

SUPERMAN

We call him Superman, a name that is elegant in its simplicity yet speaks volumes about what he truly is: godlike power in the guise of a human man. His determination to use his gifts in the service of truth and justice makes it hard to imagine that there could be anyone more worthy of his moniker.

But strip away the charming smile and the Midwestern values, look beneath the iconic emblem emblazoned on his chest, and you'll discover that Superman can't possibly be the best of us, when, in fact, he isn't one of "us" at all.

A native son of a distant planet that no longer exists, Superman is one of the last survivors of Krypton. Born Kal-El, he was sent to our world as an infant so that he might live in safety among our people. Despite his extraterrestrial origins, his adopted parents did their best to instill their son, whom they called Clark, with the very best facets of humanity. But even the Kents would have admitted that humanity equal human.

His visual abilities are astounding and seem improbable when trying to explain them in relation to human biology. My speculations are only a starting point, a way to train ourselves to consider Superman's unique processes in ways that we can comprehend.

Data Collection

Unlike many of the individuals in this book, Superman seems to understand the need to study metahuman data and has volunteered invaluable information. However, even the Batcave's technology is incapable of fully analyzing his alien physiology. Traditional needles won't pierce his skin. Conventional radiological imaging devices often fail to penetrate his dense musculature. Fortunately, I've been able to collect a few small samples of blood and tissue, mostly gathered from sites where he's been injured. In many cases, the test results raised more questions than they answered.

My SPECULATIONS are only a starting point, a way to train ourselves to consider Superman's unique processes in ways that we can comprehend.

Superman breathes and bleeds, and has the musculoskeletal shape of a man. But it would be a mistake to

Kryptonians appear entirely human on the surface with similar biological processes.

How can his skull, the size of a man's, support the ocular and aural systems that allow him to perceive so much more than a man?

Although he appears to be human on the surface, I can only speculate about what lies beneath his Kryptonian skin. Are his organs similarly human or entirely alien? Despite my best efforts to find out, we may never know.

assume that his systems work like ours.

The joints of Superman's body are strong enough to withstand incredible pressure.

Reinforced tendon and joints, or some material that has no human equivalent?

Much of my research has been focused on the composition of Superman's bones and muscles. What combination of organic structures could possibly generate his immense strength? I have many theories but all are at odds with conventional scientific thinking.

FOR FURTHER RESEARCH, Could an X-ray machine that uses the radiation from Kryptonite be a way to see beneath Superman's skin? Does this present too great a risk to Clark?

Visual Capabilities

Superman has demonstrated a wide variety of metahuman visual abilities, all of which are difficult to fully explain. Clark has been forthcoming enough with information regarding his sight, but his optical systems are so complex and so vastly different from human vision that what he "sees" is not something he can easily explain.

Telescopic/ Microscopic Vision

Whether an event is taking place hundreds of miles above the Earth or on a sub-atomic scale, Superman is capable of observing it with a glance. To achieve this, his eyes must contain multiple lenses of varying thicknesses. He can adjust the distance between lenses and retina to allow for both telescopic and microscopic vision. The process is entirely autonomic. But to account for this incredible range and accuracy, his eyes should be much, much larger. I can't explain this anomaly (and neither can Clark) so further research will be required.



To perceive so many different frequencies of light, it stands to reason that his eyes' photoreceptors are made up of many materials.

Despite my careful theorizing, trying to unravel what Superman sees is like trying to describe color to a person blind from birth. Analogies can be drawn, but interpretations aren't the same as objective reality.

X-Ray Vision

It appears that Superman can also see, or at least sense, a wide range of the electromagnetic spectrum, from megameter long waves to x-ray and gamma waves. The distinctly alien composition of his eyes allows him to alter and even reflect some of these waves. While he has the ability to see through all materials except lead, the term "X-ray vision" is actually a misnomer, considering that the objects he scans are not irradiated.

Perhaps he can detect particle density patterns, or perceive the lengths of radio and sound waves in complex layers and visually observe how they interacted and reflected from matter.

Another theory: muons, the detritus of cosmic rays, settle to the surface of our planet at something like 10,000 per square meter per second. If Superman were able to sense how these decaying particles interact with matter, the ability might be likened to X-ray vision.

Perhaps each photoreceptor is sensitive to different kinds of electromagnetic radiation?

Superman's visual capabilities defy logic. How does his ocular network support all that he can do?

A cat can discern tiny variations in sound, one-tenth of a tone apart, to hear and assess the movements of prey. Trying to ambush the Cheetah may prove extremely difficult.

