ahistorics

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Contents

1 Introduction

> All this is supposed to have taken
> place in the realm of pure thought.
>
> *The German Ideology* (1845)
> Karl Marx

ahistorics is a 2.5-dimensional top-down action video game with RPG & roguelike elements, as well as some minimalist geometric graphics on top.

For a key indicating the meaning of some symbols used throughout the document, see section 8.

2 The player

The **player** starts out with a **class**, which is represented as their shape. The player has no other visual features other than their shape and their color. There are four shapes (and their corresponding classes) that players can be:

- Equilateral triangle
- Square
- Regular pentagon
- Regular hexagon

...also known as the regular 3-, 4-, 5-, and 6-gons. These shapes are henceforth referred to as the **elementary shapes**. Their respective classes are known simply as **Triangle**, **Square**, **Pentagon**, and **Hexagon**, respectively.

As a point of terminology, the term "**agent**" is henceforth used to refer agnostically and collectively to players, **enemies** (see section 3.4), and **shadows** (see section 7).

2.1 Classes

The player may choose their class or may choose to have it randomly selected for them. Each class has an associated **base speed** which determines the maximum manual movement velocity of a player with that class in the absence of speed-modifying effects. These speeds are expressed using discrete **speed levels**, as follows:

Speed level	Hexes/second*
very fast	2.5
fast	2

Speed level	Hexes/second*
medium fast	1.5
medium	1
medium slow	0.75
slow	0.5
very slow	0.25
paralyzed	0

*See section 3.1 for an explanation of "hex" as a unit of distance.

In addition, each class is *informally* associated with what might be called "aptitudes", which describe general areas of capability, as well as how capable the class is in those areas on a scale from one to five. Combined with the exact base speeds of each class, we can use these "aptitudes" to draw a general sketch of how the four classes function (colors correspond to a capability of five, four, three, two, and one out of five, respectively):

Class	Base speed	"Aptitudes"
Triangle	fast	▪ Durability ▪ Single-target burst damage at short range ▪ Sustained damage at short range ▪ Controlling others ▪ Self-healing
Square	medium fast	▪ Durability, or fully- & partially-restricting effects ▪ Single-target sustained damage ▪ Burst damage at long range ▪ Multi-target sustained damage at short range
Pentagon	medium slow	▪ Durability against non-damaging effects ▪ Single-target sustained damage at short range ▪ Controlling others, or cancelling effects & attacks ▪ Buffing ▪ Burst damage at long range ▪ Curses/hexes & partially-restricting effects, or fully-restricting effects ▪ Self-healing, or healing others

Class	Base speed	"Aptitudes"
Hexagon	medium	▪ Self-healing & healing others ▪ Cancelling effects & attacks ▪ Curses/hexes ▪ Partially-restricting effects ▪ Healing that doubles as damage ▪ Single-target burst damage ▪ Full disables, or durability against non-damaging effects

In the above table, "or" represents a choice left to the player, depending on what **abilities** they purchase (see section 6 for more on abilities).

3 The world

3.1 Space

The world of ahistorics is all on hexagonal grids. Movement of objects in the world (including the player) is continuous, i.e. not restricted to discrete movements along the grid. In a sense, however, the world of ahistorics is three-dimensional since each hexagon (**hex**) on the grid is associated with an **elevation**, and thus "higher" hexes will appear larger (closer to the camera), among other effects.

Distance (and its derivatives with respect to time), while continuous, is nevertheless measured in terms of "hexes". A linear displacement of "one hex" is simply the distance between the centers of two adjacent hexes of the same elevation. Differences in elevation are then measured in terms of hexes as well, and the distance between the centers of two adjacent hexes of differing elevations is augmented by that elevation difference as per the Pythagorean theorem.

3.2 Levels

The game takes place in a series of discrete **levels**, each of which is analogous to a "dungeon" that must be entered through one end and successfully exited through another (one of possibly many valid exits).

A level consists one or more **layers**, where each layer is on its own grid (topologically equivalent to a plane) with its own elevation values for each hex. A layer effectively has "walls" wherever hexes are **missing**. Missing hexes may be thought of as hexes of infinite elevation which are graphically represented in a different color from other, normal hexes.

Levels are procedurally, non-deterministically, generated. Levels get progressively more difficult to complete as the player completes more of them.

3.3 Entrance & exit hexes

Every level has an **entrance hex** and one or more **exit hexes**. When the player starts a level, they start on the entrance hex. Getting to any exit hex constitutes "beating"/"completing" the level.

3.4 Enemies

Enemies also spawn throughout any given level. Enemies are constructed from the same four elementary shapes that the player can choose for their own shape, although rather than being just one such shape like the player is, enemies consist of *two or more* such shapes (possibly a mixture of multiple different shapes), connected at their edges and forming a sort of conglomerate. Enemies do not "respawn": they are created exactly once each, in-place, when the level comes into existence.

Enemies, as the term implies, are obstacles to the player, and will assail the player without provocation if they sense the player's presence. In order to bypass enemies insofar as they are obstacles to completing the level, the player may opt to simply destroy their enemies. Enemies, like the player, have both **energy** and **potential** (see section 4). A destroyed enemy (one whose energy has been lowered below one) immediately shatters into its constituent elementary shapes, and these **enemy fragments** may be "picked up" by the player, which happens automatically whenever the player gets close enough to them.

When the player picks up an enemy fragment, they get a single **experience point** of a type given by the shape of the fragment. These experience points can be spent on **abilities** that require that type of experience (see section 6). Additionally, any time the player picks up an enemy fragment with the same elementary shape as themselves, they gain (in addition to the usual experience point of that type) an **untyped experience point**, which can be spent to raise **attributes** (see section 5).

Enemies are, as their appearance implies, a collage of fractured simulacra of the player themselves. As such, enemies not only have energy, potential, and attributes like the player does, but they also have the same abilities that the player does (albeit a more mixed and limited selection that includes abilities that any given player may not have).

3.5 Treasures

Treasures can also be found scattered throughout any given level. There are two kinds of treasures: **energy packets**, and **potential packets**. Treasures, like enemy fragments, are automatically picked up any time the player gets sufficiently close to them. When a treasure is picked up, it goes in the player's **inventory**, which persists throughout and amongst levels.

A player may, at any time, choose to use a treasure that is in their inventory. Doing so consumes the treasure and bestows the treasure's **effect** (see section 6.1) on the player:

Treasure	Effect
Energy packet	Restores a specified amount of energy to the player.
Potential packet	Restores a specified amount of potential to the player.

4 Energy & potential

The player has both an **energy meter** and a **potential meter**.

4.1 Energy

The player's **energy** (represented using the energy meter) is essentially just the player's "HP" (hit points). All quantities of energy are integers (there is no such thing as, say, 1.5 energy). To enforce this, energy values (including healing, damage, &c.) are always truncated towards zero whenever they are not already integers at the end of a series of calculations. The player's energy is *not* automatically regenerated over time, and instead must be replenished by consumables (viz. energy packets, see section 3.5) and certain effects that come from abilities (see section 6 for more on effects & abilities).

The player is destroyed when their energy is less than or equal to zero. The player's energy (and thus its representation in the energy meter) is partially bounded by the player's **maximum energy**. This is, however, somewhat of a misnomer, as it is in fact possible for the player to have an energy level exceeding their maximum energy. Nevertheless, the player's maximum energy is set at

$$256 + 8\,\mathbf{PHY} + 8\,\mathbf{CHE} + \mathbf{BIO}^2.$$

More specifically, it is possible to have more energy than one's maximum (to an **absolute maximum** of 150% of one's normal maximum); this is a **hyperenergetic** state that is unstable, and the amount of energy that is in excess of the normal maximum is reduced to $\lceil \frac{3x}{4} \rfloor$ each second, where x is the amount of excess just before that reduction instance. Hyperenergetic states are usually attained through effects of classification Heal (see section 6.1 for more on effects & classifications).

4.2 Potential

The player's **potential** (represented using the potential meter) is depleted as the player uses abilities (attacking, using movement skills, &c.). In the same way as energy, quantities of potential are always integers. Like energy, potential is not automatically regenerated over time, but is instead replenished similarly to energy.

The player's potential can never be lowered below zero; any abilities that the player has which cost more potential than the player currently has are effectively disabled. Effects (in particular, of classification Debuff) which nominally remove n potential have the effect of removing n potential or however much potential the target currently has, whichever is smaller.

Like energy, the player's potential is bounded by a maximum. The **maximum potential**, however, is calculated as

$$256 + 4(\mathbf{LOG} + \mathbf{ONT} + \mathbf{ETH}).$$

Also like energy, it is possible to exceed the normal maximum and be in a **hyperpotentiation** state, which follows the same rules as hyperenergetic states w.r.t. the absolute maximum and the decay over time of the "hyper-" state.

5 Attributes

All players (and enemies) have associated with them a value (score) for each one of a fixed set of **attributes**. For a player, all **attribute scores** start at zero at the beginning of the game. Attributes are similar to "abilities" as defined in version 5.1 of the System Reference Document (SRD)[1]:

> Six abilities provide a quick description of every creature's physical and mental characteristics [...] The three main rolls of the game—the ability check, the saving throw, and the attack roll—rely on the six ability scores. The book's introduction describes the basic rule behind these rolls: roll a d20, add an ability modifier derived from one of the six ability scores, and compare the total to a target number. (SRD v5.1)

Attributes, as defined in ahistorics, are as follows:

Attribute	Shorthand	SRD analogue(s)	Semantics
Physick	PHY	Strength & Dexterity	Determines aptitude for dealing damage at close range, and for mobility.
Chemick	CHE	Dexterity & n/a	Determines aptitude for dealing damage at long range, but also for "buffing", which has no SRD analogue.
Biologick	BIO	Constitution & Dexterity	Determines aptitude for protecting from damage and delaying one's own destruction.
Logick	LOG	Wisdom & Intelligence	Determines aptitude for protecting from ill effects, and for cancelling attacks before they occur.
Ontologick	ONT	Charisma	Determines aptitude for placing restrictions on others.
Ethick	ETH	Wisdom & Charisma	Determines aptitude for healing, and for controlling others.

ahistorics has a notion of **attribute checks**, similar to so-called "ability checks" as defined by the SRD. An attribute check proceeds by calculating $a + \mathcal{U}\{0, 15\}$ (where a is the attribute score in question) and comparing the result to the **target value** of the check, succeeding if the result is greater than or equal to the target value, and failing otherwise.

[1] As published by Wizards of the Coast LLC. And, for that matter, all earlier (and probably future) SRDs. The SRD is published under version 1.0a of the Open Game License. An archived PDF copy of version 5.1 of the SRD can be found here: https://web.archive.org/web/20180726160501/https://media.wizards.com/2016/downloads/DND/SRD-OGL_V5.1.pdf

Similarly, ahistorics has a notion of **attribute contests**, which occur due to an agent using some ability that affects one or more other agents. In an attribute contest, two expressions e_u and e_t are calculated according to the description of the ability being used; e_u corresponds to the user of the ability and is calculated using one or more of the user's attribute scores, and e_t corresponds to the target and is calculated using one or more of the target's attribute scores. $e_u + \mathcal{U}\{-7, 7\}$ is calculated, and if it meets or exceeds e_t, then the user "wins" the contest and the ability succeeds normally. Otherwise the target "wins" and the ability may have lesser or no effect, according to the ability's description. If the ability in question affects multiple agents, then by default there is one attribute contest for each affected agent (other than the user), between each such agent and the user.

While the attribute scores of the player are all set to zero at the start of the game, they can be increased permanently by the player choosing to spend their **untyped experience points** on raising particular attribute score(s) (see section 3.4 for how to gain untyped experience points). Additionally, attribute scores may be increased and/or decreased by temporary **effects** (see section 6.1 for more on effects). Because of this, there is a notion of **nominal ability score**, which is an ability score including temporary effects, and of **canonical ability score**, which does not include such effects (i.e. it only includes permanent increases by the player).

The number of (untyped) experience points required to raise a canonical ability score from $a - 1$ to a is

$$4 + \left\lceil \frac{a^{3/2}}{4} \right\rceil.$$

6 Abilities

Every **agent** (see section 2) has access to some **abilities**. An ability can really be just about anything; it represents a certain "capacity" of the agent that possesses it. Every ability organizationally falls into one of the following four categories:

- **Basic abilities**
- **Class abilities**
- **Prodigious abilities**
- **Transcendental abilities**

But in order to explain what abilities *are*, we have to first explain what abilities *are made of*. First and foremost, abilities have **effects**.

6.1 Effects

Every effect is essentially what it sounds like: a concrete, atomic[2] change that its associated ability has on the world. Every effect has one or more formal **classifications** associated with it.

[2] "Atomic" in the sense of "having no internal structure at the appropriate level of analysis" (Collins Dictionaries and M. Forsyth, *Collins English Dictionary*, 12th ed. Glasgow: Harper Collins Publishers, 2014).

Classifications are actually just named sets of effects; every classification that a given effect is a member of is considered to be "associated" with that effect, and vice versa. Since classifications are just sets containing effects as their members, every effect that has a given classification also has all of the classifications that are supersets of that classification. For ease of use and reference, every ability is *informally* considered to have its own set of classifications, which is just the same as the set of all the classifications that any of its effects are members of.

A list of all existing classifications follows:

Classification	**Is the set of all...**
Effect	Effects, i.e. the "universe" in the set-theoretical sense.
Passive	"Passive" effects, which do not have to be activated.
Active	"Active" effects, which must be activated to do anything.
Close	"Close-range" effects.
Long	"Long-range" effects.
Single	"Single-target" effects.
Multi	"Multi-target" effects.
Region	"Regional" effects, i.e. effects that affect a certain region of the level persistently over some period of time.
Reflex	"Reflexive", i.e. self-affecting, effects.
Attack	"Attacks", i.e. damage-dealing, effects.
Dot	"Damage-over-time" attacks.
Heal	"Healing", i.e. energy-restoring, effects.
Hot	"Healing-over-time" effects.
Buff	"Buffs", i.e. effects that bring advantages to the agent(s) that they target.
Debuff	"Debuffs", i.e. effects that bring disadvantages to the agent(s) that they target.
Motive	"Motive" effects, i.e. effects that change something about the motion of their target(s).
Cancel	"Cancellatory" effects, i.e. effects that cancel other effects.
Neutral	"Neutral" effects, i.e. those that have no particular physical nor meta-physical "type" or interpretation.
Mind	"Mind-affecting" effects.
Suggest	"Suggestive" effects, i.e. mind-affecting effects that suggest to their target(s) to do something.
Unintuit	"Unintuitive" effects.

Classification	Is the set of all...
Physio	"Physiological" effects, i.e. effects that affect the physiology of their target(s).
Force	"Forceful" effects, i.e. effects that directly evoke forces.
Chemical	"Chemical" effects.
Infinite	"Infinitary" effects, i.e. effects involving infinity.
Contra	"Contradictory" effects, i.e. effects involving contradiction(s).

Furthermore, the existing classifications (as listed in the table above) have, definitionally, several relationships to one another as sets, which of course cannot be violated by any particular effect(s). First is that, as expected, all classifications (except for Effect) are strict subsets of Effect. In addition, the following relationships hold definitionally:

$$\begin{aligned}
\mathrm{Reflex} &\subset \mathrm{Single} \cap \mathrm{Close} \\
\mathrm{Dot} &\subset \mathrm{Attack} \\
\mathrm{Hot} &\subset \mathrm{Heal} \\
\mathrm{Suggest} &\subset \mathrm{Mind} \\
\mathrm{Unintuit} &\subset \mathrm{Mind} \\
\mathrm{Passive} \cap \mathrm{Active} &= \emptyset \\
\mathrm{Close} \cap \mathrm{Long} &= \emptyset \\
\mathrm{Single} \cap \mathrm{Multi} &= \emptyset \\
\mathrm{Heal} \cap \mathrm{Attack} &= \emptyset \\
\mathrm{Buff} \cap \mathrm{Attack} &= \emptyset \\
\mathrm{Buff} \cap \mathrm{Heal} &= \emptyset \\
\mathrm{Debuff} \cap \mathrm{Attack} &= \emptyset \\
\mathrm{Debuff} \cap \mathrm{Heal} &= \emptyset \\
\mathrm{Debuff} \cap \mathrm{Buff} &= \emptyset \\
\mathrm{Motive} \cap \mathrm{Attack} &= \emptyset \\
\mathrm{Motive} \cap \mathrm{Heal} &= \emptyset \\
\mathrm{Cancel} \cap \mathrm{Attack} &= \emptyset \\
\mathrm{Cancel} \cap \mathrm{Heal} &= \emptyset \\
\mathrm{Cancel} \cap \mathrm{Motive} &= \emptyset \\
\mathrm{Mind} \cap \mathrm{Neutral} &= \emptyset \\
\mathrm{Suggest} \cap \mathrm{Attack} &= \emptyset \\
\mathrm{Suggest} \cap \mathrm{Heal} &= \emptyset \\
\mathrm{Physio} \cap \mathrm{Neutral} &= \emptyset \\
\mathrm{Force} \cap \mathrm{Neutral} &= \emptyset \\
\mathrm{Force} \cap \mathrm{Mind} &= \emptyset \\
\mathrm{Chemical} \cap \mathrm{Neutral} &= \emptyset
\end{aligned}$$

$$\begin{aligned}\text{Chemical} \cap \text{Force} &= \emptyset \\ \text{Chemical} \cap \text{Suggest} &= \emptyset \\ \text{Infinity} \cap \text{Neutral} &= \emptyset \\ \text{Contra} \cap \text{Neutral} &= \emptyset\end{aligned}$$

Besides classifications, another concept unique to effects is that of a **tick**. A tick is one instance of a repeated, ongoing (viz. continuing over time) effect. Effects that have ticks last for some duration and, within that duration, have fixed points of time in which something happens; that "thing" is a tick. In general (unless otherwise stated), ticks occur at all boundaries, meaning that an ability that has a tick every half-second that is sustained for exactly 1 second has a total of 3 ticks: one at the incipit/onset, one in the middle, and one at the very end of the duration.

Usually, ticks occur regularly (e.g. every second or every half-second), but not necessarily. Ticks also usually belong to effects of classification $\text{Dot} \cup \text{Hot}$, but not necessarily. Every tick has a **tick number** associated with it, which is equal to 0 for the first tick that occurs in a given effect, 1 for the second tick that occurs in a given effect, 2 for the third tick that occurs in a given effect, and so on through the natural numbers in increasing order.

6.2 Other constituents of abilities

Abilities are not, however, constituted *entirely* by their one or more effects.

6.2.1 Potential of activation

Potential of activation, of simply "activation" for short, is the amount of potential that must be expended by the agent for the ability to activate. Not all abilities have this, and, in fact, all abilities that do have this produce at least one effect of classification Active.

6.2.2 Cooldown

The **cooldown** of an ability is the amount of time after an ability is activated that the agent *must* wait before having the possibility of using that ability again. Like potential of activation, not all abilities have this, and all abilities that do have this produce at least one effect of classification Active.

6.2.3 Pre-requisites and anti-requisites

A **pre-requisite** for an ability is a requirement that must be fulfilled for an agent to acquire or possess the ability in question. Usually pre-requisites come in the form of attribute requirements (see section 5) or in the form of requiring possession of one or more other abilities.

An **anti-requisite** for an ability is like a pre-requisite, but it is a requirement for something that must *not* be fulfilled for an agent to acquire or possess the ability in question. All anti-requisites can be expressed as pre-requisites, and vice versa (by simply negating them), but they are given two different names for the sake of conceptual organization.

