather.

Why is eating difficult?

The first and most important issue for the basic breed in particular, and many, many improved breeds in general is the simple fact that many of the genes that are set to reward and punish Norn behaviors are set up in ways that reward behaviors that are ineffective or downright useless in specific situations, reward some actions as much or more than actions that may actually be useful in any situation, and the fact that the work of instinct and stimuli that activate later in life respectably partially and almost fully overwrites what was going on under similar circumstances earlier in life.

The base genome had *some* thought put in what behaviors to reward when a Norn had a need and did something, but it wasn't a lot of thought, certainly not enough. Reading up on it it becomes clear this was because of some inside issues amongst the creators and later on because of hurry, but it's also important to note that because of how many instincts were there, a lot of breed creators never actually sat down and sorted through them to stop a major case of OHSS – excessive reward for too many types of actions leading the Norns to believe some, or indeed all, actions are valid even when they're completely useless.

Here's a couple of examples of not fully justified decisions in regards to instincts :

- Original norns have a way to associate the tiredness drive with the rest action, but they can only associate sleepiness drive with it when in a vehicle or lift. Most of improved breeds have fixed this.

- Most of the items that Norns can use to get rid of boredom are activated with Activate1 (push) and not Activate 2 (pull), yet Norns are rewarded more for using Activate 2 when bored through their instincts. Furthermore, no specific object types are specified, so they'll pull anything when bored. Of course, the 'pull' action is useful for things like teleporters and lifts.

- Norns are rewarded about 50% of maximum to push or pull things when hungry. There is *no* item specified and both actions are rewarded the same way. To put things in perspective, the cute but futile attempts of norns to push weather or fire are actually rewarded when they are hungry, and about halfway as much as actually eating food or fruit. A mild reward to 'push' would be sensible because it allows efficient interaction with some COBs that allow it (like the mushroom patches or the Meat Vine), as well as plants that drop fruit upon pushing or dispensers, but the 'pull' action is absolutely useless to hungry Norns, yet it is rewarded half as much as actually eating. Most improved genomes did *not* fix this issue; out of the ones I know of, only Akamai Canny and Boney Grendels did.

- Norns are rewarded equally for pushing and pulling when their Need for Pleasure is high. No objects are specified and in this case it's a minor issue, but using the wrong action leads to the 'disappointment' stimuli which magnifies their sadness.

- Norns have no instinct to identify toys specifically as sources of boredom or NFP removal. That's why Norns seem to abandon playing with toys soon after childhood.

- Norns have no instinct to identify roots or leaves as edible stuff. Instead, they have a generic 'eat everything when hungry' instinct that rewards almost as much as eating food or fruit (239 vs 255 in the basic breeds). This is why your C2 Norns may stubbornly refuse to eat all these potatoes and carrots. To magnify the issue, the mentioned foods actually don't grow well everywhere, and in the place they are supposed to grow (the ettin garden), they sometimes bug out and end up growing deep underground. Some of the breeds fix this by stocking up more eating instincts to make sure Norns identify food and fruit as the best option even when they're adults.

Despite a lot of work being done on Norns' brains and giving them ways to identify their needs better, not a whole lot of breedmakers actually took their time to sit down and analyze what could be done to improve and alter these basic instincts. As a result, most of the smarter breeds simply push back the 'One Hour Stupidity Syndrome" to happen after more hours, which is why shorter-lived breeds tend to appear smarter. Boney Grendels don't have a highly-altered brain but, except for wallbonking issues, manage to be smarter than the regular Grendels. Nova Subterra and basic Canny Norns have increased brain capacity but can still turn out badly in the long run depending on their life and amount of care. Combining both approaches is likely part of the reason why Akamai Cannies turned out so well.

Part 2 - I can break this wall if I ram into it enough times, I know it!

Wallbonking and how to fight it.