Though it's tempting to visualize the Cheetah's skeletomuscular system as that of a human with a tail, an exaggerated bite, and feline ears, what's underneath may be vastly more complex.



Retractable or fixed claws?



Her ears rotate like a cat's, increasing her auditory acuity and directional location capabilities.



The spot patterns in the Cheetah's fur provide natural camouflage, breaking up her form. To prey, she would be much harder to spot in the flat light of dawn or twilight, a cheetah's natural hunting times.

The Cheetah's musculature appears to be more akin to feline through the legs; long and lean, made for increased agility and for increased reflexes as well as short bursts of increased power.

I can only assume that the Cheetah's skull is comparatively human in its composition and only the mandible and maxilla (upper jawbone) is noticeably feline. Incisors and canines are prominent and sized as a primary method of attack.

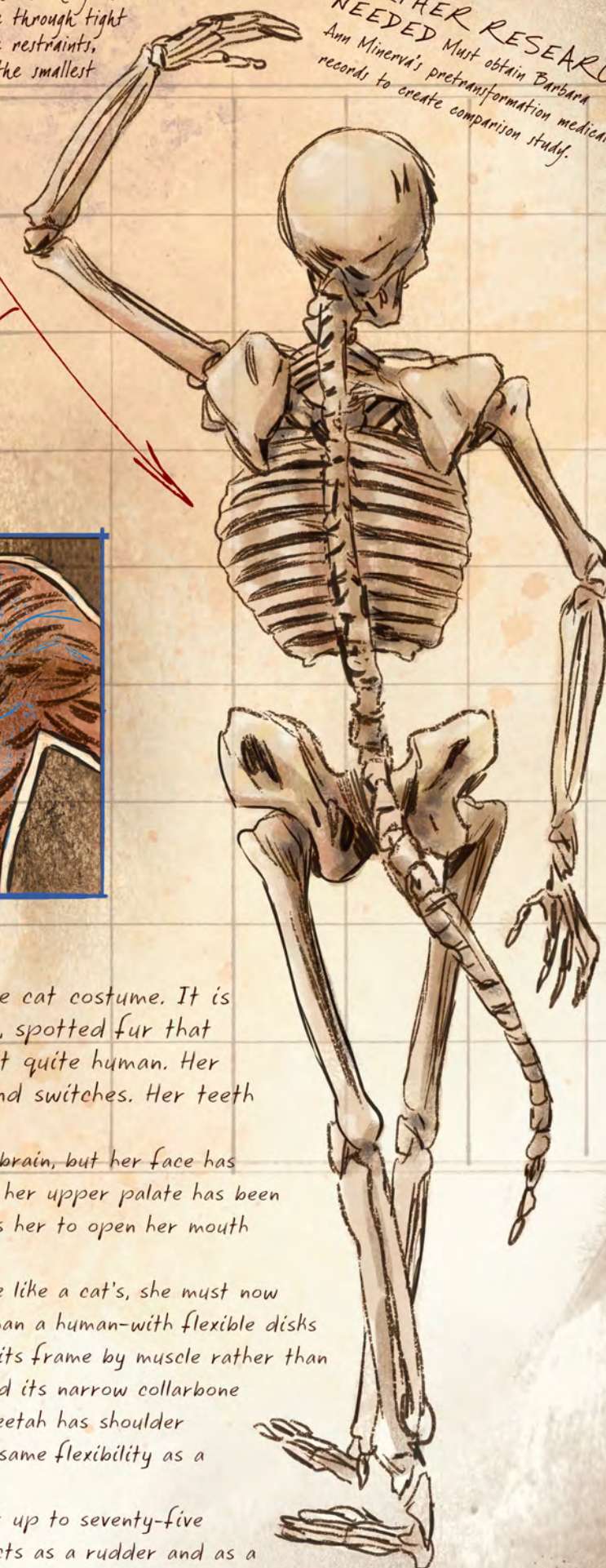


If the Cheetah's bite and ears are feline but her cranium is human, how is she able to accommodate and coordinate what should be exclusive muscle groups?



If her internal makeup is more feline than human—particularly her bones and surrounding musculature, clavicalae, pelvis, scapulae, and vertebrae—she is likely able to easily squeeze through tight spaces, escape restraints, and hide in the smallest of enclosures.

FURTHER RESEARCH NEEDED Must obtain Barbara Ann Minerva's pretransformation medical records to create companion study.