6.2.4 Preconditions

A **precondition** for an ability is a requirement that must be fulfilled for it to take effect (i.e. for any of its effects to occur). It is possible to *possess* an ability but not satisfy its precondition(s); in this case, the ability is just essentially inert while the precondition(s) is/are not satisfied.

6.2.5 Cost

The **cost** of an ability is how much experience, and of what type(s), must be spent by an agent to acquire it.

Strictly speaking, the cost is not part of the ability itself *per se*, but it is nevertheless useful to associate it with the ability and list it alongside the ability's description.

6.3 Categories of abilities

Basic abilities are abilities that are common to all agents; they have no pre-requisites nor anti-requisites, although they may have preconditions. They do not need to be purchased, and are instead already available to all agents.

Class abilities are abilities that come from **ability graphs** specific to a particular class. Ability graphs are groups of abilities that are so called because they vaguely form graphs in which there is a directed edge from any given ability to any abilities that have it as a pre-requisite. Some ability graphs are only accessible to agents who have a certain class, and this makes all the abilities in the graph class abilities.

Prodigious abilities are abilities that come from a single ability graph (the "prodigious ability graph") that is available to all classes but has abilities with high requirements and high cost. The prodigious ability graph is rather small and only offers a very limited selection.

The **transcendental abilities** are three abilities available to all classes which may only be obtained once the agent has at least two prodigious abilities. Only up to one transcendental ability may be obtained per agent.

6.4 Ability listings

The following sections list a full description of every ability in ahistorics.

Note that in ability descriptions, phrases and sentences that end with something looking like "$(\mathrm{A} \cap \mathrm{B} \cap \mathrm{C})$" contain a description of one of the effects (see section 6.1) that is involved in that ability. The "$(\mathrm{A} \cap \mathrm{B} \cap \mathrm{C})$" part simply denotes that the effect has the classification $\mathrm{A} \cap \mathrm{B} \cap \mathrm{C}$. Abilities that have no such parenthesizations consist of only one effect, whose classification is given by the intersection of the sets listed in the "Classifications" entry for the ability.

6.4.1 Basic abilities

> **Impulse**
>
> Activation: 0 potential

Cooldown: 1 second

Classifications: Active, Close, Single, Attack, Force, Physio

Description: You channel a bit of your potential energy into kinetic energy, targeting the nearest enemy within one hex of your location and within $\pm\frac{\pi}{4}$ radians of the direction that you are facing. The target takes $\mathbf{PHY} + 8$ damage, and this damage is halved if you fail an attribute contest where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{BIO}_t$.

Text:

> [Impulse is] a measure of the action of a force over some time interval; it is equal to the product of the average value of the force $\mathbf{F}$ and the time t of its action: $\mathbf{J} = \mathbf{F}t$. Impulse is a vector quantity and has the same direction as $\mathbf{F}$. [...] The concept of impulse is used widely in mechanics, especially in impact theory, where a quantity equal to the impulse of the impact force $\mathbf{F}$ over the time of impact τ is called the impact impulse. ("The Great Soviet Encyclopedia," [Большая советская энциклопедия,] 3rd ed., 1979)

Combustion

Activation: 0 potential

Cooldown: 1.5 seconds

Classifications: Active, Long, Single, Attack, $\mathrm{Chemical}$, Physio

Description: You catalyze a combustion reaction between the nearest enemy within a six-hex radius of your location that you are facing ($\pm\frac{\pi}{2}$ radians, i.e. within a semi-circle) and the oxygen in the atmosphere, producing carbon dioxide and water as byproducts. The target takes $\left\lceil \frac{3\,\mathbf{CHE}}{4} \right\rceil + 16$ damage, and this damage is halved if you fail an attribute contest where $e_u = \mathbf{CHE}$ and $e_t = \mathbf{BIO}_t$.

Text: "In rage, deaf as the sea, hasty as fire." (W. Shakespeare, "King Richard the Second," act I, scene 1, c. 1595)

Defensive reaction

Preconditions: $\mathbf{BIO} \geq 0$

Activation: 0 potential

Cooldown: 1 second

Classifications: Active, Reflex, Buff, Debuff, Cancel, Motive, Physio

Description: Using this ability puts you into a defensive state for a half-second, during which all effects of classification $(\mathrm{Attack} \cap \mathrm{Physio}) \setminus \mathrm{Reflex}$ that affect you, and whose source is situated in the direction that you are facing (and any direction within $\pm\frac{\pi}{4}$ radians of it), at the time that you are affected do $(\mathbf{BIO} + 1)^{-1/3}$ times as much damage to you ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Physio}$). During the half-second that this ability is active, you cannot activate any abilities that produce effects of classification Active,

and your manual movement speed (including manual turn speed) is halved ($\text{Active} \cap \text{Reflex} \cap \text{Debuff} \cap \text{Cancel} \cap \text{Motive} \cap \text{Physio}$).

Text:

> In cases of defence 'tis best to weigh
> The enemy more mighty than he seems
> (W. Shakespeare, "Henry V," act II, scene 4, c. 1598)

Falsehood

Preconditions: $\mathbf{LOG} \geq 0$

Activation: 2 potential

Cooldown: 4 seconds

Classifications: Active, Long, Single, Debuff, Cancel, Contra

Description: If you succeed in an attribute contest against the targeted enemy (within a six hex radius of your location) where $e_u = \mathbf{LOG} + 4$ and $e_t = \mathbf{LOG}_t$, this ability places a debuff on the target that lasts up to five seconds. If the enemy uses an ability that produces effect(s) of classification $(\text{Mind} \cup \text{Contra}) \cap \text{Active}$ while the debuff is active on them, the debuff is immediately removed and the effect(s) in question have a

$$\frac{1}{1 + \exp(2 - \frac{\mathbf{LOG}}{6})}$$

chance (all or nothing) of being declared a falsehood and cancelled outright.

Text: "Truth or falsehood consists in an agreement or disagreement either to the *real* relations of ideas, or to *real* existence and matter of fact." (D. Hume, "A Treatise of Human Nature," 1738)

Hylomorphism

Preconditions: $\mathbf{ONT} \geq 1$

Activation: 4 potential

Cooldown: 8 seconds

Classifications: Active, Long, Single, Debuff, Cancel, Motive, Physio

Description: You target an enemy within a four-hex radius of your location, separating their form from their matter and transmuting their form while keeping the matter intact. If you succeed in an attribute contest where $e_u = \mathbf{ONT}$ and $e_t = \mathbf{ONT}_t$, the target is turned into a random one of the four playable shapes (each with probability $\frac{1}{4}$) for $\min\left\{\sqrt{\mathbf{ONT}}, 5\right\}$ seconds.

An afflicted target's energy and potential are untouched, but their movement speed is changed to the default movement speed of their new shape ($\text{Active} \cap \text{Long} \cap \text{Single} \cap \text{Debuff} \cap \text{Motive} \cap \text{Physio}$). They also cannot use abilities that are not normally available to their new shape, including abilities that produce effects of classification Passive, although effects of classification Active that were already going before the transformation happened continue normally.

Text:

> Λέγομεν δὴ γένος ἕν τι τῶν ὄντων τὴν οὐσίαν, ταύτης δὲ τὸ μέν, ὡς ὕλην, ὃ καθ' αὑτὸ οὐκ ἔστι τόδε τι, ἕτερον δὲ μορφὴν καὶ εἶδος, καθ' ἣν ἤδη λέγεται τόδε τι, καὶ τρίτον τὸ ἐκ τούτων. ἔστι δ' ἡ μὲν ὕλη δύναμις, τὸ δ' εἶδος ἐντελέχεια, καὶ τοῦτο διχῶς, τὸ μὲν ὡς ἐπιστήμη, τὸ δ' ὡς τὸ θεωρεῖν.
>
> We are in the habit of recognizing, as one determinate kind of what is, substance, and that in several senses, (a) in the sense of matter or that which in itself is not "a this", and (b) in the sense of form or essence, which is that precisely in virtue of which a thing is called "a this", and thirdly (c) in the sense of that which is compounded of both (a) and (b). Now matter is potentiality, form actuality; of the latter there are two grades related to one another as e.g. knowledge to the exercise of knowledge. (Aristotle, "On the Soul," trans. J. A. Smith 1931, 4th century BC)

6.4.2 Triangle class abilities

Graph I

Thrombocytosis reciprocus

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 11$

Preconditions: $\mathbf{BIO} \geq 11$

Anti-reqs: De Morgan, μ-calculus

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Buff, Reflex, Physio

Description: Your blood thickens and becomes resistant to loss. Effects of classification $\mathrm{Dot} \cap (\mathrm{Physio} \cup \mathrm{Chemical})$ that affect you now do

$$\max\Big\{\langle 90, 80, 70\rangle - \mathbf{BIO}^{3/4},\ 10\Big\}\%$$

of their normal damage.

Text: "The threshold for clinically significant thrombocytosis is variable from patient to patient, and the exact definition of thrombocytosis also varies in the literature, although a platelet count of $\geq 450 \times 10^9/\mathrm{L}$ is a generally accepted value." (J. S. Bleeker and W. J. Hogan, "Thrombocytosis: diagnostic evaluation, thrombotic risk stratification, and risk-based management strategies," *Thrombosis*, 2011)

Erect posture

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 29$, Thrombocytosis reciprocus

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Close, Multi, Reflex, Buff, Physio

Description: You develop the ability to ambulate while erect, freeing up two or more of your limbs for the purpose of shielding. All effects of classification $\mathrm{Attack} \cap \mathrm{Physio}$ that affect you ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio}$) or any allies within

$$\frac{\langle 3, 4, 5, 6 \rangle}{3}$$

hexes of your location ($\mathrm{Passive} \cap \mathrm{Multi} \cap \mathrm{Buff} \cap \mathrm{Physio}$) are partially deflected, doing only $\langle 97, 94, 91, 88 \rangle\%$ of their normal damage.

Text: "The same heard Paul speak: who stedfastly beholding him, and perceiving that he had faith to be healed, Said with a loud voice, Stand upright on thy feet. And he leaped and walked." (Acts 14:9-10 KJV)

REM sleep

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 44$, Erect posture

Anti-reqs: Defensive posture

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Hot, Mind

Description: Your neocortex acquires the ability to engage in REM sleep during your normal sleep cycles, freely associating in a state of quasi-wakefulness based on signals from your brain stem. This REM sleep effectively repairs your neural connections, rendering you resistant to neuropsychological damage; effects of classification $\mathrm{Attack} \cap \mathrm{Mind}$ that affect you are gradually healed by $\langle 2, 4, 6, 8 \rangle\%$ every half-second for four seconds after the damage is inflicted.

Text:

> The dream is not comparable to the irregular sounds of a musical instrument, which, instead of being touched by the hand of the musician, is struck by some outside force; the dream is not senseless, not absurd, does not presuppose that a part of our store of ideas is dormant while another part begins to awaken. It is a psychic phenomenon of full value, and indeed the fulfilment of a wish; it takes its place in the concatenation of the waking psychic actions which are intelligible to us, and it has been built up by a highly complicated intellectual activity. (S. Freud, "The Interpretation of Dreams," [Die Traumdeutung,] trans. A. A. Brill 1913, 1899)

Antlered

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 9$, $\mathbf{PHY}_{\mathrm{c}} \geq 3$

Anti-reqs: De Morgan, μ-calculus

Cost: 3 triangle exp per rank

Activation: $\langle 14, 18, 22 \rangle$ potential

Cooldown: 12 seconds

Classifications: Active, $\mathrm{Passive}$, Close, Reflex, Single, Buff, Attack, Physio

Description: You gain the ability to grow triangular antlers for defense in combat *mano a mano*. Three seconds after activation, you grow two triangular antlers that last for $\langle 4, 6, 8 \rangle$ seconds before being shed ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio}$).

If an enemy physically attacks you at close range (viz. effects of classification $\mathrm{Attack} \cap \mathrm{Close} \cap (\mathrm{Physio} \cup \mathrm{Force})$) while facing your antlers (at the time that the effect affects you), there is a $\langle 30, 36, 42 \rangle\%$ chance that the attack will be deflected, dealing only half of its normal damage ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio}$) and reflecting $\min\{20 + \mathbf{BIO}, 50\}\%$ of the remaining half of the damage back at the attacker ($\mathrm{Passive} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Physio}$).

Text:

> My honoured lord, this deer I see
> With beauty rare enraptures me.
> Go, chief of mighty arm, and bring
> For my delight this precious thing.
> (Valmiki [वाल्मीकि], "Ramayana," [रामायणम् ,] trans. R. T. H. Griffith 1870, c. 500-100 BC)

Pangolian imbrication

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 24$, Antlered

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Physio

Description: Much like a pangolin, you become imbricated with keratinous scales. You take $\langle 95, 90, 85 \rangle\%$ damage from all sources of classification $\mathrm{Attack} \cap \mathrm{Physio}$.

Text: "Pangolin, also called scaly anteater, any of the about eight species of armoured placental mammals of the order Pholidota. Pangolin, from the Malay [*pengguling*] meaning 'rolling over,' refers to this animal's habit of curling into a ball when threatened." ("Pangolin," *Encyclopædia Britannica*, revision of 4 April 2019)

Defensive posture

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 37$, Pangolian imbrication

Anti-reqs: REM sleep

Cost: 2 triangle exp per rank

Activation: 25 potential

Cooldown: 12 seconds

Classifications: Active, Reflex, Buff, Debuff, Cancel, Motive, Physio

Description: You gain the ability to roll into a defensive posture, concealing all of your exposed body parts within your keratinous scales ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio}$). While in this posture, you have a global cooldown for all Active abilities (which is separate from and does not suppress the cooldowns of individual Active abilities if they are greater) of $\langle 6, 5, 4, 3 \rangle$ seconds, which is triggered by the use of any Active ability and prevents the use of all Active abilities (regardless of their individual cooldown status) while it runs ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Physio}$).

You cannot move except for rotating in place ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Physio}$), and all effects of classification $\mathrm{Reflex} \cap \mathrm{Motive}$ are suppressed ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Physio}$).

You take $\langle 11, 9, 7, 5 \rangle\%$ damage from all effects of classification $\mathrm{Attack} \cap \mathrm{Physio}$ ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio}$), and all other sources of damage, viz. those of classification $\mathrm{Attack} \setminus \mathrm{Physio}$, have a $\frac{1}{2}$ chance of being deflected entirely ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Physio}$).

The posture can be sustained for up to $\langle 5, 7, 9, 11 \rangle$ seconds, but can be voluntarily ended at any time. The cooldown for this ability starts once the posture is ended.

Text: "He shall dwell on high: his place of defence shall be the munitions of rocks: bread shall be given him; his waters shall be sure." (Isaiah 33:16 KJV)

De Morgan

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 7$

Anti-reqs: Thrombocytosis reciprocus, Antlered

Cost: 2 triangle exp per rank

Activation: $\langle 25, 22, 18 \rangle$ potential

Cooldown: $\langle 20, 15, 10 \rangle$ seconds

Classifications: Active, Reflex, Cancel, $\mathrm{Neutral}$

Description: Activating this ability negates the conjunction of all Debuff effects currently affecting you. If there are two or more Debuff effects on you, this instantly dispels the first one inflicted (i.e. oldest), choosing arbitrarily in the case of a tie. If only one (or zero) Debuff effects are in effect at the time of activating this ability, the ability does nothing except for consuming potential and starting the cooldown.

Text:

$$\neg(P \vee Q) \iff \neg P \wedge \neg Q$$
$$\neg(P \wedge Q) \iff \neg P \vee \neg Q$$

Ex falso quodlibet

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 19$, De Morgan

Cost: 3 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Single, Buff, Cancel, Attack, Mind, Contra

Description: You make use of the principle of explosion to force contradictions to backfire on your enemies. Every time you participate in an attribute challenge as the target of a contradictory effect (viz. of classification Contra), the challenge is made twice and the user succeeds only if they succeed in both challenges ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Contra}$). If the user does not succeed, their ability backfires, not affecting you and instead exploding in the user's face for

$$\mathcal{U}\{1,\ \langle 8, 12, 16\rangle\} + \left\lceil \frac{\mathbf{LOG}}{\langle 4, 3, 2\rangle} \right\rceil$$

damage ($\mathrm{Passive} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Mind} \cap \mathrm{Contra}$).

Text:

> If you assume contradictory axioms, you can derive anything. It's called the principle of explosion.
>
> *Anything?* Lemme try. [...] Hey, you're right! I started with $P \wedge \neg P$ and derived your mom's phone number!
> (R. Munroe, "Principle of Explosion," *xkcd*, no. 704, https://xkcd.com/704/, 19 February 2010)

Idempotency of entailment

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 34$, Ex falso quodlibet

Cost: 2 triangle exp per rank

Activation: $\langle 65, 55, 45\rangle$ potential

Cooldown: $\langle 24, 18, 6\rangle$ seconds

Classifications: Active, Reflex, Cancel, Physio, Mind

Description: Using this ability eliminates unnecessarily duplicated hypotheses, causing the number of physiological debuffs (effects of classification $\mathrm{Debuff} \cap \mathrm{Physio}$) affecting you to fall to one if it was greater than one ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Cancel} \cap \mathrm{Physio}$), and likewise with the number of mind-affecting debuffs (effects of classification $\mathrm{Debuff} \cap \mathrm{Mind}$) affecting you ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Cancel} \cap \mathrm{Mind}$). The particular debuff(s) that are dispelled to achieve this effect are chosen arbitrarily.

Text:

$$\frac{\Gamma, \Delta, \Delta \vdash A}{\Gamma, \Delta \vdash A}$$

Classical formalist

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 45$, Idempotency of entailment

Anti-reqs: Intuitionist

Cost: 5 triangle exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: For you, all problems are properly understood as being directly embedded in classical logic. Every proposition has an objective binary truth value; armed with this knowledge, for any problem you find a suitable model and take it to its logical conclusion. You are immune to all effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Unintuit}$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind})$, and effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Contra}$ that affect you and that have durations have their durations reduced by half $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind})$.

Text:

> The design of the following treatise is to investigate the fundamental laws of those operations of the mind by which reasoning is performed; to give expression to them in the symbolical language of a Calculus, and upon this foundation to establish the science of Logic and construct its method... (G. Boole, "An Investigation of the Laws of Thought," 1854)

μ-calculus

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 8$

Anti-reqs: Thrombocytosis reciprocus, Antlered

Cost: 3 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Mind

Description: You use modally branching temporal logic to reason about the possible behavior of systems over time. You gain the ability to favor certain branches over others in your own mind, causing effects you are suffering from of classification $\mathrm{Mind} \cap \mathrm{Debuff}$ to last for only $\langle 75, 50 \rangle\%$ of their normal duration $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind})$, and effects of classification $\mathrm{Mind} \cap \mathrm{Buff}$ to last for $\langle 115, 130 \rangle\%$ of their normal duration $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind})$.

Text:

> Two distinct extensions of temporal logic has been recently advocated in the literature. The first extension is the addition of fixpoint operators that enable the logic to make assertions about arbitrary regular events. The second extension is the addition of past temporal connectives that enables the logic to refer directly to the history of the computation. Both extensions are motivated by the desire to adapt temporal logic to modular, i.e., compositional, verification (as opposed to global verification). (M. Y. Vardi, "A temporal fixpoint calculus," *Proceedings of the 15th ACM SIGPLAN-SIGACT Symposium*, 1988)

Paraconsistency

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 16$, μ-calculus

Cost: 3 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Contra

Description: By denying disjunction introduction, you gain the ability to tame the explosive tendencies of contradictions. Every time an effect of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Contra}$ would normally affect you, there is a $\langle 24, 48, 72 \rangle\%$ chance that it will instead fizzle out and have no effect.