One of the most annoying problems is a Norn's inability to stop bumping their heads into a wall. Because of how the various room's walls work, because of how Norn brains work, and because of how little the aspect of the game was apparently tested, Norns do not handle walls well. Their attempts at turning are overshot and often spin them around, and they frequently don't understand whatsoever that they were actually slamming a wall (certain places have this problem). This can lead to many issues, including Norns believing they are the problem when near a wall, attempting to perform various actions on themselves and effectively ending up more likely to wallbonk whenever near a wall, and occasionally something akin to Creatures 3 / Docking Station's 'rightwalkers'. I've seen this happen with even the smarter breeds, and the biggest problem with Boney Grendels is arguably the simple fact that they don't avoid the perceptible or hard-to-perceive walls and often get stuck slamming into them or worse turn into the creatures that perceive themselves as the problem and source of stimuli from bumping the wall.

Some time after the development of Cannies, JayD added a set of instincts (and possibly altered the wallbonking stimuli) to produce Norns that were the least likely to get stuck wallbonking to date from Canny Norns. This was before Akamai Cannies were developed and as a result even had people still using JayD's cannies when Akamais happened!

Later on some breeds incorporated those changes into base Akamai genetics, pretty much leading to some of the best and least wall-stupified breeds around. It is worth noting, however, that JayD's improvements placed into a breed will not be certain to not make it wallbonk. They do work on Cannies, but as it turns out, the instincts of this type will be processed differently in non-canny brains. It may be noticeable in the basic breeds (252/256/Golden/improved breeds based on Golden and others), but will likely be the most noticeable in breeds that partially share a brain structure with Nova Subterra, including the Kannova norns that were an attempt to mesh Cannies and Nova Subterra Norns (fairly successful, I might add). Something in the additional brain lobes of Novas and Kannovas make them process that instinct a little differently, particularly at a very young age. The most accurate description I can provide is that when a young Norn of these breeds is born and immediately has a big instinct with lots of reward attached to it that encourages him to do something after he or she slams a wall, this Norn is likely to decide slamming a wall and attempting to retreat is actually expected of him and a good behavior, and unlike a Canny, said Norn is likely to engage in this behavior repeatedly. Which may lead to him misinterpreting the source on some walls in-game and becoming extra dumb about wallbonking, doing it, as I referred to it when testing my own breed, 'religiously'.

So, are JayD's extra genes (reinforcing the same behavior over and over at most life stages) bad for anyone other than Cannies? Are they doomed to wallbonk?

Mostly no. First of all, this gene should work with breeds based on a basic genome, or with minor modifications. Second of all, it *can* be beneficial to Nova Subterra and Kannova, as long as it isn't the most rewarding gene they have in their body at birth, meaning reward and activation time have

to be increased. In the case of the latter two, it was also beneficial to produce a second set of instincts that encouraged moving away from walls, rather than repeating and magnifying the same one. JayD's instinct instructs the Norns to retreat from walls they hit; when designing my Kannova-brained breed, it was efficient to make this instinct activate at adolescence (or any other life stage that takes a reasonable period of time to get to), which during child stage I introduced instincts that encourage these Norns to turn and travel east if during traveling west they come near a wall and end up bumping into it, and vice versa. This combination seemed to produce good results for Kannova-brained Norns; as long as they avoided turning into "I'm-the-wall" self deluded Norns during childhood they were great at avoiding wallbonking otherwise. I later achieved similar results in a Canny brain and simplifying these instincts (cutting one stage off of each one, including the mildened version of JayD's) seemed to inspire altered Boney Grendels to avoid walls more effectively, too.

The flaw of this approach and these brains is that you need to make sure your Norns avoid the most confusing walls during babyhood, and some of these walls are right down in the incubator areas.

To sum it up, if you wish a breed to avoid boinking their heads into walls, feel free to take a look on how others made it possible, and make sure to test how it works in practice whether you copy that or try to come up with something new. First and foremost, remember some instincts will not work as well in certain brains different than the ones they originally were designed for, but others will be very versatile in that regard.

Part 3 – I kisspoped mom! I kisspoped my cousin, too! My aunt's so pretty!

On inbreeding in Norns

Here is a big surprise :

It is actually very much possible to create creatures that are highly unlikely to breed with their own parents in Creatures 2.

The stimuli for recognizing parents and children is in place. The emitters for 'parent/child pheromone' is in place and works properly. A child could recognize its parent, and vice versa. Is this utilized in any way by the regular genome?