Physiology

At first sight, Barbara Ann looks like a woman in an elaborate cat costume. It is only as you get closer that you realize her "costume" is fine, spotted fur that covers every part of her and that her face and form aren't quite human. Her catlike ears twitch at distant sounds. Her long tail curls and switches. Her teeth are sharp, designed to rip and tear.

Her skull has remained large enough to accommodate a human brain, but her face has been subtly restructured by her transformation. The premaxilla of her upper palate has been extended as a separate bone for greater bite power; it also allows her to open her mouth considerably wider than before.

If Cheetah's skeletomuscular system has been altered to be more like a cat's, she must now have more vertebrae—cats have fifty-three vertebrae, twenty more than a human—with flexible disks of elastic tissue connecting them. A cat's shoulders are attached to its frame by muscle rather than bone, allowing a cat to lengthen its stride—in order to run faster—and its narrow collarbone lets it twist and rotate to fit through tight spaces. Unlike a cat, Cheetah has shoulder blades and a humanoid collarbone, but she exhibits quite nearly the same flexibility as a feline.

Cheetah is as fast as a real cheetah when on all fours, running at up to seventy-five miles an hour in short bursts. As with her namesake, Cheetah's tail acts as a rudder and as a counterbalance to her body weight, allowing her to quickly change direction while chasing prey.

It's possible that the Cheetah's musculature is enhanced by muscles that humans don't have: muscles that can be found in feline physiology. For example, if her thigh incorporates a variation of the cat's caudofemoralis muscle, this would greatly increase her running and leaping abilities. Cats also have specialized chest muscles to increase the abduction (extension) strength of their limbs so that they can run faster. She has obviously undergone a physical transformation, but how deep it goes isn't clear.

Connectivity

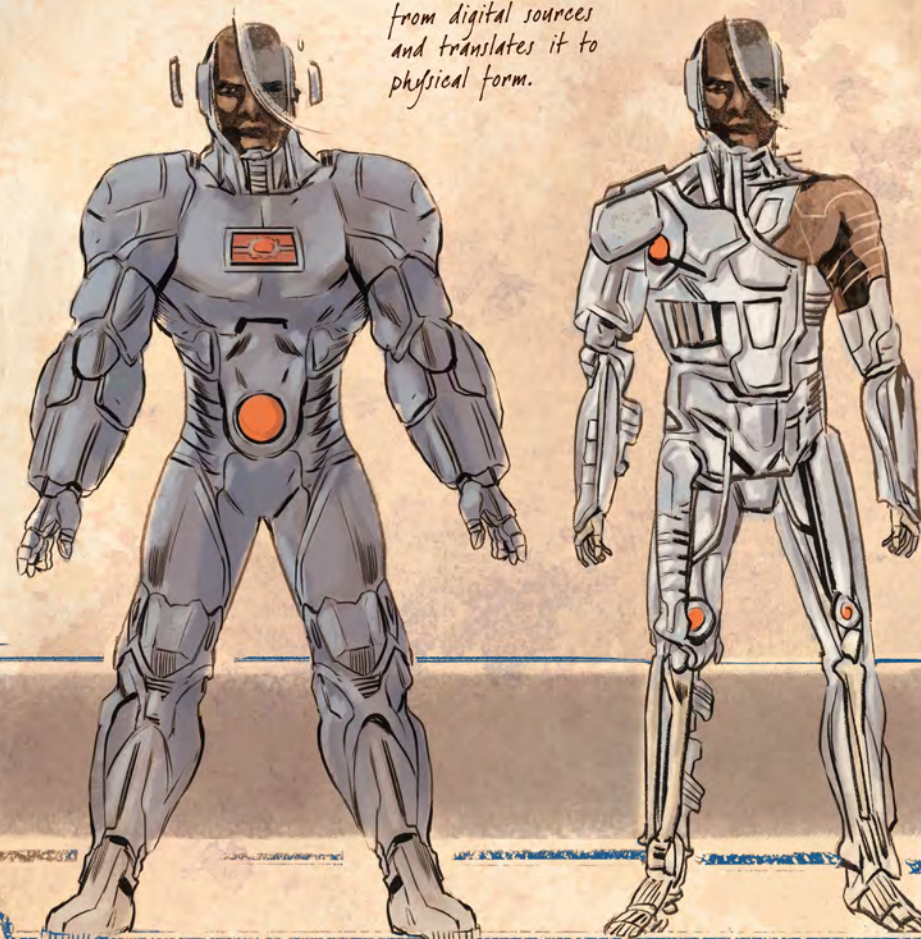
Cyborg is constantly in contact with all of Earth's computers, digital systems, and satellite relays. This depth of connectivity is possible because Victor's nanites are organized, formatted, and synced to process vast amounts of data. Presumably, he also uploads self-replicating access programs to the software of the external systems he's contacted. Once these pathways are established, he can access any digital information with just a thought. The nanites must sift through this endless stream of data, alerting him to files of interest based on their relevance to what he's thinking—something like a human subconscious, but one that has evolving search parameters and can download information directly into his memory.