Text:

> What this illustrates is that there are criteria for rationality other than consistency, and that some of these are even more powerful than consistency. [...] There are many features of belief that are rational virtues, such as simplicity, problem-solving ability, non-adhocness, fruitfulness, and, let us grant, consistency. These criteria are all independent, however, and may even be orthogonal, pulling in opposite directions. Now, what should one do if, for a certain belief, all of the criteria pull toward acceptance, except consistency—which pulls the other way? (G. Priest, "What is so Bad about Contradictions?," *The Journal of Philosophy*, vol. 95, no. 8, August 1998)

Trivalency

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 31$, Paraconsistency

Cost: 5 triangle exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel

Description: You embed all incoming debuff effects within a trivalent logic of indeterminacy, causing certain formulas to fail by taking on a third "indeterminate" value. This gives all effects of classification Debuff that would normally successfully affect you a $\frac{1}{3}$ chance of failure.

Text:

> Even then I strove to construct non-Aristotelian logic, but in vain. Now I believe I have succeeded in this. My path was indicated to me by antinomies, which prove that there is a gap in Aristotle's logic. Filling that gap led me to a transformation of the traditional principles of logic. Examination of that issue was the subject-matter of my last lectures. I have proved that in addition to true and false propositions there are possible propositions, to which objective possibility corresponds as a third in addition to being and non-being. This gave rise to a system of three-valued logic, which I worked out in detail last summer. (J. Łukasiewicz, "Selected works," ed. L. Borkowski, 1970)

Intuitionist

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 41$, Trivalency

Anti-reqs: Classical formalist

Cost: 5 triangle exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: For you, logic is a particular application of mathematical intuition to language; all mathematical constructs are languageless intuition, and are mentally constructable and realizable. All infinities are thus only "potential" infinities, and you are immune to all effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Infinite}$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind})$. Additionally, effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Unintuit}$ that affect you have a $\frac{1}{2}$ chance of being cancelled outright and not occuring at all $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind})$.

Text:

> [M]athematics is an essentially languageless activity of the mind having its origin in the perception of a move of time. This perception of a move of time may be described as the falling apart of a life moment into two distinct things, one of which gives way to the other, but is retained by memory. If the twoity thus born is divested of all quality, it passes into the empty form of the common substratum of all twoities. And it is this common substratum, this empty form, which is the basic intuition of mathematics. (L. E. J. Brouwer, "Brouwer's Cambridge lectures on intuitionism," ed. D. van Dalen, 1981)

Graph II

Nuclear fusion

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 3$

Cost: 2 square exp per rank

Activation: $\langle 28, 20, 12 \rangle$ potential

Cooldown: 3 seconds

Classifications: Active, Close, Single, Attack, Force, Physio

Description: By expending an incredible burst of energy, you radially fire lightweight particles towards your foes, abusing the strong force in an act of nuclear fusion. The closest enemy to you that is within one hex of your location takes $2\,\mathbf{PHY} + \langle 49, 64, 81 \rangle$ damage. This damage is halved if you fail in an attribute challenge where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{PHY}_t$.

Text: "The sun burnt every day. It burnt time." (R. Bradbury, "Fahrenheit 451," 1953)

Adiabatic approximation

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 16$, Nuclear fusion III

Cost: 3 square exp per rank

Activation: $\langle 30, 25, 20, 15 \rangle$ potential

Cooldown: $\langle 7, 6, 5, 4 \rangle$ seconds

Classifications: Active, Close, Single, Attack, Motive, Force, Physio

Description: You release potential energy in a sudden and nearly adiabatic manner. The closest enemy to you that is within one hex of your location takes the brunt of the work done, suffering

$$\mathbf{PHY} \left\lceil \frac{\sqrt{\mathbf{PHY}}}{\langle 4, 3, 2 \rangle} \right\rceil$$

damage ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Force} \cap \mathrm{Physio}$) and being knocked back by $\langle 1, 2, 3, 4 \rangle$ hexes ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Motive} \cap \mathrm{Force}$).

Text: "Talk of dynamic compression and adiabatic gradients didn't carry as much weight as the certainty of its conscious intent." (T. Pynchon, "Against the Day," 2006)

Quantum tunnel

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 30$, Adiabatic approximation

Cost: 1 square exp per rank

Activation: 20 potential

Cooldown: $\langle 19, 14, 10, 7, 5, 4 \rangle$ seconds

Classifications: Active, Reflex, Buff, Motive

Description: You gain the ability to briefly exhibit quantum behavior on command, spontaneously tunneling your entire body and effectively teleporting from one place to the next. Using this ability teleports you instantaneously forward in the direction you are facing.

This effect, however, being quantum in nature, exhibits stochasticity in the direction and distance that you actually teleport. The distance you teleport is $\mathcal{U}(0, \langle 4, 3.5, 3, 2.5, 2, 1.5 \rangle) + \langle 1, 1.75, 2.5, 3.25, 4, 5 \rangle$ hexes. The direction you teleport can vary from the position you are facing by multiples of $\frac{\pi}{32}$ radians.

The probability of teleporting in the direction $\frac{\pi}{2}$ radians from the position you are facing is $\Phi\left(-\frac{31}{8}\right)$, where Φ is the cumulative distribution function of N, and N is the normal distribution with a mean of zero and a variance of $\left\langle 4, 3, 2, 1, \frac{1}{2}, \frac{1}{5} \right\rangle$. Furthermore, the probability of teleporting in the direction $-\frac{\pi}{2}$ radians from the position you are facing is $1 - \Phi\left(\frac{31}{8}\right)$, and the probability of teleporting in the direction $n\frac{\pi}{32}$ radians from the direction you are facing (where $-16 < n < 16$) is $\Phi\left(\frac{2n+1}{8}\right) - \Phi\left(\frac{2n-1}{8}\right)$.

If this ability (indeterministically) would place you in an invalid position, the ability fails, going on cooldown but *not* expending any potential.

Text:

> Quantum tunnelling is a phenomenon which becomes relevant at the nanoscale and below. It is a paradox from the classical point of view as it enables elementary particles and atoms to permeate an energetic barrier without the need for sufficient energy to overcome it. (F. Trixler, "Quantum Tunnelling to the Origin and Evolution of Life," *Current Organic Chemistry*, vol. 17(16), pp. 1758-1770, 2013)

Superphonon

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 18$

Cost: 2 square exp per rank

Activation: $\langle 30, 25, 20 \rangle$ potential

Cooldown: $\langle 13, 11, 9 \rangle$ seconds

Classifications: Active, Close, Single, Attack, Motive, Force, Physio

Description: Using this ability allows you to make contact with a specified enemy within $\langle 1, 1, 2 \rangle$ hexes of your location that is directly in front of you $\pm\frac{\pi}{4}$ radians, proceeding to induce a superpowered vibrational pulse that travels through the afflicted enemy at the local speed of sound, causing catastrophic damage and the enemy to be momentarily unable to move.

This ability fails if you fail in an attribute challenge where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{BIO}_t$. A successful use of this ability deals

$$\mathbf{PHY} + \langle 24, 36, 42 \rangle \left\lceil \sqrt{\mathbf{PHY}} \right\rceil$$

damage to the target ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Force} \cap \mathrm{Physio}$), and lowers their manual movement speed to "paralyzed" for $\langle 1, 1, 2 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Force} \cap \mathrm{Physio}$).

Text:

> To understand how heat spreads through a material, consider that heat—as well as sound—is actually the motion or vibration of atoms and molecules: Low-frequency vibrations correspond to sound, while higher frequencies correspond to heat. At each frequency, quantum mechanic[al] principles dictate that the vibrational energy must be a multiple of a basic amount of energy, called a quantum, that is proportional to the frequency. (D. L. Chandler, "Explained: Phonons," *MIT News*, 8 July 2010)

CP violation

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 26$, Superphonon III

Preconditions: $\mathbf{PHY} \geq 0$

Cost: 3 square exp per rank

Activation: $\langle 50, 45, 40, 35 \rangle$ potential

Cooldown: $\langle 24, 20, 16, 12 \rangle$ seconds

Classifications: Active, Close, Single, Attack, Force, Physio

Description: Harnessing the power of extremely short-lived B mesons, you produce violent particle decay reactions that cause violations of symmetry over charge conjugation and parity. The next enemy that comes within $\langle 1, 1, 1.25, 1.5 \rangle$ hexes of you is affected, changing some of their matter into anti-matter and dealing

$$\langle 6, 7, 8, 9 \rangle \mathbf{PHY} \left\lceil \frac{\sqrt{\mathbf{PHY}}}{2} \right\rceil - 4\,\mathbf{PHY}$$

damage. This ability fails if you fail in an attribute challenge where $e_u = \mathbf{PHY}$ and $e_t = \max\{\mathbf{BIO}_t, \mathbf{PHY}_t\} - \langle 0, 1, 2, 3 \rangle$.

Text:

> We have compared the decay rates of K_L and K_S to $\pi^+\pi^-$ and $\pi^0\pi^0$ final states using a subset of the data from the KTeV experiment (E832) at Fermilab. We find that the direct-CP-violation parameter $\mathrm{Re}(\varepsilon'/\varepsilon)$ is equal to $(28.0 \pm 3.0(\mathrm{stat}) \pm 2.8(\mathrm{syst})) \times 10^{-4}$. This result definitively establishes the existence of CP violation in a decay process. (KTeV Collaboration, "Observation of Direct CP Violation in $K_{S,L}$ to $\pi\pi$ Decays," *Physical Review Letters*, vol. 83, pp. 22-27, 1999)

Graph III

Superconduction

Pre-reqs: $\mathbf{PHY}_\mathrm{c} \geq 7$

Cost: 1 square exp per rank

Activation: 2 potential per second

Cooldown: $\langle 5, 4, 4, 3 \rangle$ seconds

Classifications: Active, Close, Multi, Region, Dot, Debuff, Motive, Force, Physio

Description: Using this ability allows you to induce superconductivity in the surrounding fluid and channel electrical energy through it. After selecting a hex within two hexes of your location, that hex and all adjacent hexes become superconductive for $\langle 2, 3, 4, 5 \rangle$ seconds. Every half-second that this effect continues, each enemy within the affected area takes

$$\left\lceil \frac{\langle 1, 1, 2, 3 \rangle \mathbf{PHY}}{4} \right\rfloor + \langle 6, 8, 10, 12 \rangle$$

damage ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Region} \cap \mathrm{Dot} \cap \mathrm{Force} \cap \mathrm{Physio}$). In addition, enemies that are within the affected region have difficulty controlling their muscles in the presence of the electric currents, and their manual movement speed is reduced by $\langle 1, 1, 2, 2 \rangle$ levels for a half-second each tick if you succeed in an attribute contest where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{BIO}_t$ ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Region} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Force} \cap \mathrm{Physio}$).

Text: "He observed that when mercury was cooled to below minus-452 degrees Fahrenheit, about 7 degrees above absolute zero, electrical resistance suddenly disappeared, and mercury was a superconductor." (K. Chang, "When Superconductivity Became Clear (to Some)," *The New York Times*, 8 January 2003)

Standing waves

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 21$, Superconduction

Cost: 3 square exp per rank

Activation: 32 potential

Cooldown: $\langle 7, 6, 5 \rangle$ seconds

Classifications: Active, Close, Multi, Dot, Force, Physio

Description: You induce high-amplitude vibrations in all nearby enemies (within $\langle 1, 2, 2 \rangle$ hexes of your location), targeting a frequency that produces standing waves in your enemies. Because the vibrations are standing waves, they persist and deal damage that decreases harmonically over time as the waves are dampened. Every half-second that this effect affects an enemy, that enemy takes

$$\left\lceil \frac{\langle 1, \frac{5}{4}, \frac{3}{2} \rangle \mathbf{PHY}}{n+1} \right\rceil$$

damage, where n is the tick number. The effect persists for $\langle 5, 7, 9 \rangle$ seconds in each enemy that is affected. Each affected enemy competes in an attribute contest where $e_u = \mathbf{PHY}$ and $e_t = \min\{\mathbf{PHY}_t, \mathbf{BIO}_t\} - n$ each tick, and if the target succeeds, the effect is prematurely dispelled.

Text:

> Look with what courteous action
> It waves you to a more removèd ground.
> But do not go with it.
> (W. Shakespeare, "The Tragedy of Hamlet, Prince of Denmark," act I, scene 4, c. 1600)

Thermal conduction

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 6$

Cost: 2 square exp per rank

Activation: $\langle 4, 7, 8 \rangle$ potential to activate, $\langle 2, 2, 3 \rangle$ potential per second sustained

Cooldown: $\langle 30, 25, 20, 15 \rangle$ seconds

Classifications: Active, Close, Single, Dot, Physio

Description: You raise your own thermal conductivity and make contact with a single selected enemy within one hex of your location, conducting your own extreme amounts of heat in an attempt to melt the enemy.[3] The affected target takes

$$\frac{\langle 2, 2, 3, 4 \rangle \mathbf{PHY}}{8} + \langle 2, 3, 5, 8 \rangle$$

damage every quarter-second that this ability is sustained. The successful use of this ability requires you to succeed in an attribute contest where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{BIO}_t - \langle -1, 0, 1, 2 \rangle$; failing to hit still consumes at least the first second's worth of potential and causes the cooldown to begin. If the target moves further than $\langle 2, 2.25, 2.5, 2.75 \rangle$ hexes away from you, this ability is ended prematurely.

The cooldown for this ability starts once the ability is ended, and the ability can be held active for a minimum of 1 second up to a maximum of $\langle 4, 6, 8, 10 \rangle$ seconds. Other Active abilities cannot be activated while this one is engaged.

Text:

> Until recently it was the generally accepted view that Heat was a special substance, which was present in bodies in greater or less quantity, and which produced thereby their higher or lower temperature; which was also sent forth from bodies, and in that case passed with immense speed through empty space and through such cavities as ponderable bodies contain, in the form of what is called radiant heat. In later days has arisen the other view that Heat is in reality a mode of motion. According to this view, the heat found in bodies and determining their temperature is treated as being a motion of their ponderable atoms, in which motion the ether existing within the bodies may also participate; and radiant heat is looked upon as an undulatory motion propagated in that ether. (R. Clausius, "The Mechanical Theory of Heat," trans. W. R. Browne 1879, 1867)

Radionuclide injection

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 16$, Thermal conduction

Anti-reqs: Superconduction

Cost: 3 square exp per rank

[3] This ability notably does not have the Force classification, since its use involves no macroscopic work.

Activation: $\langle 24, 32, 40 \rangle$ potential

Cooldown: $\langle 9, 9, 8 \rangle$ seconds

Classifications: Active, Close, Single, Dot, Force, Physio

Description: You inject a sample of a highly radioactive species into the closest enemy that you are facing ($\pm\frac{\pi}{4}$ radians), within one hex of your location. If you succeed in an attribute contest where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{PHY}_t$, this ability initially does just 1 damage, and every half-second after the nuclide is injected, the target takes further damage. This damage is cumulative, so each tick deals $x + \left\lceil \sqrt{\mathbf{PHY}} \right\rceil$ damage, where x is the damage of the previous tick. This effect lasts for $\langle 4, 5, 6 \rangle$ seconds.

Text:

> Sometimes, during the lonely hours on the control deck, Bowman would listen to this radiation. He would turn up the gain until the room filled with a crackling, hissing roar; out of this background, at irregular intervals, emerged brief whistles and peeps like the cries of demented birds. It was an eerie sound, for it had nothing to do with Man; it was as lonely and meaningless as the murmur of waves on a beach, or the distant crash of thunder beyond the horizon. (A. C. Clarke, "2001: A Space Odyssey," 1968)

Period-doubling bifurcation

Pre-reqs: $\mathbf{PHY}_c \geq 32$, Standing waves or Radionuclide injection

Cost: 4 square exp per rank

Activation: 4 potential to toggle on or off

Cooldown: $\langle 16, 8, 4 \rangle$ seconds

Classifications: Active, $\mathrm{Passive}$, Reflex, Buff, Debuff, $\mathrm{Neutral}$

Description: When this ability is toggled ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Neutral}$) "on", your physical attacks exhibit highly non-linear behavior. All damage from effects of classification $\mathrm{Attack} \cap (\mathrm{Force} \cup \mathrm{Physio})$ that you deal is doubled; however, such damage also becomes extremely unstable, actually dealing

$$\mathcal{U}\left\{\left\lceil \frac{\langle 4, 5, 6 \rangle x}{8} \right\rfloor, x\right\}$$

damage, where x is the damage you would have normally otherwise done (counting the doubling effect of this ability) ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Neutral}$). Additionally, the non-linearity reduces your accuracy when using abilities that produce effects of classification $\mathrm{Attack} \cap (\mathrm{Force} \cup \mathrm{Physio})$ by bestowing a $\langle -5, -4, -3 \rangle$ penalty to your effective physick score when competing in attribute contests involved in such abilities ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$).

Text: "I tell you: one must still have chaos in one, to give birth to a dancing star. I tell you: ye have still chaos in you." (F. Nietzsche, "Thus Spoke Zarathustra: A Book for All and None," [Also sprach Zarathustra: Ein Buch für Alle und Keinen,] trans. Thomas Common 1917, 1883)

Graph IV

Einfühlung

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 3$

Preconditions: $\mathbf{ETH} \geq 0$

Cost: 2 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Heal

Description: You selectively empathize with others when they are healed, emulating a part of that healing in your own self. Every time anyone (yourself excluded) within $\langle 2, 3, 4, 6 \rangle$ hexes of you is affected by any effects with classification Heal, you take $\min\{\mathbf{ETH} + \langle 10, 20, 30, 40 \rangle, 100\}\%$ of the healing dealt by that effect to any one recipient (if there are multiple recipients of the Heal effect, one is picked arbitrarily). The original effect is not altered by this in any way (viz. it does not siphon off the healing).

Text:

> Can I see another's woe,
> And not be in sorrow too?
> Can I see another's grief,
> And not seek for kind relief?
>
> Can I see a falling tear,
> And not feel my sorrow's share?
> Can a father see his child
> Weep, nor be with sorrow filled?
>
> Can a mother sit and hear
> An infant groan, an infant fear?
> No, no! never can it be!
> Never, never can it be!
> (W. Blake, "On Another's Sorrow," *Songs of Innocence and of Experience*, 1789)

Eunoia

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 18$, Einfühlung IV

Preconditions: $\mathbf{ETH} \geq 0$

Cost: 4 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Hot, Buff, Cancel, Mind

Description: Your intentions reflect an inclination for goodness & beauty in the world and a wholeness of mind. You passively heal

$$\left\lceil \frac{\langle 2,3,4\rangle \mathbf{ETH}}{4} \right\rceil + \langle 1,3,5\rangle$$

every second whenever you are not under the influence of any effects of classification $\mathrm{Debuff} \cap \mathrm{Mind}$ ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Hot}$), and all effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Mind}$ that target you have a

$$\left(\left\lceil \sqrt{\mathbf{ETH}} \right\rceil + \langle 1,3,6\rangle\right)\%$$

chance of failing to affect you ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind}$).