Children feel a little more relaxed by metabolizing parental pheromones. Parents gain no benefits, don't recognize their children really, and the only mechanism that actually discourages mating between parents and children is the fact that once they hit the appropriate age the children get crowded more from parental pheromones, as opposed to only metabolizing them into relaxing 'decrease' chemicals. This means no instincts are normally in place to recognize relatives, and no mechanism to actually reduce sex drive or arousal potential exists in the regular Norns, Grendels, or Ettins that would've cut back on this.

Make no mistake; Norns aren't human or even regular creatures. The haploid-style of digital DNA as well as the fact all breeds other than the usual one are essentially just genetic engineering (and said creatures are not capable of being crossed with many others that were engineered differently for similar purposes) means that Norns would not have nearly as many reasons to avoid inbreeding as diploid creatures with the mechanism of recessive genes. Essentially the biggest deterrent from reproducing with people closely related (accumulation of negative genes in a way that allows them to manifest) is greatly decreased.

As a person studying in a very closely related field, I understood quite well that there'd be little benefit in blocking off Norns from reproducing with their own close kin. Especially within the limits of a game engine where their decisions are based on instinct, player reinforcement and drives. However, I did believe that it socially (and because of the various views of players playing the game) it might often be better if the Norns at least limited crossbreeding with their parents, especially after realizing some players completely separated their generations, preferring to never allow parents and children to meet rather than risking intergenerational breeding or even more so intergenerational incest.

So, in my viewpoint, there was little reason to stop siblings or cousins from producing offspring, especially given the fact most games had a limit on creatures that could be around at the same time, and there were only so many 1st generation eggs that were plausible to hatch at once. However, finding a way to reduce parent-child inbreeding was actually quite wanted and beneficial from a purely social viewpoint.

Lo and behold; Creatures 2 has a working way to determine who are parents and who are children of a particular Norn, but sibling recognition… is a mess.

I do not kid you. First of all, if you were to stop anyone recognized as sibling from reproducing with the Norn in question, your 1st generation Norns would not reproduce on their own. For some reason, creatures of the 1st generation recognize one another as siblings, even cross-species, particularly if the children are a result of a so-called 'virgin birth'. This isn't true for later generations, but oftentimes still creatures that are not siblings will be recognized as such; half-siblings always count as siblings (unless the import-export mechanism changes that), and parents or children never count as siblings, but other than that, it's pretty much fair game. It's possible you'll be unable to fully test who is recognized as siblings and who isn't with certain Norn brains because they can apparently get sibling pheromone out of THEMSELVES when they focus on themselves. As such, I discourage anyone from attempting to make it so in Creatures 2 creatures avoid mating with siblings; it's not worth it and too complicated. If you wish to create instincts for siblings, they are plausible, but don't base *anything* off of the Sibling Pheromone; only work on the instinct and stimuli recognition patterns themselves. I wish I was fully aware of these ramifications before I engaged in making family instincts for me breed, because now I know the sibling instincts change their behavior in regards to many unrelated Norns, too.

And then comes the shock : Parent-children relationships are perfectly recognized, but nothing was done to truly reduce the chance of them mating. Other than Canny-based Kai Norns, I'm fairly sure not many people worked to help build good child-parent relationships, either, and I am quite certain no breeds were made and retained their availability that limited inbreeding up or down the genealogical tree as well. However, it is very simple to actually do it; Play with the parent pheromone. Play with the instincts. Utilize 'it is my parent' part of either. You can introduce Norns that stick together, Norns that don't breed with their parents, Norns that become less stressed and angry when around their children, and so on, and so on. Such mechanisms are incorporated in all of the breeds I've made and released this year, 2016, and will be available at the Creatures Community Spirit Festival should they be allowed in. The chances of them reproducing with their parents are extremely minimal and would depend on something like them using the Love Horn or aphrodisiacs; sex drive falls when just in the presence of children and very quickly when actually focusing on them, and the same applies to parents.