Cyborg is the main reason you're looking at a physical report rather than reading a screen. Despite my best efforts, Victor can gain access to even my private digital files with little difficulty. The only thing that keeps him out of the Batcomputer is respect for my privacy.

With each functional modification, Cyborg can alter his dimensions to suit his needs. Early incarnations required more mass to protect his remaining organic tissue.

With a thought, he culls relevant data from digital sources and translates it to physical form.

As the nanites evolved, efficiency increased and mass could be reduced. This self-directed physiology defies easy explanation.



Nanite Upgrade

The functions of the nanites that reside in both the organic and inorganic parts of Cyborg are far more advanced and efficient than any nanotechnology currently available to your average Earth scientist. The first incarnation of Cyborg, after the initial graft of alien technology to his dying tissues, required him to be physically bigger to house the replicating nanites and the mechanics of his artificial flesh. He was bulky, robotic. Now, he is sleeker, more humanoid. It's my theory that when the nanites took over cellular function, they simultaneously downloaded the chemical makeup of weapons-grade promethium and started to create hybrid cells. These hybrid nanites could have learned to mimic human tissue as easily as they could promethium.

The latest incarnation of Cyborg no longer requires the storage space he once needed to hold complicated cybernetic systems. Take the multiple capabilities of his cybernetic eye, for example. It can become a telescope or a microscope, or provide X-ray and infrared night vision. The eye can be also used as a tracking and targeting system and can operate as a medical scanner. The space needed to house all of these functions is far larger than the synthetic portion of Cyborg's head. The only possible way for such a small area to perform such specific and complex tasks is if the living nanites constantly reconfigure, reforming into what he needs as he needs it. His morphology has transcended the thought/impulse/receive/interpret/lact paradigm, which is the standard for human-synthetic combinations. He has essentially become a vast network of lightning-fast applications and titanic storage capacity, a nanite hive-mind of pure power, all tuned to Victor Stone's will.

I would have to study a significant sample of Cyborg's nanites to verify these theories. Unfortunately, Victor is still unwilling to part with them, and the S.T.A.R. files theorize even more than I do—the invention has far surpassed what the inventors can understand.

The nanites seem to function with a hive mind. How extensively is this collective consciousness connected to Victor and the Mother Box? Is it fair to say that Cyborg is a triadic creature, or is Victor's control always dominant?

The continual restructuring of Cyborg's optics is an example of the nanites' functionality and efficiency. With each permutation, there seems to be no loss in effectiveness and no lapse time.

Cyborg has access to the most sensitive data of every civilization on Earth.

It's safe to assume that nefarious organizations on and off this world have made a note of it. As long as he is Cyborg, Victor Stone is a man of particular interest to those who would exploit him.

Does Cyborg's continual connection with the data streams of the world increase his vulnerability to virtual viruses or cyberattacks? I don't doubt that his security measures are comprehensive, but, given enough time, any system can be hacked.

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HE MORPHS FROM ONE SHAPE TO ANOTHER EFFORTLESSLY, SEAMLESSLY, FLESH AND BONE MELTING AND MOLDING TO ITS NEW FORM IN MILLISECONDS.

THE PROCESS OF METAMORPHASIS ITSELF is highly mysterious and challenging to observe in any amount of detail. From what I have been able to gather, his transformations are almost fugu-like, as elements of organic matter twist and intertwine to weave new forms, the remarkable process happening in a matter of seconds. The question that I struggle to answer is where does the excess organic matter go when he transforms from a larger being into a smaller one? And where does it return from when the process is reversed? Are certain areas of his body denser than others to accommodate this displacement of matter? If so, does this mean that he has multiple weak spots in certain forms? Volorempor.

Obtaining and studying CCTV footage of J'onn's transformations must become a priority going forward. The digital records I recovered from the Watchtower may be a good place to start.

NOTE: Talk to Lucius about sending a Wayne Enterprises probe to Mars. We can publicly claim it's in the general interest of scientific community, but its covert purpose will be to collect data pertinent to the study of J'onn.