Text:

> For many people are goodwilled toward those they have not seen, but believe to be decent or useful, and one of the latter might feel this same way toward the former. These people, then, are obviously goodwilled to one another, but how could one say they were friends when they are unaware of how they stand toward each other? Therefore it is necessary to have goodwill and wish for good things for one another, not being unaware of it, on account of some one of the reasons mentioned. (Aristotle [Ἀριστοτέλης], "Nicomachean Ethics," [Ἠθικὰ Νικομάχεια,] trans. Joe Sachs 2002, 4th century BC)

Graph V

Perfect self-duty

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 5$

Cost: 2 hexagon exp per rank

Activation: $\langle 15, 20, 22\rangle$ potential

Cooldown: $\langle 9, 7, 5\rangle$ seconds

Classifications: Active, $\mathrm{Passive}$, Long, Single, Reflex, Debuff, Buff, Cancel, Hot, $\mathrm{Suggest}$

Description: Upon successfully affecting a target with this ability, you convince the target that they must engage in self-preservation; they can do nothing else ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Suggest}$) besides heal themselves for

$$\left\lceil \frac{\mathbf{ETH}_t}{2} \right\rceil + 10$$

every half-second ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Hot} \cap \mathrm{Suggest}$). Both of these effects last for $\langle 2, 2.5, 3.5\rangle$ seconds.

Text: "For the rest, I understand by a perfect duty that which permits no exception to the advantage of inclination, and I do have perfect duties

that are not merely external but also internal, which runs contrary to the use of words common in the schools…" (I. Kant, "Groundwork of the Metaphysic of Morals," [Grundlegung zur Metaphysik der Sitten,] Ak4:421, trans. A. W. Wood 2002, 1785)

Empty virtue

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 16$, Perfect self-duty

Cost: 2 hexagon exp per rank

Activation: $\langle 22, 22, 22, 22, 20 \rangle$ potential

Cooldown: $\langle 30, 28, 26, 24, 22 \rangle$ seconds

Classifications: Active, Long, Multi, Reflex, Debuff, Buff, Cancel, Attack, Heal, $\mathrm{Suggest}$

Description: Activating this ability poisons a $\langle 1, 2, 3, 4, 5 \rangle$-hexagon-radius area with empty virtues ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Suggest}$). The area must be selected such that it is centered around a hex within six hexes of the player. Up to $\langle 1, 2, 2, 3, 4 \rangle$ enemies in the area at the time of the ability's use are afflicted if they fail in an attribute contest where $e_u = \mathbf{ETH}$ and $e_t = \mathbf{ETH}_t$, and each afflicted enemy is spoiled by a randomly (uniformly) selected "empty virtue" from the following list:

Temperance: The afflicted cannot activate abilities that expend potential for $\langle 1, 1.25, 1.5, 1.75, 2 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Suggest}$).

Charity: The afflicted gives you $\langle 8, 10, 13, 17, 22 \rangle\%$ of their current energy (split into two effects, classified $\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Attack} \cap \mathrm{Suggest}$ and $\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Heal}$), and the same percentage of their current potential as well (split into two effects, classified $\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Suggest}$ and $\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff}$).

Patience: All of the afflicted's abilities that are not already on cooldown immediately go on cooldown for half of their normal cooldown time ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Suggest}$).

Mercy: The afflicted cannot activate abilities that produce effects of classification Attack for $\langle 1, 2, 2, 2, 3 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Suggest}$). Additionally, any effects affecting the afflicted that are classified as $\mathrm{Attack} \cap \mathrm{Passive}$ are suppressed for the same duration ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Cancel} \cap \mathrm{Suggest}$).

Self-reliance: The afflicted is immune to all effects of classification $(\mathrm{Heal} \cup \mathrm{Buff}) \setminus \mathrm{Reflex}$ for $\langle 3, 4, 5, 6, 7 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Suggest}$).

Regardless of which empty virtue the afflicted agent(s) are spoiled by, each one has their ethick score lowered by $\left\lceil \sqrt{\mathbf{ETH}} \right\rceil$ for $\langle 2, 3, 4, 4, 5 \rangle$

seconds.

Text:

> First, then, one must recognize this, that things such as virtues are of such a nature as to be destroyed by deficiency and by excess, as we see (since one must use visible examples as evidence for invisible things) in the case of strength and health; for excessive gymnastic exercises, as well as deficient ones, destroy one's strength, and similarly drink and food, when they come to be too much or too little, destroy one's health, while proportionate amounts produce, increase, and preserve these. And it is the same way also with temperance and courage and the other virtues. (Aristotle [Ἀριστοτέλης], "Nicomachean Ethics," [Ἠθικὰ Νικομάχεια,] trans. Joe Sachs 2002, 4th century BC)

Wú wéi

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 24$, Empty virtue

Cost: 4 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Mind

Description: You cultivate an ability to act through inaction, effortlessly effecting change, like water yielding to rock erodes the rock over many years. Whenever you use an ability that consumes potential, the actual potential you consume is only $\langle 90, 80, 70 \rangle \%$ of what it would otherwise be.

Text:

> That's why the wise soul
> does without doing,
> teaches without talking.
>
> The things of this world
> exist, they are;
> you can't refuse them.
>
> To bear and not to own;
> to act and not lay claim;
> to do the work and let it go:
> for just letting it go
> is what makes it stay.
> (Lǎozǐ [老子], "Dào dé Jīng," [道德經,] trans. Ursula K. Le Guin 1997, 4th century BC)

Jūnzǐ

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 34$, Wú wéi

Preconditions: $\mathbf{ETH} \geq 34$

Cost: 11 hexagon exp

Activation: 51 potential

Cooldown: 44 seconds

Classifications: Active, Long, Single, Debuff, Suggest

Description: An enemy that is successfully targeted by this ability becomes convinced that you are the jūnzǐ, and feels compelled to mirror your noble ways. For six seconds, the target duplicates all actions that you take. This includes movement and the use of Active abilities (even if the target does not normally possess those abilities), although the target uses their own mobility characteristics and their own attributes whenever they apply to the movements and abilities they use. The target's energy and potential work as normal, e.g. the target's potential being consumed when they mirror abilities that consume potential.

Text: "Of what use is killing in your governance? If you desire goodness, the people will be good. The virtue of the junzi is like the wind and the virtue of common people is like the grasses: when the wind blows over the grasses, they will surely bend." (Confucius [孔子], "Analects," [論語,] trans. R. Eno 2015, c. 475-221 BC)

6.4.3 Square class abilities

Graph I

No one ever steps in the same river twice

Pre-reqs: $\mathbf{ONT}_c \geq 3$

Anti-reqs: Coming into being is extinguished, and destruction unknown; Paradox of the arrow; Muscular asynchrony; Gracility; Carapace; Plastron

Cost: 1 pentagon exp and 1 hexagon exp per rank

Classifications: Passive, Long, Multi, Debuff, Cancel, Unintuit

Description: Enemies that enter within a $\langle 3, 4, 5, 6\rangle$-hex radius of your position are automatically afflicted with a debuff. This debuff causes repeated uses of the same ability (that is, of any ability which produces effect(s) of classification Active) to become confused and frustrated by everpresent change, failing to fully activate as normal. The first time that a given agent with this debuff uses a given Active ability, it works normally. Further uses of the same ability will fail if the agent fails in an attribute contest where $e_u = \mathbf{ONT} + \langle -2, -1, 0, 1\rangle$ and $e_t = \mathbf{ONT}_t$. A failed ability starts its cooldown as normal, but does not consume any potential. When an agent with the debuff leaves the radius of this ability, the debuff is instantly dispelled unless the agent is still within the radius of another of this same ability. The debuff effect of this ability cannot afflict the same agent more than once, and in the case of a conflict the instance that took effect first cancels the other.

Text:

> Ποταμοῖσι τοῖσιν αὐτοῖσιν ἐμβαίνουσιν, ἕτερα καὶ ἕτερα ὕδατα ἐπιρρεῖ.
>
> Ever-newer waters flow on those who step into the same rivers. (Heraclitus [Ἡράκλειτος], DK 22 B12, c. 500 BC)

Το ἄπειρον

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 3$

Anti-reqs: Coming into being is extinguished, and destruction unknown; Paradox of the arrow; Muscular asynchrony; Gracility; Carapace; Plastron

Cost: 1 pentagon exp and 2 hexagon exp per rank

Activation: 13 potential

Cooldown: $\langle 21, 15, 10 \rangle$ seconds

Classifications: Active, Close, Single, Attack, Hot, Cancel, $\mathrm{Infinite}$

Description: This ability targets a single enemy within 2 hexes of your location, punishing them for overstaying their welcome of being in existence and sending them back to the *apeiron* (the indefiniteness) until they are born again into the world. This ability only has effects when you succeed in an attribute contest where $e_u = \mathbf{ONT} + \langle -1, 0, 1 \rangle$ and $e_t = \mathbf{ONT}_t$. The first effect of this ability removes an amount of energy from the target equal to $\langle 4, 6, 12 \rangle\%$ of their maximum energy ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Infinite}$). The second effect causes the target to return to the *apeiron*, thus being removed from space entirely and effectively being invisible, untargetable, collisionless, unmovable, unable to activate abilities, unable to lose or gain energy or potential, as well as having all $\mathrm{Passive}$ effects paused and all cooldowns paused ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Cancel} \cap \mathrm{Infinite}$). This second effect lasts for $\langle 3, 4, 5 \rangle$ seconds. When the second effect elapses, a third effect immediately triggers, healing the target for an amount of energy equal to $\langle \frac{2}{3}, 1, 2 \rangle\%$ of their maximum energy every second for 6 seconds ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Hot} \cap \mathrm{Infinite}$).

Text:

> [I]t is neither water nor any other of the so-called elements, but some other indefinite (*apeiron*) nature, from which come to be all the heavens and the worlds in them; and those things, from which there is coming-to-be for the things that are, are also those into which is their passing-away, in accordance with what must be. For they give penalty (*dikê*) and recompense to one another for their injustice (*adikia*) in accordance with the ordering of time... (Simplicius [Σιμπλίκιος], "Commentary on Aristotle's Physics," DK 12 A9, a paraphrasing of the words of

Anaximander [Ἀναξίμανδρος] early 6th century BC, 6th century AD)

Figs far sweeter

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 15$, No one ever steps in the same river twice and/or To ἄπειρον

Cost: 2 pentagon exp and 2 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Long, Multi, Debuff, Motive, $\mathrm{Neutral}$

Description: This ability creates a permanent aura of relativity around you with a radius of $\langle 3, 4, 6 \rangle$ hexes. Enemy agents within the aura are afflicted with a debuff that lasts for the duration that they are within the aura. The debuff causes the afflicted to spend $\max\{\mathbf{ONT} - \mathbf{ONT}_t,\, 0\}\%$ more potential than usual every time they activate an ability that consumes potential ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$). The debuff also causes the afflicted to have a penalty of

$$-\langle 1, 2, 3 \rangle [\mathbf{ONT} > \mathbf{ONT}_t]$$

to all ontologick checks and to their effective ontologick score in attribute contests ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$). The debuff also causes the afflicted to have their manual movement speed multiplied by

$$\max\{100 - \max\{\mathbf{ONT} - \mathbf{ONT}_t,\, 0\},\, \langle 89, 73, 61 \rangle\}\%$$

($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Neutral}$).

Text:

> εἰ μὴ χλωρὸν ἔφυσε θεὸς μέλι, πολλὸν ἔφασκον γλύσσονα σῦκα πέλεσθαι.
>
> If god had not made yellow honey, men would consider figs far sweeter. (Xenophanes of Colophon [Ξενοφάνης ὁ Κολοφώνιος], DK 21 B38, trans. G. S. Kirk, J. E. Raven, and M. Schofield 1983, c. 6th century BC)

Coming into being is extinguished, and destruction unknown

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 3$

Anti-reqs: No one ever steps in the same river twice, To ἄπειρον, Muscular asynchrony, Gracility, Carapace, Plastron

Preconditions: $\mathbf{ONT} \geq 3$

Cost: 1 pentagon exp and 1 hexagon exp per rank

Activation: $\langle 15, 18, 20, 21 \rangle$ potential

Cooldown: $\langle 15, 12, 10, 9 \rangle$ seconds

Classifications: Active, Close, Single, Debuff, Buff, Cancel, Motive, Contra

Description: This ability targets a single enemy within 2 hexes of your location, merging their perception of themselves with the reality of their unchanging oneness and indivisibility. This ability only has effects when you succeed in an attribute contest where $e_u = \mathbf{ONT} + \langle -2, -1, 0, 1 \rangle$ and $e_t = \mathbf{ONT}_t$. The effects from this ability last for

$$\frac{\langle 2, 3, 4, 5 \rangle + \sqrt{\mathbf{ONT}}}{2}$$

seconds, during which the afflicted agent cannot activate abilities and cannot move (including forced/induced movement from effects of classification Motive) ($\mathrm{Active} \cap \mathrm{Short} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Motive} \cap \mathrm{Contra}$), cannot lose nor gain energy nor potential ($\mathrm{Active} \cap \mathrm{Short} \cap \mathrm{Single} \cap \mathrm{Cancel} \cap \mathrm{Contra}$), and is immune to being destroyed ($\mathrm{Active} \cap \mathrm{Short} \cap \mathrm{Single} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Contra}$). Effects of classification $\mathrm{Passive}$ still otherwise work as usual. During the time that this ability's effects are active, the afflicted agent's ability cooldowns are frozen and do not elapse as normal ($\mathrm{Active} \cap \mathrm{Short} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Contra}$).

Text:

> Πῶς δ' ἂν ἔπειτα πέλοιτὸ ἐόν; πῶς δ' ἄν κε γένοιτο; εἰ γὰρ ἔγεντ', οὐκ ἔστι, οὐδ' εἴ ποτε μέλλει ἔσεσθαι. Τὼς γένεσις μὲν ἀπέσβεσται καὶ ἄπυστος ὄλεθρος.
>
> How could what is perish? How could it have come to be? For if it came into being, it is not; nor is it if ever it is going to be. Thus coming into being is extinguished, and destruction unknown. (Parmenides [Παρμενίδης], "On Nature," DK 28 B8.20-22, early 5th century BC)

Paradox of the arrow

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 3$

Anti-reqs: No one ever steps in the same river twice, Το ἄπειρον, Muscular asynchrony, Gracility, Carapace, Plastron

Cost: 1 pentagon exp and 2 hexagon exp per rank

Activation: $\langle 15, 18, 20 \rangle$ potential

Cooldown: $\langle 15, 12, 10 \rangle$ seconds

Classifications: Active, Close, Multi, Debuff, Motive, $\mathrm{Unintuit}$, $\mathrm{Infinite}$, Contra

Description: Activating this ability invokes the paradox that time is composed of moments, and yet no motion is possible in a single moment, thus abolishing motion. The effect affects all enemies in a $\langle 1, 1.5, 2 \rangle$-hex radius centered on you, causing them to be unable to move in any way, produce effects of classification Motive (although other effects that may be part of the same ability as an effect of classification Motive will still work normally), or be affected by other effects of classification Motive.

When this ability is used, you participate in an attribute contest for each targeted enemy where $e_u = \mathbf{ONT} + \langle -1, 0, 1 \rangle$ and $e_t = \mathbf{ONT}_t$. Any enemy that succeeds in their attribute contest is not affected by that usage of the ability. This effect lasts for $\langle 2, 3, 4 \rangle$ seconds.

Text: "[I]f everything when it occupies an equal space is at rest, and if that which is in locomotion is always occupying such a space at any moment, the flying arrow is therefore motionless." (Aristotle [Ἀριστοτέλης], "Physics," [Φυσικὴ ἀκρόασις,] book VI, ch. 9, a paraphrasing of the words of Zeno of Elea [Ζήνων ὁ Ἐλεάτης] c. 460 BC, 4th century BC)

Just the same nature as the one

Pre-reqs: $\mathbf{ONT}_c \geq 15$, Coming into being is extinguished, and destruction unknown and/or Paradox of the arrow

Preconditions: $\mathbf{ONT} \geq 15$

Cost: 2 pentagon exp and 2 hexagon exp per rank

Activation: $\langle 24, 16, 8 \rangle$ potential

Cooldown: 2 seconds (see description)

Classifications: Active, Long, Multi, Debuff, Motive, $\mathrm{Unintuit}$, Contra

Description: Activating this ability requires targeting two agents (of any combination of friendly and enemy), both within a $\langle 4, 6, 8 \rangle$-hex range of the ability's user, and causes the two selected agents to expose their universal, timeless, and immutable shared natures. This ability fails (but still consumes potential and goes on cooldown) if one or both targets are enemies, and the user of the ability fails in an attribute contest where $e_u = \mathbf{ONT} + \langle -1, 0, 1 \rangle$ and e_t is the ontologick score of the enemy target (if there is only one such target), or the maximum of the ontologick scores of the two enemy targets (if both targets are enemies). Depending on what the targets are, any one of the following things results from this ability:

Both targets are enemies: The cooldown time for this use of the ability is extended by $\langle 14, 12, 10 \rangle$ seconds. For $\langle 5, 7, 9 \rangle$ seconds, the two targets are bound by their indistinguishability, causing all effects of classification $(\mathrm{Active} \cap \mathrm{Single}) \setminus \mathrm{Reflex}$ that affect either target during this duration to affect both targets instead of just the one, as if the effect had been two identical effects both simultaneously affecting each target ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Unintuit} \cap \mathrm{Contra}$). Additionally, over the course of the duration, the two targets are gradually pulled towards one another's locations at a constant speed of $\langle 0.1, 0.15, 0.2 \rangle \log_2(\mathbf{ONT})$ hexes per second ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Unintuit} \cap \mathrm{Contra}$). These velocities are added normally to both targets' velocities, i.e. this effect does not (directly) prevent any other kind of movement, including ordinary manual movement.

Both targets are allies: The cooldown time for this use of the ability is extended by $\langle 14, 12, 10\rangle$ seconds. For $\langle 5, 7, 9\rangle$ seconds, the two targets are bound by their indistinguishability, causing all effects of classification Heal (except this one) that affect either target during this duration to grant

$$\frac{1}{1+\exp(\langle 4,3,2\rangle - \frac{\mathbf{ONT}}{8})}$$

times the healing of the original effect to the other target ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Buff} \cap \mathrm{Heal} \cap \mathrm{Unintuit} \cap \mathrm{Contra}$). The duration of this effect is cut short as soon as the two targets move further than $\langle 8, 9, 10\rangle$ hexes away from one another. If the two targets are already further than the maximum distance away from each other when this ability is used, the ability fails, but does not consume any potential nor go on cooldown.

One target is an enemy, one target is an ally: The two targets are indistinguishable enough to instantaneously swap places, their positions being changed, but the first and higher derivatives of their positions with respect to time (their velocity, acceleration, &c.) staying intact ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Motive} \cap \mathrm{Unintuit} \cap \mathrm{Contra}$). This also adds $[\mathbf{ONT} \geq 32]$ seconds to the current remaining cooldown time of every one of the enemy target's Active abilities, even if the remaining cooldown time is zero ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Unintuit} \cap \mathrm{Contra}$).