To sum it up : You *can* make Norns recognize that parents, or children, are not suitable mates. You can limit the inbreeding and allow them to become more social with their family. You shouldn't try to do it with siblings, as it may make your Norns asexual entirely. Aunts, uncles, cousins, and so on cannot be recognized within the existing system at all, but parents and children *can* and you can limit inbreeding very effectively, either by geengineering or by downloading one of my breeds and allowing it to insert these genes in your population naturally (and since Kannova Venterra are Kannova Norns, you can do it with Nova Subterra, Kannova, Canny, and even some Akamai Canny populations, as long as the last are an almost exact copy of the Akamai Canny gene order. Regrettably, popular variants like Dewa and Flora norns didn't crossbreed well.) The reason why I selected Kannovas for it was because I was new and unaware of which breeds are the truly popular ones – and, as a person with my education, a Norn that could pass their genes down many otherwise impossible to cross lines of creatures truly appealed to me. Big thanks to Ettina for taking the time to create the original Kannovas!

Part IV – Norn! Norn! Push norn! Eeem push Norn! EEM SLEE… EEM PULL NORN! EEM CROWDED EEM HIT NORN EEM SL… NOOOORNNN!

On sleeping and social issues in Creatures 2 Norns, and why is eating even more difficult

Creatures are social. This is their defining characteristic in the first two games : Other creatures are very stimulating to Norns/Ettins/Grendels, they help with some needs, particularly loneliness, and easily occupy all of a Creature's focus if there's more than one of them. Regrettably, while the Norns have a generally good idea of what they need before they are made stupid by their lifespan, and sometimes even know how to get it, they don't really select needs based on importance for survival, and occasionally stimulation trumps needs.

And other Norns give so much stimulation! So obviously they are more important than these pesky drives!

This issue is twofold. Firstly, Creatures indeed command other Creatures' attention with speaking, moving, and generally being something so similar yet different to them, and capable of helping with so many needs that make a Norn sad. Secondly… Creatures have no idea how other creatures feel. What's important is how they feel. Selfish little critters! So, what essentially happens is that even if norn A is actually smart and determined enough to satisfy a very important need, PARTICULARLY sleeping/resting, norn B is primarily interested in how to get norn A to scritch him, and how it'd feel to pet, then slap norn A. The fact norn A just fell asleep is inconsequential. They're gonna be slapped, and woken up, and forced to contend with norn B's company until Nornette C comes along and makes Norn A realize becoming a father is much more important than sleeping (don't even get me started on whether she's more important than adipose, muscle tissue and glycogen levels).

Essentially, by the time he's done slapping, petting, mating, and exchanging bibbles with norn B and Nornette C, norn A may actually only vaguely remember how to sleep, be very hungry, and generally confused about which needs, which of course his Norn friends didn't satisfy at all, is he supposed to take care of. Oh, and if he's getting rewarded for stating need, he's gonna get stuck doing just that for a while.

- Presence of other Norns/Creatures encourages socialization and may deter a Norn/Creature from trying to satisfy other needs.

- Presence of other Creatures mean they're likely to focus on the creature attempting to satisfy their need, and interrupt them because of their own drives or overstimulation by their presence.

- Norns are likely to become very confused about which one of their needs should be satisfied first if they stocked up several.

- Sociability at least equals survival in a Norns' eyes.

The summarization of these is why presence of other Norns impairs a Creature's ability to take care of some of its own needs. And there's more to it, since there can be many more creatures around making things worse. But surely it's not the only source of the problem?

When Norns sleep, they try processing their instincts and start to understand what to expect when they attempt certain actions. However, not all Norns will be able to maintain this sleep without immediately attempting said actions if they seem like they'd wield pleasant results. A form of lunacy may appear where the creature retains the sleeping animation, but not the stimuli, and the problem is increased if they have backed up a lot of 'sleepiness increase' along the way. They won't be able to reduce their Sleepiness from this restless sleep, and may even get up and attempt to do things while still sleeping. The Norn additionally may start realizing sleeping doesn't satisfy its need, although

that's a little far-fetched. Primarily, it is likely to lose the sleeping stimuli and continue to go without sleep decreases for a while, particularly if it falls asleep with other high needs.

How can that issue be circumvented?

Well, first off, you got to realize Creatures 2 is a fairly old game and while it has immense potential, some of its elements are very buggy. This, regrettably, includes sleep. Sometimes, your Norn can be doing everything right and still not get the stimuli it needs to decrease its Sleepiness drive. This isn't frequent and as long as the creature is sufficiently stubborn a rest that actually counts as a rest will eventually help. But if you want many rests that are proper to happen, you need to realize that :

- Different brains and differently raised Creatures may be more or less prone to lunacy and it is not likely related to their intelligence. In my personal experience, unaltered hand-raised Kannovas were amongst the most lunatic creatures.