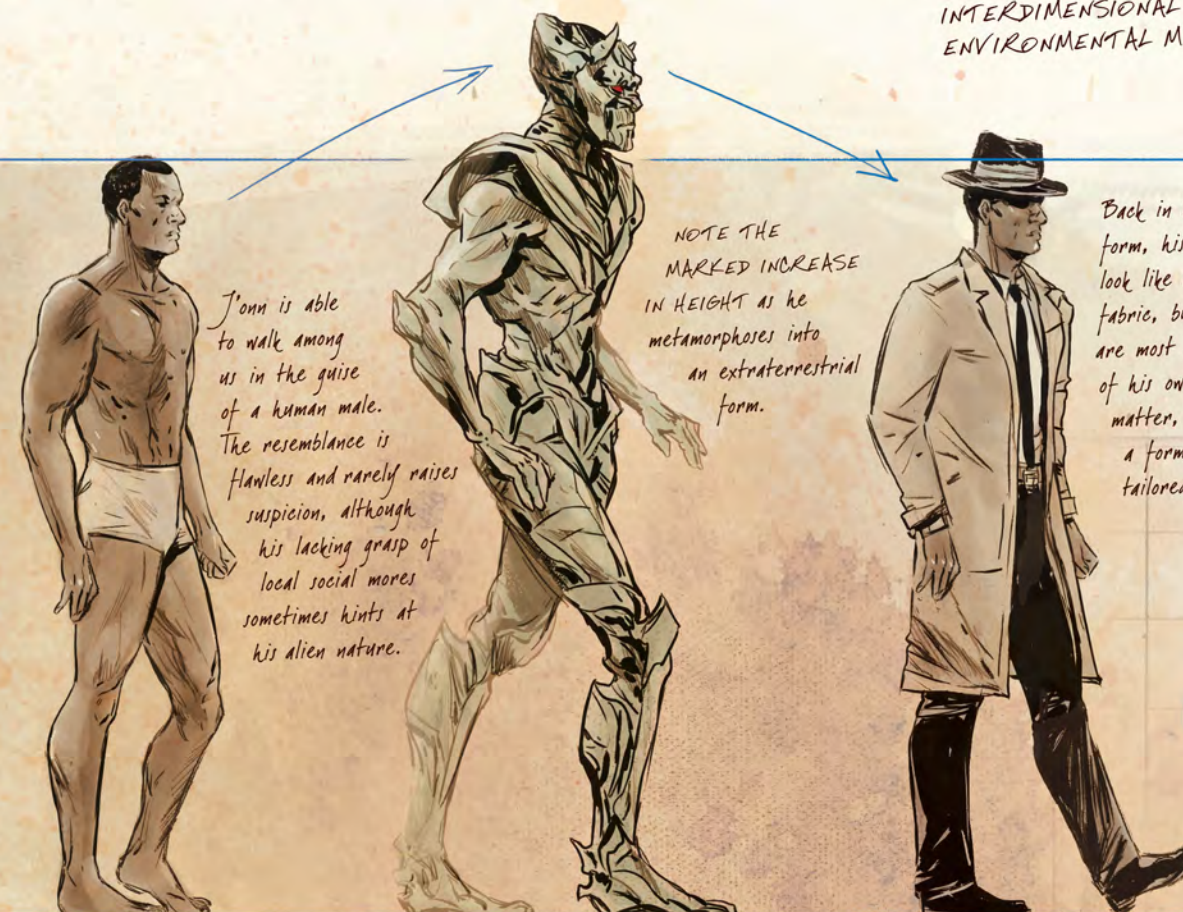
As, presumably, an offshoot of his shapeshifting abilities, J'onn is able to become invisible. If I could gain a working understanding of the science behind this process, the applications to my own technology might be revolutionary.

ACTION NEEDED

I should offer to assist J'onn in tracking down Thoth. Apart from the need to eliminate THE threat that this parasite presents, working closely with the Martian Manhunter will give me a far greater understanding of his abilities and further win his trust. I'm not sure that he'll ever fully cooperate with my studies, but he may become more amenable to providing basic physiological information.

DENSITY SHIFTS unaccountable considering INCREASES/DECREASES in mass.

INTERDIMENSIONAL PHASING or ENVIRONMENTAL MANIPULATION?



Back in human form, his clothes look like regular fabric, but they are most likely formed of his own organic matter, essentially a form of tailored skin.