Text:

> We said that there were many things that were eternal and had forms and strength of their own, and yet we fancy that they all suffer alteration, and that they change from what we see each time. […] They would not change if they were real, but each thing would be just what we believed it to be; for nothing is stronger than true reality. But if it has changed, what is has passed away and what is not has come into being. So then, if there were a plurality, things would have to be of just the same nature as the one. (Melissus of Samos [Μέλισσος ὁ Σάμιος], DK 30 B8.24-27 and B8.29-33, trans. G. S. Kirk, J. E. Raven, and M. Schofield 1983, c. 5th century BC)

Dunamis/entelechy

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 25$, Figs far sweeter or Just the same nature as the one

Preconditions: $\mathbf{ONT} > 0$

Cost: 5 pentagon exp and 7 hexagon exp

Activation: $\langle 24, 36, 48\rangle$ potential

Cooldown: 48 seconds

Classifications: Active, Long, Multi, Attack, Debuff, Cancel, $\mathrm{Neutral}$

Description: Using this ability flips the distinction between the merely potential/capable (*dunamis*) and the actively-completely-actualized (*entelechia*) in a three-hex radius centered on the chosen hex within five hexes of the ability's user. Each enemy within the radius at the time that this ability is used must succeed in an attribute contest (where $e_u = \mathbf{ONT} + \langle 0, 1, 2 \rangle$ and $e_t = \mathbf{ONT}_t$), else that enemy comes under a condition for $\sqrt{\mathbf{ONT}}$ seconds.

This condition causes the afflicted to take an amount of damage to their energy equal to the amount of potential that they spend/lose any time that they spend or otherwise lose potential for any reason ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Attack} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$). This condition also causes the afflicted to take an amount of damage to their potential equal to the amount of energy that they spend/lose any time that they spend or otherwise lose energy for any reason ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$).

Furthermore, this condition (only when it is first inflicted) causes the cooldowns of the afflicted to be swapped, putting all of their abilities that are not on cooldown onto their usual cooldown, and cancelling the cooldown of all of their abilities that are on cooldown ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Cancel} \cap \mathrm{Neutral}$).

Text:

> A distinction having been made in each kind of being between the fully active and what *is* only potentially, the being-at-work-staying-itself [*entelecheia*] of whatever is potentially, *just as such*, is motion: of the alterable, as alterable, it is alteration, of what can grow and its opposite, what can shrink (since no name is common to the two), it is growth and shrinkage, of the generable and destructible it is coming-to-be and passing away, and of the movable in place it is change of place. (Aristotle [Ἀριστοτέλης], "Physics," [Φυσικὴ ἀκρόασις,] book III, ch. 1, trans. J. Sachs 1995, 4th century BC)

Muscular asynchrony

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 3$

Anti-reqs: Carapace; Plastron; No one ever steps in the same river twice; To ἄπειρον; Coming into being is extinguished, and destruction unknown; Paradox of the arrow

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Debuff, Physio, Cancel

Description: You greatly speed up the frequency of your repetitive actions by using a resonant system to drive several repeated muscle contractions with a single neural signal. Your blinding speed reduces the cooldown of all your abilities by $\langle 3, 4, 7, 11, 18, 29 \rangle\%$ ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio}$) and gives you a flat $\langle 6, 9, 12, 15, 18, 21 \rangle\%$ chance to avoid ef-

fects of classification $\mathrm{Attack} \cap \mathrm{Single}$ ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Physio} \cap \mathrm{Cancel}$). It also, however, comes with some wasteful movement, increasing the potential costs of your abilities by $\langle 6, 9, 11, 13, 14, 15 \rangle\%$ ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Physio}$).

Text: "The success of insects as a major and often the dominant animal group in most terrestrial environments may be attributed in part to the evolution of asynchronous flight muscle in several insect taxa." (R. K. Josephson, J. G. Malamud, and D. R. Stokes, "Asynchronous muscle: a primer," *Journal of Experimental Biology*, vol. 203, no. 18, pp. 2713-2722, 2000)

Gracility

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 3$

Anti-reqs: Carapace; Plastron; No one ever steps in the same river twice; To ἄπειρον; Coming into being is extinguished, and destruction unknown; Paradox of the arrow

Preconditions: $\mathbf{BIO} \geq 3$, not under any effects of classification $\mathrm{Debuff} \cap (\mathrm{Mind} \cup \mathrm{Motive})$

Cost: 3 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Physio, Cancel

Description: Your slender form allows you to be more nimble, and causes your enemies to have a harder time hitting you directly. Your effective physick, chemick, and biologick scores are increased by

$$\lceil \log_2(\mathbf{BIO} + \langle -2, 2, 8 \rangle) \rceil$$

when you participate in attribute contests as the target of effect(s) of classification $\mathrm{Attack} \cap (\mathrm{Physio} \cup \mathrm{Force})$.

Text: Gracility, from the Latin *gracilis*, meaning "slender", not to be confused with grace, which is from an unrelated Latin *grātus* meaning "pleasing".

Deimatic metachrosis

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 18$, Muscular asynchrony and/or Gracility

Preconditions: $\mathbf{BIO} \geq 18$

Cost: 4 triangle exp per rank

Cooldown: $\langle 11, 7 \rangle$ seconds

Classifications: $\mathrm{Passive}$, Reflex, Buff, Physio, Cancel

Description: You develop the ability to physiologically change color in direct response to being attacked, blending into your surroundings and making further attacks less likely to hit. Any time you are affected by an effect

of classification $\mathrm{Attack} \setminus \mathrm{Reflex}$ and this ability is not on cooldown, you get a temporary buff for

$$\frac{\langle 3,4\rangle\sqrt{\mathbf{BIO}}}{8}$$

seconds. This buff causes your effective physick, chemick, and biologick scores to be increased by

$$\left\lceil \sqrt{\max\{\mathbf{BIO} - x,\, 0\} + \langle 4,9\rangle} \right\rceil$$

when you participate in attribute contests as the target of effect(s) of classification $\mathrm{Attack} \cap (\mathrm{Neutral} \cup \mathrm{Physio} \cup \mathrm{Force})$, where x is the effective biologick score of your opponent in the contest.

Text:

> …καὶ θηρεύει τοὺς ἰχθῦς τὸ χρῶμα μεταβάλλων καὶ ποιῶν ὅμοιον οἷς ἂν πλησιάζῃ λίθοις. Τὸ δ' αὐτὸ ποιεῖ καὶ φοβηθείς.
>
> [The octopus] seeks its prey by so changing its colour as to render it like the colour of the stones adjacent to it; it does so also when alarmed. (Aristotle [Ἀριστοτέλης], "History of Animals," [Τῶν περὶ τὰ ζῷα ἱστοριῶν,] book IX, trans. D. W. Thompson 1910, 4th century BC)

Carapace

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 3$

Anti-reqs: Muscular asynchrony; Gracility; No one ever steps in the same river twice; To ἄπειρον; Coming into being is extinguished, and destruction unknown; Paradox of the arrow

Preconditions: $\mathbf{BIO} \geq 3$

Cost: 3 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Physio

Description: You develop a bony shield that protects your dorsal flank. This shield passively absorbs

$$\left(\langle 1,3,5\rangle\left\lceil\sqrt{\mathbf{BIO}}\right\rceil + \langle 0,2,4\rangle\right)\%$$

of damage from any effects of classification $\mathrm{Attack} \cap (\mathrm{Physio} \cup \mathrm{Force}) \setminus \mathrm{Reflex}$ that originate from sources situated at least $\frac{\pi}{2}$ radians away from the direction you are facing at the time that the effect initially affects you.

Text: "The Hare was once boasting of his speed before the other animals. 'I have never yet been beaten,' said he, 'when I put forth my full speed. I challenge any one here to race with me.' The Tortoise said quietly, 'I accept your challenge.'" (J. Jacobs, "The Hare & the Tortoise," a retelling of Aesop's fable of Perry index no. 226, 1894)

Plastron

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 3$

Anti-reqs: Muscular asynchrony; Gracility; No one ever steps in the same river twice; To ἄπειρον; Coming into being is extinguished, and destruction unknown; Paradox of the arrow

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Physio

Description: You develop a bony shield that protects your ventral flank. This shield passively absorbs the first

$$\left\lceil \frac{\langle 1,2,2,3\rangle \mathbf{BIO}}{2} \right\rceil + \langle 2,3,5,8\rangle$$

damage of all effects of classification $\mathrm{Attack} \cap (\mathrm{Physio} \cup \mathrm{Force}) \setminus \mathrm{Reflex}$ that originate from sources situated less than $\frac{\pi}{2}$ radians away from the direction you are facing at the time that the effect initially affects you.

Text:

> Tortoise: Sebastian Bach isn't so bad, in my opinion. But these days, I must say, I am developing more and more of an interest in a rather specialized sort of music.
>
> Achilles: Tell me, what kind of music is that?
>
> Tortoise: A type of music which you are most unlikely to have heard of. I call it "music to break phonographs by".
> (D. R. Hofstadter, "Gödel, Escher, Bach: An Eternal Golden Braid," 1979)

Metabolism

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 18$, Carapace and/or Plastron

Cost: 4 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Physio

Description: You develop a heightened metabolism, increasing the energy that you have at your biological disposal. Your maximum energy is passively increased by a factor of

$$\frac{\langle 9,10\rangle}{8}.$$

Text:

> δοκεῖ δέ τισιν ἡ τοῦ πυρὸς φύσις ἁπλῶς αἰτία τῆς τροφῆς καὶ τῆς αὐξήσεως εἶναι· καὶ γὰρ αὐτὸ φαίνεται μόνον τῶν σωμάτων [ἢ τῶν στοιχείων] τρεφόμενον καὶ αὐξόμενον, διὸ καὶ ἐν τοῖς φυτοῖς καὶ ἐν τοῖς ζῴοις ὑπολάβοι τις ἂν τοῦτο εἶναι τὸ

ἐργαζόμενον. τὸ δὲ συναίτιον μέν πώς ἐστιν, οὐ μὴν ἁπλῶς γε αἴτιον, ἀλλὰ μᾶλλον ἡ ψυχή· ἡ μὲν γὰρ τοῦ πυρὸς αὔξησις εἰς ἄπειρον, ἕως ἂν ᾖ τὸ καυστόν, τῶν δὲ φύσει συνισταμένων πάντων ἔστι πέρας καὶ λόγος μεγέθους τε καὶ αὐξήσεως· ταῦτα δὲ ψυχῆς, ἀλλ' οὐ πυρός, καὶ λόγου μᾶλλον ἢ ὕλης.

Some think the fire itself is the main cause of nutrition and growth. It's not—the soul is; though it may be a contributory factor. Fires will always grow so long as there's fuel but the size and growth of all naturally composed (i.e. living) things is limited and defined: this is the job of the soul not the fire, of defining characteristics not matter. (Aristotle [Ἀριστοτέλης], "On the Soul," [Περὶ Ψυχῆς,] book II, 416a9, trans. Simon MacPherson 2014, 4th century BC)

Morphogenesis

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 30$, $\mathbf{CHE}_{\mathrm{c}} \geq 5$, Deimatic metachrosis or Metabolism

Cost: 4 triangle exp per rank

Activation: $\langle 5, 6, 7 \rangle$ potential

Cooldown: $\langle 20, 18, 16 \rangle$ seconds

Classifications: Active, Reflex, Buff, Physio, Chemical

Description: You gain the ability to generate new biological forms in yourself, spontaneously acquiring new physiology that gives you new, but temporary, functionality. Using this ability uniformly and randomly selects one ability from the following abilities, not including those that you have one or more ranks in: Muscular asynchrony, Gracility, Deimatic metachrosis, Carapace, Plastron, Metabolism. The ability that is selected is granted to you for $\langle 4, 6, 8 \rangle$ seconds as if you had purchased all ranks of that ability.

Text:

It is suggested that a system of chemical substances, called morphogens, reacting together and diffusing through a tissue, is adequate to account for the main phenomena of morphogenesis. Such a system, although it may originally be quite homogeneous, may later develop a pattern or structure due to an instability of the homogeneous equilibrium, which is triggered off by random disturbances. (A. M. Turing, "The Chemical Basis of Morphogenesis," *Philosophical Transactions of the Royal Society of London*, series B, vol. 237, no. 641, pp. 37-72, 14 August 1952)

Graph II

Sympathetic resonance

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 6$

Anti-reqs: Enthalpy of fusion, Gibbs free energy

Cost: 1 square exp per rank

Activation: $\langle 7, 7, 8, 8, 9, 9, 10, 10 \rangle$ potential

Cooldown: $\langle 9, 9, 9, 9, 8, 8, 8, 8 \rangle$ seconds

Classifications: Active, Close, Single, Dot, Debuff, Motive, Force, Physio

Description: You target an enemy within one hex of your location, coming close enough to induce sympathetic vibrations in them by vibrating your own body. Damage is dealt every half-second to the affected enemy, each tick dealing

$$\left\lceil \frac{\langle 5, 6, 6, 7, 7, 8, 8, 9 \rangle \mathbf{PHY}}{8(n+1)} \right\rceil$$

such damage, where n is the tick number ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Dot} \cap \mathrm{Force} \cap \mathrm{Physio}$). In addition, on every other tick (starting from the first tick, not the initial impact), the target has their movement slowed by $\langle 42, 46, 52, 58, 60, 66, 70, 72 \rangle\%$ for a half-second if they fail in an attribute contest where $e_u = \mathbf{PHY} + \langle -1, -1, 0, 0, 1, 1, 2, 2 \rangle$ and $e_t = \mathbf{PHY}_t$ ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Force} \cap \mathrm{Physio}$).

You can take other actions while this ability is active, but the ability is cancelled as soon as the target moves to be more than one hex away from you, or $\langle 3, 3, 4, 4, 5, 5, 6, 6 \rangle$ seconds elapses, whichever comes first.

Text:

> So if you meet me, have some courtesy
> Have some sympathy, and some taste
> Use all your well-learned politesse
> Or I'll lay your soul to waste
> (Mick Jagger, "Sympathy for the Devil," the Rolling Stones's *Beggars Banquet*, Decca Records, 6 December 1968)

Dirac sea

Pre-reqs: $\mathbf{PHY}_c \geq 16$, Sympathetic resonance

Cost: 2 square exp per rank

Activation: $\langle 15, 16, 17 \rangle$ potential

Cooldown: $\langle 5, 4, 3 \rangle$ seconds

Classifications: Active, Close, Long, Single, Attack, Dot, Debuff, Force, Physio, $\mathrm{Infinite}$

Description: If you succeed in an attribute contest where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{PHY}_t$, you plunge a single targeted enemy (within $\langle 1, 1.25, 1.5 \rangle$ hexes of your location) in and out of the Dirac sea, causing violent annihilation processes that deal $\left\lceil \sqrt{\mathbf{PHY}} \right\rceil + \langle 3, 5, 7 \rangle$ damage to the target every half-second for $\langle 3, 3, 4 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap$

$\mathrm{Dot} \cap \mathrm{Force} \cap \mathrm{Physio} \cap \mathrm{Infinite}$). In addition, every other half-second of the duration (starting from the onset), the target is plunged into the sea of infinite negative energy, causing their energy to be unable to increase (although it can still decrease); this effectively "mutes" effects of classification Heal, although it does not actually cancel such effects, which is notable for those specifically of classification Hot ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Physio} \cap \mathrm{Infinite}$).

Every half second, the afflicted target releases a high-energy photon as the result of the annihilation processes; this photon moves at a speed of three hexes per second and starts at a uniformly-random position around the circumference of the afflicted target (i.e. the initial position is chosen as an angle of $\mathcal{U}(0,\, 2\pi)$ radians, excluding 2π), moving directly away from the center of the target. If the photon hits a "wall", it is absorbed and nothing happens. If it hits an agent, the agent takes 2 damage ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Force} \cap \mathrm{Physio}$).

Text:

> The new quantum mechanics, when applied to the problem of the structure of the atom with point-charge electrons, does not give results in agreement with experiment. The discrepancies consist of "duplexity" phenomena, the observed number of stationary states for an electron in an atom being twice the number given by the theory. [...] The question remains as to why Nature should have chosen this particular model for the electron instead of being satisfied with the point-charge. One would like to find some incompleteness in the previous methods of applying quantum mechanics to the point-charge electron such that, when removed, the whole of the duplexity phenomena follow without arbitrary assumptions. In the present paper it is shown that this is the case [...] It appears that the simplest Hamiltonian for a point-charge electron satisfying the requirements of both relativity and the general transformation theory leads to an explanation of all duplexity phenomena without further assumption. (P. A. M. Dirac, "The Quantum Theory of the Electron," *Proceedings of the Royal Society of London*, series A, vol. 117, no. 778, pp. 610-624, 1 February 1928)

Friedmann-Lemaître-Robertson-Walker

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 3$, $\mathbf{CHE}_{\mathrm{c}} \geq 3$

Anti-reqs: Enthalpy of fusion, Gibbs free energy

Cost: 1 square exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff

Description: By ensuring the isotropy of the universe, you improve your ability to aim over distance. You gain a passive $\langle 1, 2, 3, 4, 5 \rangle$ bonus to your effective physick, chemick, and biologick scores when participating in

attribute contests as a user to successfully produce effects of classification $\mathrm{Attack} \cap (\mathrm{Force} \cup \mathrm{Chemical} \cup \mathrm{Physio})$ against target(s) that are more than $\langle 3, 2.75, 2.5, 2.25, 2\rangle$ hexes away from you.

Text:

> Das Ziel dieser Notiz ist, erstens die Ableitung der Zylinderund Kugelwelt (als spezielle Fälle) aus einigen allgemeinen Annahmen, und zweitens der Beweis der Möglichkeit einer Welt, deren Raumkrümmung konstant ist in bezug auf drei Koordinaten, die als Raumkoordinaten gelten, und abhängig von der Zeit, d.h. von der vierten — der Zeitkoordinate; dieser neue Typus ist, was seine übrigen Eigenschaften anbetrifft, ein Analogon der Einsteinschen Zylinderwelt.
>
> The aim of this note is, first, the derivation of the cylinder and sphere worlds (as special cases) from some general assumptions, and second, the proof of the possibility of a world whose spatial curvature is constant with respect to three coordinates, which are considered spatial coordinates, and dependent on the time, i.e. the fourth coordinate. This new type, as far as its other properties are concerned, is analogous to Einstein's cylinder world.
> (A. A. Friedmann [Алекса́ндр Алекса́ндрович Фри́дман], "On the Curvature of Space," [Über die Krümmung des Raumes,] *Zeitschrift für Physik*, series A, vol. 10, issue 1, pp. 377-386, December 1922)

Path integral

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 9$, Friedmann-Lemaître-Robertson-Walker

Cost: 1 square exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff

Description: You are able to sum over all possible paths your enemies (and allies) can take from one spatiotemporal point to another, allowing you to better phenomenologically project the probability of their passage between those two points. As a result, every time that you compete in an attribute challenge using your physick, chemick, and/or biologick scores in order to (as the user) successfully produce effect(s) of classification $\mathrm{Force} \cup \mathrm{Chemical} \cup \mathrm{Physio}$ and you fail that challenge, there is a $\min\{\mathbf{PHY} + \langle 4, 8, 12, 16, 20, 24, 28, 32\rangle, 100\}\%$ chance that you make the challenge a second time (ceteris paribus) and succeed iff you succeed in the second challenge. This means that failing the second challenge does not result in any chance of making a third (or fourth, or…) challenge.