- You may be interrupting a Norn's attempt to process its instincts by trying to fix its sleep. A Norn may thus not be sure what to expect of its new instincts until the next time they sleep, or until they actually meet the requirements for the instinct. Feel free to always let a Norn get lunatic on every first sleep after it changes age categories.

There are two approaches from here :

- Physical. A Norn needs to have Rest as its chosen and highest decision when resting (observable through the Neuroscience kit). If it is not resting properly, you may punish it. A single slap won't wake the creature, nor will injections if they aren't very rapidly fired one after another. Once a creature's Rest action is the chosen one, they'll be getting the stimuli.

- Genetic. Stock up on instincts that associate sleepiness and tiredness drive with Rest action, and allow various benefits for resting in your breed. Finally, when a creature is adult enough to realize it has needs and mostly follow them, but forgot how to sleep or eat, feel free to fire off new eating and sleeping stimuli and instincts, and actually make the stimuli themselves give rewards. Kannova Venterra 2.0, with their instincts altered, as well as very similarly-made Ettins that hopefully will be released this CCSF have improved their sleeping tremendously through giving them an instinct that lowered their NFP when resting and another that simultaneously associated tiredness and sleepiness drives with the resting action. The final bonus kick was the stimuli that allowed them to gain 'reward' directly from resting. In most creatures I stopped having to fix their lunacy problems altogether. Do note that these have to be introduced one after the other, as its easy to make a creature obsessed with a single action if it becomes the most desirable.

Regrettably, the best ways to lower Norn obsession with other creatures is to either guide them directly when in tough situations or introduce instincts that punish social behaviors like approaching or petting other Norns when their sleep or hunger drives are high. It is worth noting the 'company

over need' problem is something Nova Subterra breeds have completely eliminated, but it has lead to other issues that refer to this breed specifically – ones that can also be overcome by intervention.

Part V – On Drowning and other issues

Can we fight the cliff edge?

Long story short, the cliff edge is overpowered. It has stimuli and instincts associated with it that flood the creature with more concentrated chemical shots than mostly any other situation in the game, and because of the game's engine the creature won't always be able to properly perceive the cliff edge, either. The best way is still to produce more bridges or other blockades that prevent a creature from falling off, but you *can* attempt to figure out a way to set the instincts and stimuli in a way that is less confusing for the creature; since its instinct tells it will be rewarded if it retreats from edge, the whole situation becomes very confusing for it when being on the edge causes it to potentially experience so many chemicals at once, many of them inducing punishment, if the whole thing even triggers right. LummoxJR even reported one of the bodies of water is buggy and will cause Norns to fall into it anyway even after he managed to get Nova Subterra to be better at avoiding other cliff edges and water bodies.

I have no solution here; only observing the relevant genes in Nova Subterra and working through testing to produce better results in other breeds by altering instincts and perfecting the (crazy) chemical cocktail Norns receive from approaching an edge can result in better avoiding of falling in water.

Part VI – Nova Subterra and related.

Smart, amazing learners, forever alone.

Nova Subterra is a breed that is a general improvement over the run-off-the-mill, basic-shipping Norns in the areas of learning ability, memory, overall intelligence, survival skills – sleeping and eating habits in particular, as well as exploration and traveling. However, it never got very popular because it has trouble breeding on its own, and essentially has to be taught to do so – causing problems with less experienced players as well as making them unviable for Wolfling Runs, since they rarely get to generation 3 in those. A lot of people simply left it at that, but since I started my adventure with smart-type breeds from them, and then tried to further improve upon them before turning my attention to Kannovas, I managed to get a better insight in what exactly were their issues.