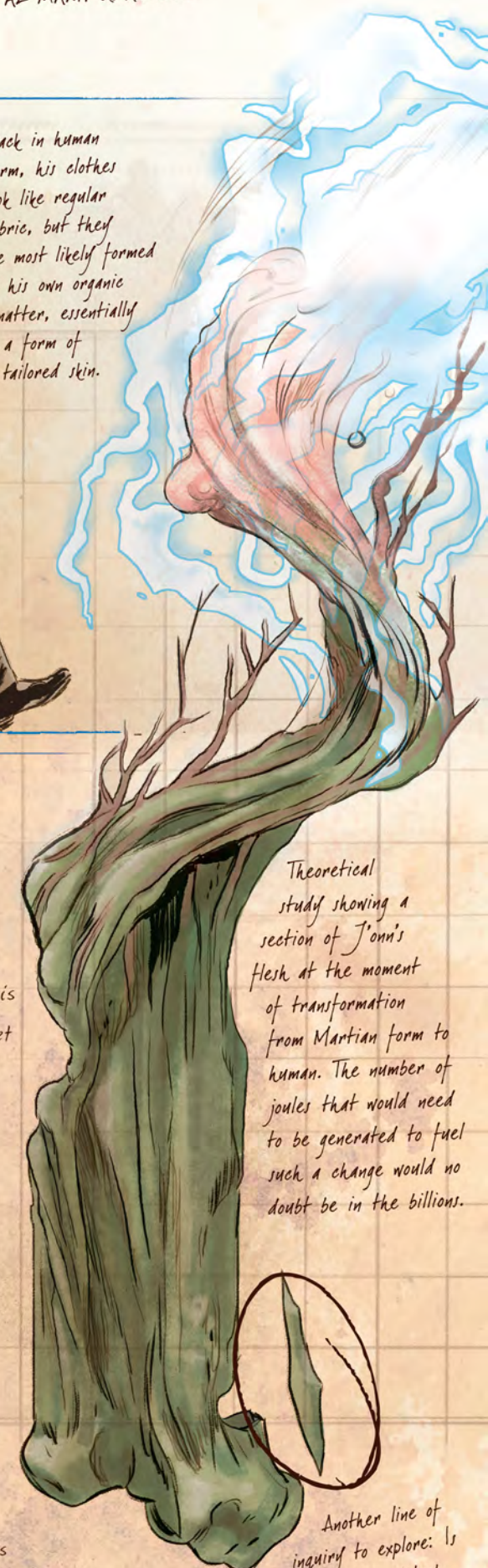
Shape-Shifting Ability

THE MARTIAN MANHUNTER DOESN'T JUST ALTER HIS APPEARANCE when he shifts from his "natural" form; he actually becomes the new form, with its own inherent strengths and abilities. A change of this magnitude would require total molecular control, perhaps involving malleable embryonic stem cells that can change size and shape. Or maybe there are no cells involved at all; maybe his body is comprised of a dense cellular fluid manipulated by J'onn's consciousness to reinterpret itself to his will. One theory I have been working on proposes that he absorbs matter from his environment to change mass, shedding the material when he wants to decrease his size. Conversely, it could be that he is able to access a dimensional shift from which he can draw or discard additional matter. I'd be more inclined toward the latter explanation, considering the levels of density the Manhunter's working with. I've seen footage of him becoming a dragon big enough to carry a failing jetliner safely to the ground. That's a considerable amount of matter.

As to how he can effectively become another being, the powerful combination of J'onn's psionically enhanced senses must enable him to "see" into another's mind and body, to elemental particle size. He'd have to, in order to control the new form's organic processes. He can assume any shape or form, imitating it perfectly. I believe that a kind of internal, unconscious telekinesis is the basis for his shape-shifting ability—total mental control of his physicality, the cells themselves manipulated by his thoughts and his empathic understanding of the person or thing he's imitating.

As mentioned, J'onn's shape-shifting ability is extremely similar to that of one of Arkham Asylum's revolving door patients: Basil Karlo, aka Clayface. Like J'onn, Karlo can alter his body to any form he chooses, although he gained this ability after injecting himself with a mysterious formula. I've never entertained the possibility that the substance that originally created Clayface could be of Martian origin, but considering the similarities, perhaps it's worth investigating.

Theoretical study showing a section of J'onn's flesh at the moment of transformation from Martian form to human. The number of joules that would need to be generated to fuel such a change would no doubt be in the billions.



Another line of inquiry to explore: Is J'onn able to detach pieces of flesh and form multiple entities?

Chlorokinesis

Swamp Thing can communicate with and control plant life in his environment, from the tiniest molecule of algae to acres of forest or jungle. Using the power of the Green, he can push any plant to grow at an incredible rate, essentially creating an army of vines, branches, thorns, and needles. Trees burst from his chest. Vines entangle enemies as fast as one might throw a rope.