Text: "A path integral to victory." (Valve Corporation, "Dota 2," spoken by *Enigma*, voiced by Jon St. John, July 2013)

Specular reflection

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 26$, Dirac sea and/or Path integral

Preconditions: $\mathbf{PHY} \geq 1$

Cost: 2 square exp per rank

Classifications: $\mathrm{Passive}$, Close, Single, Buff, Attack, Dot, Physio, Force

Description: Any time that you are affected by an effect of classification $(\mathrm{Active} \cap \mathrm{Attack} \cap (\mathrm{Physio} \cup \mathrm{Force})) \setminus (\mathrm{Reflex} \cup \mathrm{Dot})$, a check is made for if the effect was produced by an agent situated (at the time of the check) within $\langle 1, 2, 3 \rangle$ hexes of you and in front of you, plus or minus $\pi / \langle 6, 5, 4 \rangle$ radians. If the check succeeds, that agent takes $\langle 4, 4, 5 \rangle \left\lceil \sqrt{\mathbf{PHY}} \right\rceil \%$ of the damage that the effect in question dealt to you, before amplifications or reductions $(\mathrm{Passive} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Physio})$.

Text:

> Mirror stares back again
> I contort like the wheels in my head
> Still nothing ever happens
> Please wake up
> (Tommy Rogers, "Specular Reflection," Between the Buried and Me's *The Parallax: Hypersleep Dialogues*, Metal Blade Records, 12 April 2011)

Enthalpy of fusion

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 4$

Anti-reqs: Sympathetic resonance, Friedmann-Lemaître-Robertson-Walker

Cost: 1 square exp per rank

Activation: $\langle 4, 5, 6, 7, 8, 9, 10, 11 \rangle$ potential

Cooldown: $\langle 12, 12, 11, 10, 10, 9, 8, 8 \rangle$ seconds

Classifications: Active, Long, Single, Dot, Debuff, Motive, $\mathrm{Chemical}$, Physio

Description: Upon succeeding in an attribute challenge where $e_u = \mathbf{CHE}$ and $e_t = \mathbf{CHE}_t$, you transfer enough heat to the target within $\langle 5, 5, 6, 6, 6, 6, 6, 7 \rangle$ hexes of your location to partially melt them. The melting lasts for $\langle 4, 4, 4, 5, 5, 5, 5, 6 \rangle$ seconds and deals

$$\left\lceil \frac{(n + \langle 0, 0, 0, 0, 1, 1, 1, 1 \rangle)\mathbf{CHE}}{4} \right\rceil$$

damage every second (starting at the onset), where n is the tick number $(\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Dot} \cap \mathrm{Chemical} \cap \mathrm{Physio})$. For the duration of the melting, the target also has their movement impaired by the phase change, their manual movement speed being multiplied by

$$\max \begin{cases} 100 - (n + \langle 0, 1, 1, 2, 2, 3, 3, 4 \rangle) \sqrt{\max\{\mathbf{CHE} - \mathbf{CHE}_t,\, 0\}} \\ 5 \end{cases}$$

percent, where n is the same as before ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Physio}$).

Text:

> Upon further consideration it appeared to me that this practice was one of the best illustrations of the Doctrine of Latent Heat; for the small quantity of water thrown upon the stove is instantly converted into vapour, and striking against the bottom of the kettle is thereby condensed into drops, at the same time communicating a large quantity of latent heat to the kettle. These drops now fall down from the bottom of the kettle to the stove, and are again converted into vapour. Hence it happens that this small quantity of water, alternately suffering expansion and condensation, is not dissipated even by a very hot stove, but for a considerable time passes backwards and forwards between the stove and the bottom of the kettle, becoming a carrier of heat in the same manner that pieces of gold-leaf become carriers of electricity between two plates, one being suspended above the other. (J. Black, "The life and letters of Joseph Black, M.D.," ed. W. Ramsay and F. G. Donnan 1918, c. 1783)

Second law

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 14$, Enthalpy of fusion

Cost: 2 square exp per rank

Activation: $\langle 24, 26, 28 \rangle$ potential

Cooldown: $\langle 13, 12, 11 \rangle$ seconds

Classifications: Active, Long, Single, Reflex, Dot, Debuff, Buff, $\mathrm{Chemical}$, Physio

Description: Upon succeeding in an attribute contest where $e_u = \mathbf{CHE}$ and $e_t = \mathbf{CHE}_t$ against a target enemy within $\langle 4, 5, 6 \rangle$ hexes of your location, you rapidly increase the entropy of that enemy, dealing $\left\lceil \frac{\mathbf{CHE}}{2} \right\rfloor + \langle 0, 1, 2 \rangle n$ damage every half-second for $\langle 3, 4, 5 \rangle$ seconds, where n is the tick number ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Dot} \cap \mathrm{Chemical} \cap \mathrm{Physio}$). In addition, each tick deals

$$\left\lceil \frac{\left\lceil \sqrt{\mathbf{CHE}} \right\rceil + \langle 1, 2, 3 \rangle}{2} \right\rfloor$$

damage to the target's potential ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Chemical} \cap \mathrm{Physio}$). You lose some entropy in the process, gaining half of the potential that you remove from the target ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Chemical} \cap \mathrm{Physio}$).

Text: "No structure, even an artificial one, enjoys the process of entropy. It is the ultimate fate of everything, and everything resists it." (P. K. Dick, "Galactic Pot-Healer," 1969)

Gibbs free energy

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 3$

Anti-reqs: Sympathetic resonance, Friedmann-Lemaître-Robertson-Walker

Cost: 1 square exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Chemical}$

Description: You turn the favorability of constant-pressure thermodynamic processes into your own favor, dealing

$$\langle 102, 104, 106, 108, 110, 112, 114, 116 \rangle \%$$

times as much damage when producing effects of classification $\mathrm{Attack} \cap \mathrm{Chemical}$.

Text:

> For example, let it be required to find the greatest amount of mechanical work which can be obtained from a given quantity of a certain substance in a given initial state, without increasing its total volume or allowing heat to pass to or from external bodies, except such as at the close of the processes are left in their initial condition. This has been called the *available energy* of the body. The initial state of the body is supposed to be such that the body can be made to pass from it to states of dissipated energy by reversible processes. (J. W. Gibbs, "A Method of Geometrical Representation of the Thermodynamic Properties of Substances by Means of Surfaces," *Transactions of the Connecticut Academy of Arts and Sciences*, vol. 2, pp. 382-404, 1873)

Redox

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 12$, Gibbs free energy

Cost: 2 square exp per rank

Activation: 7 potential

Cooldown: $\langle 2, 2, 1 \rangle$ seconds

Classifications: Active, Long, Single, Reflex, Debuff, Buff, $\mathrm{Chemical}$

Description: You target a single enemy agent within $\langle 5, 6, 7 \rangle$ hexes of your location, and if you succeed in an attribute challenge where $e_u = \mathbf{CHE} + \langle -2, -1, 0 \rangle$ and $e_t = \mathbf{CHE}_t$, you induce a reduction-oxidation reaction between you and your target, oxidizing the target and reducing yourself. The target loses $1 + \left\lceil \frac{\mathbf{CHE}}{32} \right\rceil$ of their chemick score for $\langle 4, 6, 8 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Chemical}$). You gain an amount of chemick equal to the amount lost by the target for the same amount of time ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Chemical}$). These two effects are independent, that is, if one effect ends earlier than its allotted

duration, it does not end the other effect early or change its duration in any other way.

Text:

> Although different kinds of chemical reactions are thus easily recognized, it has not been found very useful in general to attempt to classify reactions in a rigorous way. Nevertheless, there is one very important class of chemical reactions that deserves special study. These reactions are oxidation-reduction reactions, to which we now turn our attention. (L. Pauling, "College Chemistry," 2nd ed., ch. 12, p. 243, 1957)

Hysteresis

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 24$, $\mathbf{PHY}_{\mathrm{c}} \geq 6$, $\mathbf{BIO}_{\mathrm{c}} \geq 3$, Second law and/or Redox

Preconditions: $\mathbf{CHE} \geq 1$

Cost: 2 square exp per rank

Cooldown: $\langle 5, 4, 3 \rangle$ seconds

Classifications: $\mathrm{Passive}$, Long, Single, Attack, $\mathrm{Chemical}$, Physio

Description: Any time that this ability is not on cooldown, it continuously searches a five-hex radius centered on your position from the center (your position) outwards for enemy agents. The first enemy that it finds, if any, participates in an attribute challenge against you where $e_u = \mathbf{CHE} + \langle 0, 1, 2 \rangle$ and $e_t = \max\{\mathbf{CHE}_t, \mathbf{PHY}_t, \mathbf{BIO}_t\}$. If the enemy fails, they are affected by a hysteresis effect that deals damage equal to $(32 + \log_2(\mathbf{CHE}))\%$ of the total loss of energy that the enemy has suffered in the past four seconds. The loss of energy is in terms of total loss (i.e. including damaging and healing effects), thus being equal to the energy that the enemy had four seconds ago minus the energy that they have now (just as this ability starts to activate). If this difference is nonpositive, the enemy takes zero damage as a result of this ability's effect.

Text:

> Det er ganske sandt, hvad Philosophien siger, at Livet maa forstaaes baglænds. Men derover glemmer man den anden Sætning, at det maa leves forlænds.
>
> It is quite true, as the philosophers say, that life must be understood backwards. But beyond that, one forgets the other proposition, that it must be lived forwards.
> (S. Kierkegaard, Journal JJ:167, 1843)

Recombination

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 32$, $\mathbf{CHE}_{\mathrm{c}} \geq 32$, Specular Reflection III or Hysteresis III

Anti-reqs: Radicalization

Preconditions: $\mathbf{PHY} + \mathbf{CHE} \geq 0$

Cost: 3 square exp per rank

Activation: 13 potential + 5 potential/second

Cooldown: $\langle 60, 50, 40 \rangle$ seconds

Classifications: Active, Long, Single, Multi, Reflex, Attack, Debuff, Cancel, Motive, Physio, Force, $\mathrm{Chemical}$

Description: You continuously recombine free protons and electrons into neutral hydrogen atoms, emitting ultraviolet photons and incredible amounts of heat. You columnate this radiant energy towards a single foe within six hexes of your location, dealing

$$\left\lceil \frac{2(\mathbf{PHY} + \mathbf{CHE})}{x + \langle 6, 5, 4 \rangle} \right\rceil$$

damage every quarter-second for up to $\langle 3, 4, 5 \rangle$ seconds, where x is the distance (in hexes) between you to the target at the time of that impact ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Chemical}$). Each damage instance is subject to an attribute challenge where $e_u = \left\lceil \frac{\mathbf{CHE}+\mathbf{PHY}}{2} \right\rceil$ and $e_t = \left\lceil \frac{\mathbf{CHE}_t+\mathbf{PHY}_t}{2} \right\rceil$, such that a victory of the target in the challenge means only taking half of the damage that the instance would otherwise deal.

This damage is not instant, but is sent in a series of projectiles that travel at a constant speed of six hexes per second towards the target. Any agents (enemy or friendly) that these projectiles pass through take

$$\left\lceil \frac{\mathbf{PHY} + \mathbf{CHE}}{y + \langle 6, 5, 4 \rangle} \right\rceil$$

damage (also subject to the same attribute challenges as impacts with the main target), where y is the distance (in hexes) between you and the agent in question at the time of that impact ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Attack} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Chemical}$). These additionally affected agents are not, however, considered targets of this ability or any of its effects.

For the duration of this ability, you cannot manually move, nor can you use other abilities, although you can cancel this ability at any time ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Motive}$). If, during this ability, you become affected by any effect(s) that would normally disallow you from using this ability, the duration of this ability is ended prematurely.

Text: The energy required to ionize one mole of hydrogen atoms is the same amount of available food energy in $\frac{1}{4}$ kg of potato (1312 kJ).

Radicalization

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 32$, $\mathbf{CHE}_{\mathrm{c}} \geq 32$, Specular Reflection III or Hysteresis III

Anti-reqs: Recombination

Preconditions: $\mathbf{PHY} + \mathbf{CHE} \geq 0$

Cost: 3 square exp per rank

Activation: 23 potential

Cooldown: $\langle 60, 50, 40 \rangle$ seconds

Classifications: Active, Long, Single, Reflex, Attack, Debuff, Force, $\mathrm{Chemical}$, Physio

Description: You ionize bits of yourself to produce free radicals, launching them at an enemy within six hexes of your location in intervals of a half-second for $\langle 4, 5, 6 \rangle$ seconds. The radicals are projectiles that move towards the target with a constant speed of 3.5 hexes per second, and on impact, they each deal

$$\left\lfloor \frac{\langle 4, 5, 6 \rangle (\mathbf{PHY} + \mathbf{CHE})}{8} \right\rfloor + \langle 2, 3, 4 \rangle \left\lceil \sqrt{\mathbf{PHY} + \mathbf{CHE}} \right\rceil$$

damage ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Force} \cap \mathrm{Chemical} \cap \mathrm{Physio}$). Also on impact, they each remove

$$\left\lfloor \frac{(\mathbf{PHY} + \mathbf{CHE}) \left\lceil \sqrt{\mathbf{PHY} + \mathbf{CHE}} \right\rceil}{\langle 96, 80, 64 \rangle} \right\rfloor$$

potential ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Force} \cap \mathrm{Chemical} \cap \mathrm{Physio}$). Each impact is subject to an attribute challenge where $e_u = \left\lceil \frac{\mathbf{CHE} + \mathbf{PHY}}{2} \right\rceil + \langle 0, 1, 2 \rangle$ and $e_t = \left\lceil \frac{\mathbf{CHE}_t + \mathbf{PHY}_t}{2} \right\rceil$, such that a victory of the target in the challenge means only taking half of the damage (to both energy and potential) that the impact would otherwise deal.

The radical generation process damages your energy, and each time that a projectile is generated, you instantly take half of the damage that the projectile would deal on impact (assuming that the target fails in the attribute challenge) ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Attack} \cap \mathrm{Force} \cap \mathrm{Chemical} \cap \mathrm{Physio}$). As soon as any given projectile travels a total path distance exceeding six hexes, it is instantly destroyed and can never impact its target.

Text:

> On the "Celestial Seasonings" green tea packet there is a short explanation of its benefits: "Green tea is a natural source of antioxidants, which neutralize harmful molecules in the body known as free radicals. By taming free radicals, antioxidants help the body maintain its natural health." Mutatis mutandis, is not the notion of totalitarianism one of the main ideological antioxidants, whose function throughout its career was to tame free radicals, and thus to help the social body to maintain its politico-ideological good health? (Slavoj Žižek, "Did Somebody Say Totalitarianism?: 5 Interventions in the (Mis)Use of a Notion," 1 March 2001)

Graph III

Aromaticity

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 5$, $\mathbf{ONT}_{\mathrm{c}} \geq 4$

Cost: 1 square exp and 1 hexagon exp per rank

Activation: $\langle 15, 16, 17 \rangle$ potential

Cooldown: $\langle 24, 22, 20 \rangle$ seconds

Classifications: Active, Long, Single, Region, Attack, Buff, Debuff, Cancel, Motive, Physio, $\mathrm{Chemical}$

Description: This ability targets a single hex within $\langle 4, 5, 6 \rangle$ hexes of your location, placing it under a condition that lasts for $\langle 3, 4, 5 \rangle$ seconds. The first agent (friendly or enemy) to occupy that hex, if any, becomes the target of this ability and ends the condition that was placed on the hex. In the case of a tie (e.g. there are already two or more agents occupying the hex at the time that the hex is targeted), one agent is chosen arbitrarily.

An agent that is targeted by this ability becomes internally nebulous, delocalized, and uniform, doing damage equal to one third of what their energy was just before triggering this effect ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Region} \cap \mathrm{Attack} \cap \mathrm{Physio} \cap \mathrm{Chemical}$). This damage is halved if the affected agent succeeds in an attribute challenge where $e_u = \left\lceil \frac{\mathbf{CHE}+\mathbf{ONT}}{2} \right\rfloor + \langle 0, 1, 2 \rangle$ and $e_t = \mathbf{CHE}_t$. Additionally, the affected agent has their manual movement speed reduced by half for $\langle 1, 2, 3 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Region} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Physio} \cap \mathrm{Chemical}$). Additionally, due to their nebulous nature, the affected agent has, for the next $\langle 3, 2, 1 \rangle$ seconds, a $\frac{1}{2}$ probability of ignoring effects of classification $\mathrm{Attack} \cap \mathrm{Physio}$ ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Region} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Physio} \cap \mathrm{Chemical}$).

Text:

> I was sitting there, working on my textbook, but it was not going well; my mind was on other things. I turned my chair toward the fireplace and sank into half-sleep. Again the atoms fluttered before my eyes. This time smaller groups remained modestly in the background. My mind's eye, sharpened by repeated visions of a similar kind, now distinguished larger forms in a variety of shapes. Long lines, often combined more densely; everything in motion, twisting and turning like snakes. But look, what was that? One of the snakes had seized its own tail, and the figure whirled mockingly before my eyes. I awoke in a flash, and this time, too, I spent the rest of the night working out the consequences of the hypothesis. (F. A. Kekulé, at *Benzolfest*, 1890)

Chelation

Pre-reqs: $\mathbf{CHE}_c \geq 18$, $\mathbf{ONT}_c \geq 12$, Aromaticity

Anti-reqs: Maximal entanglement, Unitary operator

Cost: 1 square exp and 1 hexagon exp per rank

Activation: $\langle 9, 16, 25 \rangle$ potential

Cooldown: 16 seconds

Classifications: Active, Long, Single, Attack, Debuff, Cancel, Physio, Chemical

Description: The chosen enemy agent within four hexes of your location is chelated by a single ligand if you succeed in an attribute check where $e_u = \mathbf{CHE}$ and $e_t = \left\lceil \frac{\mathbf{CHE}_t + \mathbf{ONT}_t}{2} \right\rfloor + \langle 2, 1, 0 \rangle$, taking

$$\mathbf{CHE} + \mathbf{ONT} + \mathcal{U}\{\langle 100, 121, 144 \rangle, \langle 225, 400, 625 \rangle\}$$

damage ($\text{Active} \cap \text{Long} \cap \text{Single} \cap \text{Attack} \cap \text{Physio} \cap \text{Chemical}$). The target remains chelated for $\langle 1, 1.5625, 2.25 \rangle [\mathbf{ONT} \geq \mathbf{ONT}_t]$ seconds, during which time they are neutralized and are unable to use abilities that produce effects of classification $\text{Active} \cap \text{Attack}$.

Text: "chelate (adj.): in zoology, 'having pincer-like claws,' 1826 as a term in zoology; 1920 in chemistry, from Modern Latin *chela* 'claw' of a crab or lobster (from Greek *khele* 'claw, talon, pincers, cloven hoof,' a word of uncertain origin) + **-ate**." (D. Harper, "Online Etymology Dictionary," https://www.etymonline.com/word/chelate, 2001-2019)

Atomism

Pre-reqs: $\mathbf{ONT}_c \geq 5$, $\mathbf{CHE}_c \geq 4$

Cost: 1 hexagon exp and 1 square exp per rank

Classifications: Passive, Reflex, Buff, Chemical

Description: You analyze your surroundings as consisting merely of atoms (and the void), increasing the damage you deal by a bonus $\langle 5, 10, 15, 20, 25 \rangle\%$ any time you produce an effect of classification $\text{Active} \cap \text{Attack} \cap \text{Chemical}$ ($\text{Passive} \cap \text{Reflex} \cap \text{Buff} \cap \text{Chemical}$). Additionally, effects of classification $\text{Active} \cap \text{Debuff} \cap \text{Chemical}$ that you produce that have a duration have that duration extended by an additional $\langle 10, 20, 30, 40, 50 \rangle\%$ ($\text{Passive} \cap \text{Reflex} \cap \text{Buff} \cap \text{Chemical}$).