Some of the surprising but big improvements LummoxJR noted in both the general description of Nova Subterra and in message boards are inclusion of the brain-clearing ConASH chemical's emitter and afterdrive and change lobes. The inclusion of the latter two lobes appear to be the moment when the breed started having issues with, well, breeding, although LummoxJR ultimately deemed testing satisfactory after a lot of effort, at least under the playstyle of himself and his testers. To quote a fragment of a post from a group, "Project Gemlode, the middle generations were fantastic breeders, pumping out eggs faster than the testers could keep track. But once the afterdrive and change lobes were added, Nova Subterra intelligence just about tripled, and their desire to mate constantly was muted by a desire to explore, and I believe a certain boredom (same-old, same-old, you know) with other Norns. They had high sex drive, but just didn't care to mate--go figure."

Given the popularity of wolfling runs combined with the apparent dislike of getting Norns to breed by careful pairing, instead leaving it up to them, it does seem on forums at least that the breed was less popular than Cannies and later Akamai Cannies.

In my personal experience, however, their issue was somewhat different; Nova Subterras frequently had trouble actually perceiving the presence or actions of other creatures. They were capable of doing so when the creature in question was in their presence for a long time or when the two were hatched very close to one another, but in general they do not seek one another out for satisfying their NFP drive (which is how most Norns satisfy it, actually, since being pet by other creatures helps the best with that), and when fertile their brains often do not register the presence of Norns close to them, their sex drive doesn't increase nor do they get pheromone spikes. When altered to produce sex drive naturally the Norns could be at 'extremely friendly' levels and completely ignore viable partner Norns. When a Kannova was introduced into the mix, she readily followed a potential Subterra mate and attempted to initiate mating (kisspopping was heard) but the Nova Subterra did not receive the breeding stimuli. Some attempts at interaction from other Norns, Grendels, and Ettins, whether friendly or not, doesn't work at all on Nova Subterras (in my experience and on my computer, at least), which is completely mind-boggling.

Part of the reason for them sleeping and eating so well is, as a result, regrettably this antisocial tendency (or solipsism, or psychosis, call it however you want).

To combat this in practice, you can try to :

- If you're nurturing your Norns, hatch them in pairs and try to raise two at once. This is not recommended for any other breed, but may help that particular case. Use of the laptop computer will likely be necessary for them to learn the basic category names as their focus may be confused if you attempt to teach them names for food and fruit by hand.

- If you attempt wolfling runs, mix in any Kannova breed into the population and limit their traveling space (or occasionally limit it) to encourage noticing one another and breeding.

If you wish to combat it with genetics :

- Try implementing more instincts that focus specifically on other creatures.

- Try altering the afterdrive and change lobes, or (more risky) the ConASH emitter.

Finally, remember to encourage your Nova Subterra norn to play with toys and occasionally pet them, as they have trouble receiving NFP decreases from other creatures; you could also alter the emitters and reactions pertaining to NFP on a genetic level.

Part VII – Boney Grendel and related

Same brain, better brainwork, in love with the walls.

Lis Morris made Boney Grendels following a request by CyberLife and with some input from the community; while their concept lobes aren't as big as Nova Subterra, Kannova or Akamai Canny, they are a little larger than the common Bulbous Grendel. Primarily, I feel, the improved intelligence came from the fact that Lis took the time to rework their instincts at some point; Boney Grendels are one of the few breeds I've seen that didn't have the potentially nonsensical instincts I've described earlier. There is one problem with Boney Grendels, which for some reason is particularly strong in all Grendels, and one problem only.

They wallbonk like madmen.

As such, it is necessary to devise an anti-wallbonking instinct that actually works for Boney Grendels. I did attempt to do this with positive results, but I'm sure some people out there might have even greater success. Not sure whether Grendels, with their brain power, would process their instincts more like Canny norns or more like Kannova and Nova Subterra norns, I opted to try with simplifying the instincts and quickly achieved some success. In my slightly-enhanced version of Boney Grendel genome (which was also sent to CCSF and may end up being published), the instincts I used were a simplified version of what I put in Kannova Venterra; rather than put two requirements for 'retreating from a wall' like JayD did and like I did originally in my breed, I only placed one (slamming a wall). Rather than put three requirements for traveling the opposite way (Near a wall+traveling direction+slam a wall → Reward decision for going the opposite way), I only put in two (Traveling direction + slam a wall → reward a decision for going the opposite way). These instincts seemed fairly compatible with Lis' and CyberlLife's brainwork and quickly brought enough success to feel satisfied, yet I am certain someone who tested more thoroughly could make these Grendels even less likely to wallbonk.