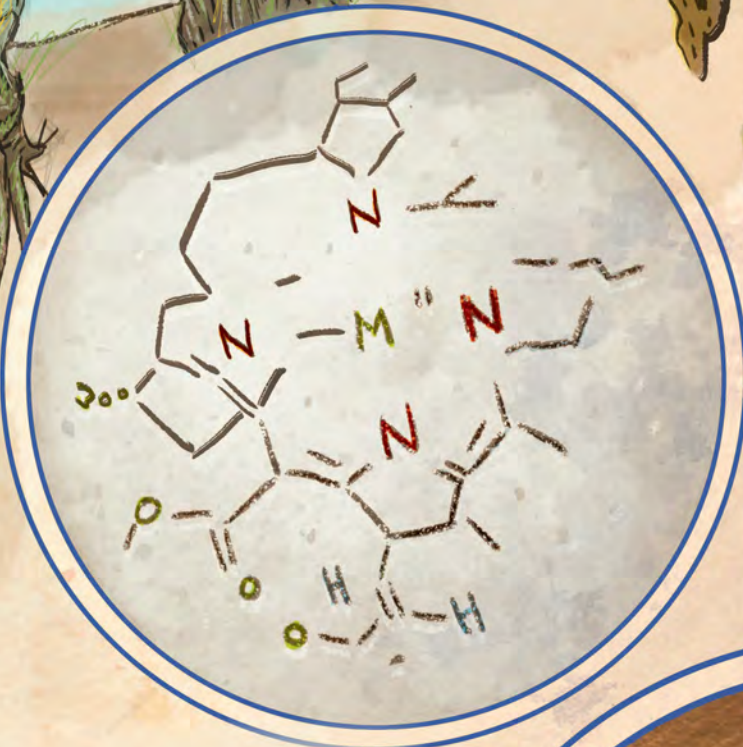
How is this lightning-fast chlorokinesis possible? Communicating to a plant that it suddenly has sufficient nutrients and the right conditions to grow doesn't create those nutrients or conditions. However, if Swamp Thing has a physical link with the plants he holds in his sway, it's conceivable that he could share some of his own stem cells—essentially transforming the specimen into a semiconnected appendage by a kind of pollination process. It may be that he's continually shedding molecules of organic matter, sharing his cells—pollinating—with the plants in his vicinity.

But that's only a partial theory. The Green is the likeliest answer to all of these questions, and at this point, I can only say that it exists—not how or why. It appears to be within the Green's power to "borrow" from a collective environment, to divert energy from the plant world's communal life force to its Avatars. While I can't explain the alleged "spiritual" basis for the Green's power, I also can't deny its existence.