Text:

> νόμωι (γάρ φησι) γλυκὺ καὶ νόμωι πικρόν, νόμωι θερμόν, νόμωι ψυχρόν, νόμωι χροιή, ἐτεῆι δὲ ἄτομα καὶ κενόν...
>
> Sweet exists by convention, bitter by convention, colour by convention; atoms and Void (alone) exist in reality...
> (Democritus [Δημόκριτος], DK 68 B9, trans. K. Freeman 1948, c. 460 - c. 370 BC)

Horror vacui

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 16$, $\mathbf{CHE}_{\mathrm{c}} \geq 10$, Atomism

Anti-reqs: Maximal entanglement, Unitary operator

Cost: 1 hexagon exp and 1 square exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Unintuit}$, $\mathrm{Chemical}$

Description: You exploit the empty space in the energy of your enemies. Any time you inflict an effect of classification $\mathrm{Attack} \cap \mathrm{Chemical}$ that deals at least 1 damage (effective damage, i.e. after reductions), the affected agent takes an additional

$$\left\lceil \frac{\left\lfloor x\left(1 - \frac{x}{y}\right) \right\rfloor}{\langle 4, 3, 2 \rangle} \right\rceil$$

damage immediately afterwards (if you succeed in an attribute contest where $e_u = \min\{\mathbf{ONT}, \mathbf{CHE}\}$ and $e_t = \min\{\mathbf{ONT}_t, \mathbf{CHE}_t\}$), where x is that agent's energy and y is that agent's maximum energy.

Text:

> But even in its own right, the so-called void would seem to those who examine it to be a truly empty idea. For just as, if someone places a cube in water, it will displace an amount of water that is as much as the cube, so also is it in air, though it is not evident to the senses. And always in every body capable of displacement, in the direction in which it is its nature to be displaced, it is necessary, if it is not compressed, that it be displaced, either always downward, if, like that of earth, its motion is downward, or upward, if it is fire, or in both directions, whatever sort of thing might be placed in it. But surely in the void this is impossible (since it has no body), but there would be dissolved through the cube an interval equal to that which was in the void before, just as if the water had not been displaced by the wooden cube, nor the air, but went all through it everywhere. (Aristotle [Ἀριστοτέλης], "Physics," [Φυσικὴ ἀκρόασις,] book IV, ch. 8, trans. J. Sachs 1995, 4th century BC)

Superposition

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 5$, $\mathbf{LOG}_{\mathrm{c}} \geq 3$

Cost: 1 triangle exp, 1 pentagon exp, and 1 hexagon exp per rank

Activation: $\langle 3, 5 \rangle$ potential

Cooldown: $\langle 13, 11 \rangle$ seconds

Classifications: Active, Long, Single, Reflex, Buff, Debuff, Cancel, Contra

Description: You place a selected agent within $\langle 3, 5 \rangle$ hexes of your location into a quantum superposition for $\langle 3, 5 \rangle$ seconds. If the target is friendly, their position is fractured into two superposed non-overlapping positions of equal wave-functional magnitude, and any time they are affected by an effect of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Single}$ during this duration, there is a $\frac{1}{2}$ probability that the effect is cancelled ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Contra}$, or $\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Contra}$ if the target is yourself). If this occurs, then regardless of whether or not the effect in question is cancelled, this collapses the superposition, thus ending the buff.

If the target of this ability is an enemy, you must succeed in an attribute challenge where $e_u = \mathbf{PHY}$ and $e_t = \left\lceil \frac{\mathbf{PHY}_t + \mathbf{LOG}_t}{2} \right\rfloor + \langle 2, 0 \rangle$. If you do succeed, the cooldowns of the target's abilities are put into superpositions; if, during the duration of this effect, the target activates an ability that has a cooldown, there is a $\frac{1}{2}$ probability that the ability goes on cooldown without activating ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Contra}$). If this occurs, then regardless of whether or not the ability in question is cancelled, this collapses the superpositions, thus ending the debuff.

Text:

> One can even set up quite ridiculous cases. A cat is penned up in a steel chamber, along with the following device (which must be secured against direct interference by the cat): in a Geiger counter, there is a tiny bit of radioactive substance, so small, that perhaps in the course of the hour one of the atoms decays, but also, with equal probability, perhaps none; if it happens, the counter tube discharges and through a relay releases a hammer that shatters a small flask of hydrocyanic acid. If one has left this entire system to itself for an hour, one would say that the cat still lives if meanwhile no atom has decayed. The first atomic decay would have poisoned it. The psi-function of the entire system would express this by having in it the living and dead cat (pardon the expression) mixed or smeared out in equal parts. (E. Schrödinger, "The Present Situation in Quantum Mechanics," [Die gegenwärtige Situation in der Quantenmechanik,] *Naturwissenschaften*, vol. 23, issue 48, pp. 807-812, trans. J. D. Trimmer 1980, November 1935)

Maximal entanglement

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 17$, $\mathbf{LOG}_{\mathrm{c}} \geq 13$, Superposition

Anti-reqs: Chelation, Horror vacui

Cost: 1 square exp, 1 pentagon exp, and 1 hexagon exp per rank

Activation: $\langle 37, 31 \rangle$ potential

Cooldown: $\langle 71, 61 \rangle$ seconds

Classifications: Active, Long, Multi, Debuff, Physio

Description: You target an enemy agent within three hexes of your location, and if you succeed in an attribute challenge where $e_u = \mathbf{PHY}$ and $e_t = \min\{\mathbf{PHY}_t, \mathbf{LOG}_t\} + \langle 3, -1 \rangle$, that target becomes maximally entangled with the nearest (w.r.t. the target) enemy (w.r.t. you) agent for $\langle 5, 7 \rangle$ seconds. Agents that are maximally entangled that get affected by any effect(s) (viz. effects whose incipit is within the duration of the entanglement) of classification $\mathrm{Attack} \cup \mathrm{Debuff}$ copy that effect, instantly affecting the agent they are entangled to with the copy of the effect.

Text:

> When two systems, of which we know the states by their respective representatives [respective quantum states], enter into temporary physical interaction due to known forces between them, and when after a time of mutual influence the systems separate again, then they can no longer be described in the same way as before, viz. by endowing each of them with a representative of its own. I would not call that one but rather the characteristic trait of quantum mechanics, the one that enforces its entire departure from classical lines of thought. By the interaction the two representatives have become entangled. (E. Schrödinger, "Discussion of Probability Relations Between Separated Systems," *Proceedings of the Cambridge Philosophical Society*, vol. 31, issue 4, pp. 555-563, 1935)

Hilbert space

Pre-reqs: $\mathbf{LOG}_\mathrm{c} \geq 5$, $\mathbf{PHY}_\mathrm{c} \geq 3$

Cost: 4 pentagon exp and 2 square exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, Motive, $\mathrm{Neutral}$

Description: You gain the ability to manipulate Hilbert spaces, using simple linear operators to increase your manual movement speed by one level ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Motive} \cap \mathrm{Neutral}$) and to increase the range of your abilities that produce effect(s) of classification Active by one hex ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Neutral}$).

Text: "Later on, in London, came the visit from that most ubiquitous of double agents, Sammy Hilbert-Spaess, whom everyone had thought in Stockholm, or was it Paraguay?" (T. Pynchon, "Gravity's Rainbow," 1973)

Unitary operator

Pre-reqs: $\mathbf{LOG}_\mathrm{c} \geq 14$, $\mathbf{PHY}_\mathrm{c} \geq 9$, Hilbert space

Anti-reqs: Chelation, Horror vacui

Cost: 1 triangle exp, 1 pentagon exp, and 1 hexagon exp per rank

Activation: $\langle 25, 20 \rangle$ potential

Cooldown: $\langle 25, 15 \rangle$ seconds

Classifications: Active, Long, Single, Debuff, Cancel, $\mathrm{Neutral}$

Description: You target an enemy agent within $\langle 4, 6 \rangle$ hexes of your location, afflicting them with a debuff that lasts for $\langle 2, 4 \rangle$ seconds if you succeed in an attribute challenge where $e_u = \mathbf{LOG}$ and $e_t = \mathbf{LOG}_t - \langle 0, 1 \rangle$. An agent affected by this debuff that activates an ability that produces effect(s) of classification Active dispels the debuff, but the the ability is turned into a unitary operator. The effects produced by unitary abilities cannot make changes to the energy or potential of any agent(s), and also cannot make changes to the attribute scores of any agent(s).

Text: $U^*U = UU^* = I$

Principle energy level

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 36$, $\mathbf{PHY}_{\mathrm{c}} \geq 36$, Chelation or Maximal entanglement

Cost: 2 square exp and 2 hexagon exp per rank

Cooldown: $\langle 5, 4, 3 \rangle$ seconds

Classifications: $\mathrm{Passive}$, Long, Single, Attack, Debuff, Motive, Physio, Force, $\mathrm{Chemical}$

Description: You develop a permanent electronic shell, complete with sub-shells and their orbitals. The outer influence of the shell extends to a four hex radius around your position at all times. An enemy agent that crosses this boundary inwards (towards you) while this ability is not on cooldown triggers the cooldown and becomes damaged and slowed for $\langle 3, 4, 5 \rangle$ seconds. The damage dealt is equal to

$$\langle 2, 3, 4 \rangle (\mathbf{PHY} + \mathbf{CHE}) + \mathcal{U}\{2\langle 2, 6, 10 \rangle,\ 6\langle 2, 6, 10 \rangle\}$$

($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Chemical}$). This damage does not occur if the target succeeds in an attribute contest where $e_u = \max\{\mathbf{CHE}, \mathbf{PHY}\}$ and $e_t = \max\{\mathbf{CHE}_t, \mathbf{PHY}_t\} + \langle 1, 0, -1 \rangle$.

The slow multiplies the manual movement speed of the affected enemy by $\min\left\{\frac{2x^2}{32},\ 1\right\}$, where x is the distance between your position and the affected enemy's; this multiplier is updated continuously throughout the duration ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Chemical}$). This slow effect is does not occur if the target succeeds in an attribute contest where $e_u = \min\{\mathbf{CHE}, \mathbf{PHY}\}$ and $e_t = \min\{\mathbf{CHE}_t, \mathbf{PHY}_t\} + \langle 1, 0, -1 \rangle$.

Text:

> Everyday life depends on the structure of the atom. Turn off the electrical charges and everything crumbles to an invisible fine dust, without electrical forces, there would no longer be things

> in the universe — merely diffuse clouds of electrons, protons, and neutrons, and gravitating spheres of elementary particles, the featureless remnants of worlds. (C. Sagan, "Cosmos," 1980)

Nonhæcceity

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 36$, $\mathbf{PHY}_{\mathrm{c}} \geq 36$, Horror vacui or Maximal entanglement

Cost: 1 square exp, 2 pentagon exp, and 1 hexagon exp per rank

Activation: $\langle 16, 24, 32 \rangle$ potential

Cooldown: $\langle 24, 16, 8 \rangle$ seconds

Classifications: Active, Reflex, Buff, $\mathrm{Unintuit}$

Description: Using this ability places a buff on yourself that lasts for $\langle 8, 16, 24 \rangle$ seconds. If you activate an ability that produces effect(s) of classification $\mathrm{Active} \cap \mathrm{Single} \cap (\mathrm{Attack} \cup \mathrm{Debuff})$ while affected by this buff, the buff is dispelled, and if the target of that ability is an enemy, all enemies within $\langle 1, 2, 3 \rangle$ hexes of the target become nonhæcceitic with the target, each receiving a copy of the effect(s) produced by that ability. The original target does not receive any copies, but only the original effect(s).

Text:

> As a by-product of this same view, I received a telephone call one day at the graduate college at Princeton from Professor Wheeler, in which he said, "Feynman, I know why all electrons have the same charge and the same mass" "Why?" "Because, they are all the same electron!" (R. Feynman, Nobel Lecture, 11 December 1965)

Zeroth law

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 36$, $\mathbf{LOG}_{\mathrm{c}} \geq 36$, Chelation or Unitary operator

Preconditions: $\mathbf{CHE} + \mathbf{LOG} > 0$

Cost: 4 hexagon exp per rank

Activation: $\langle 3, 4, 5 \rangle$ potential to toggle on or off

Cooldown: $\frac{1}{2}$ seconds

Classifications: Active, $\mathrm{Passive}$, Long, Multi, Reflex, $\mathrm{Chemical}$, Physio

Description: When this ability is toggled ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Chemical} \cap \mathrm{Physio}$) "on", you gradually enter thermodynamic equilibrium with any agents (enemy and friendly alike) that are within five hexes of your position at any given time. Whenever two or more agents (yourself included) are within this radius, this ability exercises energy- and potential-manipulating effects on all such agents. Every quarter-second, each of

the affected agents has their energy changed to

$$x + \operatorname{sgn}(y - x) \cdot \min\left\{\frac{\mathbf{CHE} + \mathbf{LOG}}{\langle 200, 150, 100\rangle}, |y - x|\right\}$$

percent of their maximum energy, where x is the percentage of their maximum energy that the agent in question is at, and y is the arithmetic average of the energy percentages of all the agents within the radius (including the agent in question) ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Chemical} \cap \mathrm{Physio}$, or $\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Chemical} \cap \mathrm{Physio}$ when affecting the user of this ability).

Likewise, each affected agent has their potential changed every quarter-second to a percentage of their maximum potential given by the previous mathematical expression, but where x is the percentage of their maximum potential that the agent in question is at, and y is the arithmetic average of the potential percentages of all the agents within the radius (including the agent in question) ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Chemical} \cap \mathrm{Physio}$, or $\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Chemical} \cap \mathrm{Physio}$ when affecting the user of this ability).

Text: "All heat is of the same kind." (J. C. Maxwell, "Theory of Heat," 1871)

Problem of induction

Pre-reqs: $\mathbf{ONT}_{\mathrm{c}} \geq 36$, $\mathbf{LOG}_{\mathrm{c}} \geq 36$, Horror vacui or Unitary operator

Preconditions: $\mathbf{ONT} + \mathbf{LOG} \geq 0$

Cost: 4 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Long, Multi, Debuff, Cancel, $\mathrm{Unintuit}$

Description: Enemies within $\langle 3, 4, 5\rangle$ hexes of your location participate in an attribute challenge where $e_u = \left\lceil \frac{\mathbf{ONT}+\mathbf{LOG}}{2} \right\rfloor + \langle -1, 1, 3\rangle$ and e_t is either $\mathbf{ONT}_t$ or $\mathbf{LOG}_t$ (with probability $\frac{1}{2}$ each) each time that they activate an ability that produces effect(s) of classification Active. If the check fails, there is a $\frac{1}{2}$ probability that the ability that the enemy in question used produces unexpected results ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Unintuit}$). There is a

$$\max\left\{\frac{1}{2} - \frac{\sqrt{\mathbf{ONT} + \mathbf{LOG}}}{\langle 28, 26, 24\rangle}, 0\right\}$$

probability that the unexpected result is that the ability produces no effects at all. Otherwise, the ability produces any number of these effects with probability $\frac{1}{2}$ each (that is, zero or more may occur, in accordance with the binomial distribution where n is the length of the following list and $p = \frac{1}{2}$):

- The enemy takes damage equal to the sum of their ontologick and logick scores ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Attack} \cap \mathrm{Unintuit}$).

- The enemy heals you for an amount of energy equal to the sum of their ontologick and logick scores ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Heal} \cap \mathrm{Unintuit}$).
- The enemy has their manual movement speed reduced by one level for three seconds ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Unintuit}$).
- The enemy gains ten potential ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Unintuit}$).
- The enemy's ontologick and logick scores are both increased by 4 for three seconds ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Unintuit}$).

Text: "But notwithstanding this ignorance of natural powers and principles, we always presume, when we see like sensible qualities, that they have like secret powers, and expect, that effects, similar to those which we have experienced, will follow from them." (D. Hume, "An Enquiry Concerning Human Understanding," E 4.16, 1748)

Graph IV

Laplace's demon

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 8$

Cost: 1 square exp and 2 pentagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Neutral}$

Description: Harnessing the determinism of your classical view of the universe, you gain a $\langle 1, 2 \rangle$ bonus on all physick, chemick, and biologick checks. You also gain the same bonus to your effective physick, chemick, and biologick scores when you participate in attribute challenges.

Text:

> We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes. (P.-S. Laplace, "A Philosophical Essay on Probabilities," [Essai philosophique sur les probabilités,] trans. F. W. Truscott and F. L. Emory 1951, 1814)

Supermagnet

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 10$

Preconditions: $\mathbf{PHY} \geq 0$

Cost: 2 square exp and 1 hexagon exp per rank

Activation: 2 potential per second

Cooldown: $\langle 9, 8, 7 \rangle$ seconds

Classifications: Active, Close, Long, Multi, Dot, Motive, Physio, Force

Description: You transform yourself into a supermagnet, powerful enough to rip at polar molecules and even ionize certain atoms themselves. Every half-second for the duration of this ability, each enemy agent within one hex of your location takes

$$\left\lceil \frac{\langle 2, 2, 3 \rangle \mathbf{PHY} \left\lfloor \sqrt{\mathbf{PHY}} \right\rfloor}{4} \right\rceil + \langle 4, 8, 12 \rangle$$

damage ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Dot} \cap \mathrm{Physio} \cap \mathrm{Force}$). This damage is halved if a given enemy succeeds in an attribute challenge where $e_u = \mathbf{PHY} - \langle 2, 1, 0 \rangle$ and $e_t = \mathbf{PHY}_t$.

Additionally, those enemies within one hex of your location participate in another attribute challenge where $e_u = \mathbf{PHY} + \langle -2, 0, 1 \rangle$ and $e_t = \mathbf{PHY}_t$ every tick; every failure results in that enemy staying in the same position relative to you (you can still move while this ability is sustained) for the duration of that tick (a half-second) ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Motive} \cap \mathrm{Force}$).

Furthermore, enemies that are not within one hex of your location but are within five hexes of your location must participate in an attribute challenge where $e_u = \mathbf{PHY} - \langle 2, 1, 0 \rangle$ and $e_t = \mathbf{PHY}_t$ every second for the duration of the ability; every failure results in the enemy being pulled $\frac{1}{2}$ hexes towards you ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Motive} \cap \mathrm{Force}$).

The cooldown for this ability starts once the ability is ended, and the ability can be held active for a minimum of 1 second up to a maximum of $\langle 2, 4, 6 \rangle$ seconds. Other Active abilities cannot be activated while this one is engaged.

Text: "What phenomenon is more astonishing? Where has nature shown greater audacity? For iron, the tamer of all substances, is drawn to the magnet, following some intangible attraction, and, as it comes nearer, leaps to meet the magnet." (Pliny the Elder [Gaius Plinius Secundus], "Naturalis Historia," book XXXVI, ch. XXV, 79 AD)

Hawking radiation

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 20$

Preconditions: $\mathbf{PHY} \geq 20$

Cost: 2 square exp and 1 hexagon exp per rank

Activation: $\langle 14, 17, 20, 23, 29 \rangle$ potential

Cooldown: $\langle 32, 28, 24, 20, 8 \rangle$ seconds

Classifications: Active, Close, Multi, Dot, Motive, Physio, Force, $\mathrm{Infinite}$

Description: You collapse yourself into a small Schwarzschild-like black hole, exerting exceptional levels of gravitational influence and continuously emitting radiation (mostly photons) radially outwards. This state lasts for $\langle 3, 3.25, 3.5, 3.75, 4\rangle$ seconds, during which, every $\frac{1}{8}$ seconds, all enemy agents within a two hex radius of your position take

$$\left\lceil \frac{(x+1)^2 \cdot \mathbf{PHY}}{\lfloor 128(y+1) \rfloor} \right\rceil$$

damage, where x is the tick number and y is the distance between you and the particular agent in question ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Dot} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Infinite}$). This damage is halved if the affected agent succeeds in an attribute challenge where $e_u = \mathbf{PHY} - \langle 3, 2, 1, 0, -2\rangle$ and $e_t = \mathbf{PHY}_t$.