Part VIII – Canny, A. Canny and related

I wanna be the very best like no one ever was!

But it's gonna take a lot of episodes...

Akamai Cannies are the end result of a long chain of Canny experiments and improvements along the way, and the original creators sitting down and working over their instincts as well as implementing final brain improvements. Cannies and Akamai Cannies use more substances to help with behavior alteration than Nova Subterra, and in this, Kannovas mimic them; on the other hand, Kannovas are more similar to Subterras in instinct processing.

From what I understand, before Akamai Cannies were a thing, Ettina decided to mix Kannova Norns from Nova Subterra and Canny genetics and methods of handling intelligence, the result of which was a breed that was roughly as smart as Cannies and N. Subterra of that time but able to crossbreed with them.

JayD introduced their own improvement when they noticed that Cannies still had some serious wallbonking issues, and produced a set of instincts that activated at virtually every age encouraging retreating from walls when a Norn hit into them. This worked very well with a Canny brain and lead to the formation of the first properly anti-wallbonk breeds.

Hivemind Ettins, which I didn't have the pleasure of properly testing as they utterly bug out on my computer, were also reportedly made based on Cannies.

Akamai Cannies came after that and originally didn't have the genes, but these days you should be able to find a lot of breeds that combine the two improvements. Akamai Canny in general are the most popular breed amongst C2 players (if we count variants of it like the Flora Norns and Dewa Norns). Since OHSS is essentially eliminated entirely by greater intelligence and fewer 'junk' instincts, they also live for a long time (over 10 hours) in most cases.

The flaw to that is that Akamai Canny can be even harder to crossbreed than other Norns. Because their genes are slightly out of order and they have quite a lot of genes, Akamai Cannies that were further varied (i.e. Dewa and Flora Norns) become a lot harder to crossbreed with other Canny breeds and my testing with Kannovas refused to produce any viable offspring that was Akamai-brained – most of them crashed the game, as a matter of fact. However, regular Akamai Cannies retain enough in common with other Canny breeds to be able to crossbreed with them, and some improved breeds were so directly based on these genetics that they retain that capacity too, while improving a little further (an example would be Grendel Man's variant or Ivrogne Norn variant).

On the plus side, you can crossbreed Dewas with some other variant versions successfully, so as long as you stick only to Akamai Cannies you can freely use several breeds that possess these brain genetics!

There's really not to say about Akamai Cannies, to be honest. They're pretty much at the peak in terms of intelligence and viability for both hand-raising and wolfling runs in terms of what was achieved in Creatures 2. However, you can still seek to improve them, or use them to improve strains of other breeds. Inserting new anti-wallbonking instincts into Akamai Cannies might improve them even further, as would copying JayD's work into breeds that do not have them. Akamai Canny still crossbreed with their parents and children, so working on family instincts may be something you want to do. I believe most Akamai Canny breeds still don't recognize roots or leaves as edible food-types and don't have any drink-related instincts, so there's work to put in there.

There's many Canny breeds with quirks that go beyond an unique model you could swap in, so upgrading these breeds to Akamai Canny versions or just giving them small improvements where it is possible may also be part of your calling in terms of genetic engineering or crossbreeding Norns! Finally, using Kannovas or altered versions of them, you could try crossbreeding Akamai Cannies with Nova Subterra indirectly and obtain increasing amounts of curious new variants that may end up even smarter – not to mention you may find an even better way of combining the two or improving upon either than Ettina did with her version.

I'll include a list of some of the smarter breeds later, so you can learn what got left behind when Akamais were created.

Part IX – Summary

Despite the fact that Akamai Cannies already did a lot, there's still much to do especially if you found yourself enjoying other breeds. A lot can be improved, ranging from Akamai's anti-wallbonk capabilities (though those were already largely fixed with JayD's edits being incorporated into some breeds), to a lot of things in other breeds.

- Remember to always test your anti-wallbonk instincts when used on a breed with a different brain structure, and remember there's more than one way to encourage not-wallbonking.

- Take care of your Norn if you find out that the instincts work better if not activated at birth; some can get confused for a LONG time if they wallbonk excessively at youth.