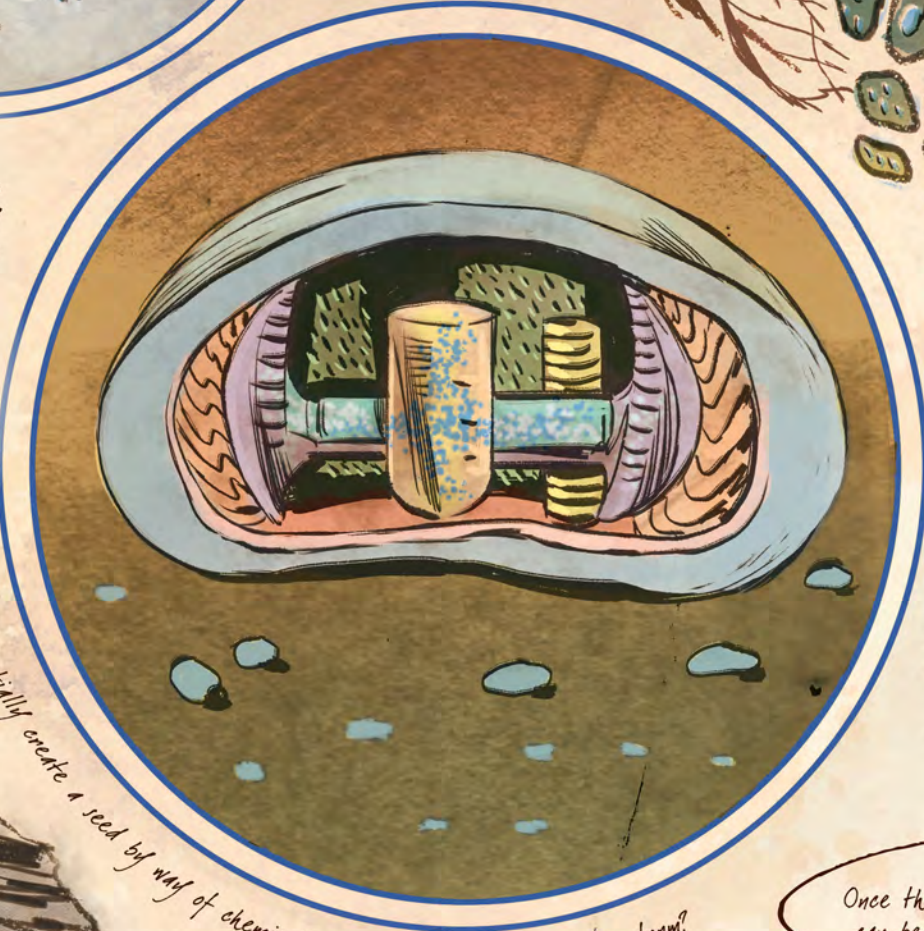


Swamp Thing can apparently choose the plants he grows, whether or not they are native to the environment he's in.

Stem cells part of the pollination process? What processes would make this possible? A heart

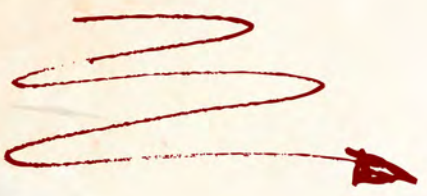


How can he create the specific DNA needed if it's unavailable? The science behind this seeming impossibility isn't supported, leaving me to reconsider the mystical nature of the Green.



Can he augment the design of a plant's cellular machinery to create new botanical life-forms?

Once the "seed" takes hold, growth can be explosive.



Apokolips

Darkseid was the absolute ruler of Apokolips, a literal version of our mythical concept of "hell on Earth." He ruled his kingdom through fear and violence, the downtrodden masses overseen by giant, winged Parademons and a council of Female Furies. Apokolips is a much larger world than Earth, surfaced by an ecumenopolis (a planet-wide city), an endless technological wasteland broken up by burning fire pits. The denizens of this world must have a much denser musculature than that found in humans, their skin resistant to searing temperatures. Living lives of servitude without hope or independence, the people of Apokolips are a brutal, savage race, the few exceptions hiding in the shadows of the planet's infamous ghettos.

Even if there were extradimensional forms of Darkseid that we couldn't access, seeking ways to bar his manifestation's entry to our world might prove useful for restricting others like him from reaching us.

Physical Makeup

Darkseid appeared roughly humanoid in form, but there were some obvious differences. His eyes glowed red. His skull-like face appeared hewn from veined stone, as did the visible portions of "skin" beneath his armor. I say "armor," but given the levels of technology available to Darkseid, the metallic plating may have also served as an environmental suit, an additional source of power, or some other purpose that we don't yet understand.

I have a theory that Darkseid is a multidimensional creature, and we may only be battling a physical shell in the third dimension here on Earth—his suit of armor and flesh containing his essence, his will, but not the entirety of his being. Darkseid's physical body would be subject to our dimension's physical laws, but he may have existed in other forms unaffected by our actions, able to withdraw from our perception at will.

I'm not willing to commit to any assumptions about Darkseid's actual physical form, however, including whether it was supported by a skeletal system. He spoke but does that necessitate vocal cords, lips, a tongue? He had eyes, but does that mean he "saw" and interpreted data in a manner that we would interpret as vision? However his body was constructed, it had to be able to contain the Omega Effect, an energy powerful enough to transform matter, which could create and destroy worlds. It goes without saying that he was fully capable of choosing his form. If he indeed one day returns, we shouldn't assume that the form we see is what we're actually fighting.

I also doubt that Darkseid had internal organs, at least in the way we understand them. I'd guess his torso housed complex battery-like storage devices that supported the Omega Effect. Maybe his internal cavities were filled with an energy-enhancement medium, or particles that drew the Omega Effect. This is clearly speculation, though, and included here just as food for thought.

We fought and ultimately defeated the physical manifestation of Darkseid, but he may continue to exist in ways we haven't considered. Unfortunately, without an understanding of his true nature, all we can address is the manifestation we're faced with.

POSSIBLE LAYERS OF DARKSEID:

The fundamental, elemental power at his core

A TECHNOLOGICAL OVERLAY that contained and channeled the forces at his command

Insulating materials and whatever substance acted as musculature

A thick dermal layer containing these other elements



An environmental suit or additional protection for his core? Could it have served as a power source?