- Remember some brainlobes improve intelligence or potential intelligence, but cause new issues to happen in Norns. Nova Subterras are amazingly smart but can have serious social issues; Kannovas can be just as smart as Cannies or Subterras, or more, but are more prone to lunacy and have slightly more chaotic brainpatterns.

- Remember a lot of breeds still have instincts that do not make much sense. You can improve intelligence just by swapping these instincts for ones that could actually help the Norn; as long as the order remains close to the same, your Norns may remain crossbreedable with others.

- Remember brain genetics greatly alter your Norns' ability to mix and match with other Norns. Cannies can reproduce with Cannies and Kannovas, Subterras can reproduce with themselves and potentially Kannovas, but none of the group can reproduce efficiently with the regular Norns. If you introduce a new way to process information and more new versions of brain lobes, your breed may develop new options for interbreeding or be impossible to crossbreed.

If you wish to attempt crossbreeding, want to know which breeds could be updated to a new variant or experimented on, and so on, I'll try to compile a list of some of the breeds that base on certain genetics below :

- Nova Subterra : You can download the regular three Norn breed variants of it from Creatures Caves. There aren't many variants in terms of looks, but you could probably download individual creatures of various looks that have the Subterra brain structure – in example, on Creatures Repository Malkin uploaded Ettin Nova Subterras that have been modified by JayD. Given that JayD's instincts may be confusing for N.S. much like they were for Kannovas, you could check them out and see!

- Kannova : Most variants are individual creatures or adoption packs rather than breeds. You can download a group that has an instinct for eating leaves and roots on Creatures Caves (Diverse Diet Kannovas), and a couple are possible for adoption on both Creatures Caves and Creatures Repository. The breed I've created is a Kannova; you can find download links to slightly earlier versions on the Discover Albia forums, or wait for Kannova Venterra to be uploaded to the CCSF 2016!

Kannova Venterra come in what is essentially four variants : Basic Kannovas with heavy metal resistance and family instincts, including limited parent-child inbreeding, Kannovas with an altered metabolism that makes breeding more difficult unless the Norns eat with a heavy reliance on sources of fat to maintain fertility and very low fertility during adolescence (called Altered Breed), and versions 2 of both breeds where I revised their instincts thoroughly to improve intelligence and sleeping habits at the expense of some of their crossbreeding potential (they still crossbreed well with many regular Canny breeds, but fail with some Akamai Canny variants).

- The fore-mentioned Hive Mind Ettins do not count fully as a Canny variant, but should be mentioned. I believe they lack a direct anti-wallbonking instinct, and can still crossbreed with their parents and children, for example.

- Canny : There's quite a lot of them. Albian Bat Norns by Norngirl have slightly altered metabolism but are not yet updated to Akamai or JayD version of Cannies. Pegasus Ettins use a Canny genome,

and Spotted Norns use a version of JayD. Kai Norns are based on Cannies and are the first norns to really incorporate any sort of family interactions on a greater scale. You can download various Grendels and Ettins incorporating Canny genetics as individual adoptions, go for Improved Canny Ettins from Discover Albia, or my further improvement of them the Iscah Ettins from this year's CCSF website!

- Akamai Canny : Regular, Grendel Man-Improved, and Ivrogne Norns (which were geared to be low-need, survival-effective, wolfling-run effective version of Grendel Man's variant) generally retain normal Canny-like crossbreedability. Dewas and Floras have their own unique characteristics and should only be crossbred with other Akamais, at least in my experience. Kimahris appear to be borderline immortal from the description, and are also based on Akamai Canny genetics.

- Boney Grendels : A lot of the newer Grendel breeds will use the Boney Grendel genome over the regular genome. C2 version of Tiger Grendels, Winged Bulbous Grendels, Sweetheart Grendels, and Plasma Grendels are all ones that are either Boney or based on a Boney genome. I also created a Grendel breed for CCSF that is meant to improve on Boneys, particularly limit parental inbreeding and wallbonking along with improving their immune system; they're called the Bonewall Grendels, and will be downloadable on CCSF 2016.

While I know Creatures 2 is problematic to run nowadays, I still have hopes to see even more intellectually improved breeds in the future!