Additionally, on each damage tick, all agents (enemy or friendly) within a six hex radius of your position are affected by your gravity well, being pulled towards your position by

$$\min\left\{ \frac{1}{4}, \frac{\sqrt{\mathbf{PHY}}}{16y^2} \right\}$$

hexes, where y is the same as before ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Motive} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Infinite}$). The previous effect does not apply to agents that are already $\frac{3}{4}$ hexes or less from you; the movement effect is not inflicted on these agents, but they are instead trapped in your apparent event horizon in an indeterminate state, taking $\left\lfloor \sqrt{\mathbf{PHY}} \right\rfloor + \langle -2, -1, 0, 1, 2\rangle$ damage ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Dot} \cap \mathrm{Physio} \cap \mathrm{Force} \cap \mathrm{Infinite}$). Neither the pulling effect nor its associated damage effect occur if the target agent succeeds in an attribute challenge where $e_u = \mathbf{PHY} + \langle 0, 1, 2, 3, 4\rangle$ and $e_t = \mathbf{PHY}_t$.

While this ability is active, you cannot activate other abilities ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Physio} \cap \mathrm{Force}$), although you can move normally and can cancel this ability at any time.

Text:

> The black hole would therefore have a finite life of the order of $10^{71}(M_\odot/M)^{-3}$ s. For a black hole of solar mass this is much longer than the age of the Universe. There might, however, be much smaller black holes which were formed by fluctuations in the early Universe. Any such black hole of mass less than 10^{15} g would have evaporated by now. Near the end of its life the rate of emission would be very high and about 10^{30} erg would be released in the last 0.1 s. This is a fairly small explosion by astronomical standards but it is equivalent to about 1 million 1 Mton hydrogen bombs. (S. W. Hawking, "Black hole explosions?," *Nature*, vol. 248, pp. 30-31, 1 March 1974)

Heisenburg uncertain

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 22$

Preconditions: Not currently paralyzed

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Physio

Description: Your form takes on wavelike properties, and your position in time becomes less clearly defined as your frequency becomes more clearly defined, and vice versa. As a result, the lower your current velocity is, the more clearly defined it becomes, and the less clearly defined is your position. Likewise, the higher your current velocity is, the less clearly defined it becomes, and the more clearly defined is your position.

Any time that you participate in an attribute challenge as the target of effect(s) of classification $\mathrm{Attack} \cap \mathrm{Close} \cap \mathrm{Single}$, your effective physick, chemick, and biologick scores are increased by

$$\max\left\{\langle 1,2,3\rangle\left(\left\lfloor\left(\frac{1}{2}+\frac{s}{s_0}\right)^{-2}\right\rfloor-1\right),0\right\}$$

(where s is your current movement speed and s_0 is your current maximum manual movement speed), representing disadvantage to hit when position is not clearly defined ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Physio}$).

Any time that you participate in an attribute challenge as the target of effect(s) of classification $\mathrm{Attack} \cap \mathrm{Long} \cap \mathrm{Single}$, your effective physick, chemick, and biologick scores are increased by

$$\max\left\{\langle 1,1,2\rangle\left(\left\lfloor\left(\frac{3}{2}-\frac{s}{s_0}\right)^{-2}\right\rfloor-1\right),0\right\},$$

representing disadvantage to hit when velocity is not clearly defined and thus future positions are more difficult to predict ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Physio}$).

Text:

> It must have been one evening after midnight when I suddenly remembered my conversation with Einstein and particularly his statement, "It is the theory which decides what we can observe." I was immediately convinced that the key to the gate that had been closed for so long must be sought right here. I decided to go on a nocturnal walk through Faelled Park and to think further about the matter. We had always said so glibly that the path of the electron in the cloud chamber could be observed. But perhaps what we really observed was something much less. Perhaps we merely saw a series of discrete and ill-defined spots through which the electron had passed. In fact, all we do see in the cloud chamber are individual water droplets which must certainly be much larger than the electron. The right question should therefore be: Can quantum mechanics represent the fact

that an electron finds itself approximately in a given place and that it moves approximately with a given velocity, and can we make these approximations so close that they do not cause experimental difficulties? (W. K. Heisenberg, "Physics and Beyond," [Der Teil und das Ganze: Gespräche im Umkreis der Atomphysik,] trans. A. J. Pomerans 1971, ch. 6, 1969)

Electrolysis

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 39$, $\mathbf{PHY}_{\mathrm{c}} \geq 29$

Cost: 2 square exp and 1 hexagon exp per rank

Activation: $\langle 20, 21, 22, 23 \rangle$ potential

Cooldown: $\langle 18, 16, 14, 12 \rangle$ seconds

Classifications: Active, Close, Multi, Dot, Debuff, $\mathrm{Chemical}$, Force, Physio

Description: You send high-voltage direct current into the surrounding fluid, electrolysing up to $\langle 2, 3, 4, 5 \rangle$ enemy agents that are within $\langle 1, 2, 2, 3 \rangle$ hexes of your location over the course of $\langle 3, 4, 5, 6 \rangle$ seconds. Every quarter-second, this electrolysis effect damages each enemy agent in the radius for

$$\left\lceil \frac{(x+1)\left(\mathbf{CHE} + \left\lceil \frac{\mathbf{PHY}}{2} \right\rfloor\right)}{\langle 8, 7, 7, 6 \rangle} \right\rceil$$

damage, where x is the number of enemy agents that are affected by that tick ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Dot} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$). This damage is reduced by half if a given enemy succeeds in an attribute challenge where $e_u = \min\{\mathbf{CHE}, \mathbf{PHY}\} - \langle 2, 1, 1, 0 \rangle$ and $e_t = \mathbf{CHE}_t$.

Additionally, every tick gives each affected agent a penalty to their chemick checks and to their effective chemick score when participating in attribute challenges equal to $\langle 1, 2, 3, 4 \rangle$ for a quarter-second ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Debuff} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$).

Text: "Who would not have been laughed at if he had said in 1800 that metals could be extracted from their ores by electricity or that portraits could be drawn by chemistry?" (M. Faraday, "The Letters of Faraday and Schoenbein, 1836-1862," 1899)

Statistical power

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 41$, $\mathbf{LOG}_{\mathrm{c}} \geq 19$

Cost: 1 square exp and 3 pentagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Neutral}$

Description: You improve the statistical power of your hypothesis testing, detecting more true positives than you would otherwise. Your nominal physick, chemick, and biologick scores are multiplied by a factor of $\langle 1.03, 1.06, 1.1 \rangle$ (taking the integral part as the result).

Text: With great power comes great sensitivity.

6.4.4 Pentagon class abilities

Graph I

Affine logic

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 6$

Anti-reqs: Modal logic of belief, Idempotency of entailment

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: By disallowing contraction of identical terms, you allow each proposition to be used at most once, giving you a $\langle 1, 2 \rangle x$ bonus to your effective logick, ontologick, and ethick scores when participating in attribute contests as the target of effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap (\mathrm{Mind} \cup \mathrm{Contra})$, where x is the number of effects of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap (\mathrm{Mind} \cup \mathrm{Contra})$ you are already affected by or have been affected by within the past $\langle 1, 2 \rangle$ seconds.

Text:

> The most conspicuous novelty of linear logic (not the deepest one) was the banishing of contraction
>
> $$\frac{\vdash \Gamma, A, A}{\vdash \Gamma, A}$$
>
> An involutive (and constructive) negation can only live in the absence of contraction. Intuitionistic logic banishes contraction to the right under the pretext that only one formula is allowed. (J.-Y. Girard, "Locus Solum: From the rules of logic to the logic of rules," 2001)

Relevance logic

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 12$

Anti-reqs: Modal logic of possibility, Ex falso quodlibet, Classical formalist

Preconditions: $\mathbf{LOG} \geq 0$

Cost: 1 triangle exp per rank

Activation: $\langle 10, 11, 12, 13, 14, 15 \rangle$ potential

Cooldown: $\langle 12, 11, 10, 9, 8, 7 \rangle$ seconds

Classifications: Active, Reflex, Buff, Cancel, Mind

Description: By disallowing introduction of spurious terms, you require that every proposition involved in a deduction be relevant to that deduction. Using this ability places a buff on yourself that lasts for

$$\frac{\langle 4, 5, 6, 7, 8, 9 \rangle}{4}$$

seconds. The buff causes all effects of classification $\mathrm{Multi} \cap (\mathrm{Attack} \cup \mathrm{Debuff}) \cap (\mathrm{Mind} \cup \mathrm{Contra})$ that affect you to be duplicated, this duplicate immediately affecting the agent who produced the original effect $(\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind})$. In addition, the original effect has a $\min\left\{\sqrt{\mathbf{LOG}}, 100\right\}\%$ probability of being cancelled and not affecting you at all $(\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind})$.

Text: "The moon is made of green cheese. Therefore, either it is raining in Ecuador now or it is not." (E. Mares, "Relevance Logic," *The Stanford Encyclopedia of Philosophy*, Spring 2014 ed.)

Linear logic

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 18$

Anti-reqs: Modal logic of obligation, Idempotency of entailment, Ex falso quodlibet

Preconditions: $\mathbf{LOG} \geq 0$

Cost: 2 triangle and 1 pentagon exp per rank

Activation: $\langle 4, 6, 8 \rangle$ potential

Cooldown: $\langle 30, 25, 20 \rangle$ seconds

Classifications: Active, Reflex, Buff, Cancel, Mind

Description: You interpret propositions as resources that can be consumed. Using this ability dispells any effect(s) of classification $\mathrm{Debuff} \cap (\mathrm{Mind} \cup \mathrm{Contra}) \setminus \mathrm{Reflex}$ that are affecting you $(\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind})$. Each such effect that is dispelled grants you $\left\lceil \frac{\langle 2,3,4 \rangle \mathbf{LOG}}{4} \right\rfloor$ potential $(\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind})$.

Text:

> People sometimes think that constructive logics (intuitionistic, linear) are weaker, since "they prove less". As remarked by Kreisel long ago, this is a complete mistake: intuitionistic disjunction is not [classical disjunction] with one hand tied behind its back, it is a different operation. By the way, locative phenomena show that these non-classical connectives are no longer bound to be weaker than the "corresponding" classical ones, which, by the way, are no longer "corresponding" at all... (J.-Y. Girard, "Locus Solum: From the rules of logic to the logic of rules," 2001)

Ordered logic

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 24$

Anti-reqs: Modal logic of temporality, Idempotency of entailment, Ex falso quodlibet

Cost: 3 triangle exp per rank

Cooldown: $\langle 19, 13, 11 \rangle$ seconds

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: You destroy even the commutativity present in classical deduction, completely thwarting any single incoming effect of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap (\mathrm{Mind} \cup \mathrm{Contra})$ if this ability is not on cooldown. This ability being triggered immediately puts it on cooldown.

Text: "By the way, this is simply called *non-commutative logic*, since only a very bad Broccoli logic could be non-commutative without being linear." (J.-Y. Girard, "Locus Solum: From the rules of logic to the logic of rules," 2001)

Substructurality

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 30$, two or more of {Affine logic, Relevance logic, Linear logic, Ordered logic}

Anti-reqs: Modal realism, Classical formalist

Cost: 8 triangle exp and 4 square exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Unintuit}$

Description: You leverage substructural logics to your advantage, making use of their unique power to simultaneously make more sense out of your own formal systems and undercut that of your opponents. Any time that you are affected by an effect of classification $\mathrm{Debuff} \cap (\mathrm{Mind} \cup \mathrm{Neutral})$, its duration is halved $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Unintuit})$. Any time that you produce an effect of classification $\mathrm{Debuff} \cap \mathrm{Unintuit} \setminus \mathrm{Reflex}$, its duration is multiplied by $\frac{3}{2}$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Unintuit})$. Every time that you produce an effect of classification $\mathrm{Attack} \cap \mathrm{Unintuit} \setminus \mathrm{Reflex}$, its damage is multiplied by $\frac{5}{4}$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Unintuit})$.

Text:

> Structural rules: These are the rules of *exchange*, *weakening* and *contraction*, which maintain classical sequent calculus. These rules are problematic to various extents, the most powerful and criticisable being contraction. [...] The notion of a structural rule does not make sense in the absence of cut-elimination: for instance, you can add the axiom scheme $A \multimap A \otimes A$ so as to obtain the effects of contraction, without declaring contraction! This is the Tarpeian Rock of the bleak area known as "substructural logics": these systems usually do not enjoy cut-elimination... (J.-Y. Girard, "Locus Solum: From the rules of logic to the logic of rules," 2001)

Modal logic of belief

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 6$

Anti-reqs: Affine logic

Cost: 1 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: You manipulate your own beliefs as the situation suits you, giving you an additional $\langle 1, 2, 3, 4 \rangle$ to your effective ontologick, logick, and ethick scores when participating in attribute contests as the target of effect(s) of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap (\mathrm{Unintuit} \cup \mathrm{Contra})$.

Text: "You forget that a thing is not necessarily true because a man dies for it." (O. Wilde, "The Portrait of Mr. W. H.," 1889)

Modal logic of possibility

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 12$

Anti-reqs: Relevance logic

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: You subvert possibility itself, turning the necessary into the possible and the possible into the necessary. Any time that you would normally be successfully affected by an effect of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap (\mathrm{Mind} \cup \mathrm{Contra}) \setminus \mathrm{Reflex}$, you have a

$$\frac{\langle 2, 3, 4 \rangle}{8}$$

probability of causing an attribute challenge between yourself and the agent who produced the effect, where $e_u = \mathbf{LOG}_u$ and $e_t = \mathbf{LOG}_t$ (here, the "target" is you). If you succeed in the contest, the effect is cancelled; if not, the effect occurs normally.

Text:

> I dwell in Possibility –
> A fairer House than Prose –
> More numerous of Windows –
> Superior – for Doors –
> (E. Dickinson, 19th century)

Modal logic of obligation

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 18$, $\mathbf{ETH}_{\mathrm{c}} \geq 6$

Anti-reqs: Linear logic

Cost: 2 triangle exp and 1 hexagon exp per rank

Activation: 24 potential

Cooldown: $\langle 24, 18, 12 \rangle$ seconds

Classifications: Active, $\mathrm{Passive}$, Long, Single, Reflex, Debuff, Buff, Cancel, $\mathrm{Suggest}$

Description: You manipulate the obligations of a single enemy agent within $\langle 3, 5, 7 \rangle$ hexes of your location, turning obligations into forbidden acts. If you succeed in an attribute contest against the target agent where $e_u = \max\{\mathbf{LOG}, \mathbf{ETH}\} + \langle -1, 0, 1 \rangle$ and $e_t = \max\{\mathbf{LOG}, \mathbf{ETH}\}$, that agent is debuffed for

$$\frac{\mathbf{LOG} + \mathbf{ETH}}{32} + \frac{\langle 2, 3, 4 \rangle}{2}$$

seconds. This debuff causes the agent to be unable to activate abilities that would both produce effect(s) of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \setminus \mathrm{Reflex}$ and that would affect you directly $(\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Suggest})$.

Additionally, your effective ontologick, logick, and ethick scores are increased by $\langle 0, 1, 2 \rangle$ when participating in attribute contests as the target of effect(s) of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Suggest}$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Suggest})$.

Description:

> All human beings think of themselves, regarding the will, as free. Hence all judgments about actions come as if they *ought* to have *happened* even if they *have not happened*. Yet this freedom is no experiential concept, and also cannot be one, because freedom always remains even though experience shows the opposite of those requirements that are represented as necessary under the presupposition of freedom. (I. Kant, "Groundwork of the Metaphysic of Morals," [Grundlegung zur Metaphysik der Sitten,] Ak4:455, trans. A. W. Wood 2002, 1785)

Modal logic of temporality

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 24$

Anti-reqs: Ordered logic

Cost: 1 pentagon and 2 hexagon exp per rank

Activation: $\langle 96, 112, 128 \rangle$ potential

Cooldown: $\langle 20, 10, 5 \rangle$ seconds

Classifications: Active, Close, Single, Reflex, Buff, Debuff, Cancel, $\mathrm{Unintuit}$

Description: You manipulate the tensing of any single agent (enemy or friendly, yourself included) within $\langle 1, 2, 3 \rangle$ hexes of your location. If the target is friendly, all of their cooldowns expire instantly $(\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Buff} \cap \mathrm{Unintuit}$, or $\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Unintuit}$ if the target is yourself). If the target is an enemy, all of their abilities that have cooldowns of at most $\langle 15, 25, 35 \rangle$ seconds instantly go on cooldown, refreshing the cooldown for abilities that were already on cooldown $(\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Unintuit})$.

Text: "This is the bureaucracy of time so to speak, useful, but so bleak... For the temporal logician, time is a secretion of clocks." (J.-Y. Girard, "Locus Solum: From the rules of logic to the logic of rules," 2001)

Modal realism

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 30$, two or more of {Modal logic of belief, Modal logic of possibility, Modal logic of obligation, Modal logic of temporality}

Anti-reqs: Substructurality, Trivalency

Cost: 1 triangle exp and 3 pentagon exp per rank

Activation: $\langle 48, 54, 60 \rangle$ potential

Cooldown: $\langle 20, 18, 16 \rangle$ seconds

Classifications: Active, Reflex, Buff, Heal, Cancel, Mind

Description: You gain the ability to transport yourself to other possible worlds as you see fit, producing beneficial effects by simply adopting a world that already has them. Using this ability produces one of the following results, randomly and each with equal probability:

- The next $\langle 1, 2, 3 \rangle$ effects of classification $\mathrm{Attack} \cup \mathrm{Debuff}$ that affect you are cancelled ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind}$).
- You restore an amount of energy equal to $\langle 8, 16, 24 \rangle\%$ of your maximum energy ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Heal} \cap \mathrm{Mind}$).
- You restore an amount of potential equal to $\langle 8, 16, 24 \rangle\%$ of your maximum potential ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind}$).
- For the next six seconds, your cooldown times are multiplied by $\frac{\langle 5,4,3 \rangle}{8}$ ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind}$). This does not change the remaining time on cooldowns that were already elapsing.
- For the next six seconds, your ontologick, logick, and ethick scores are increased by $\langle 2, 4, 6 \rangle$ ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind}$).

Text:

> I believe, and so do you, that things could have been different in countless ways. But what does this mean? Ordinary language permits the paraphrase: there are many ways things could have been besides the way they actually are. I believe that things could have been different in countless ways; I believe permissible paraphrases of what I believe; taking the paraphrase at its face value, I therefore believe in the existence of entities that might be called "ways things could have been." I prefer to call them "possible worlds." (D. Lewis, "Counterfactuals," 1973)

Graph II

Polymerization

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 8$, $\mathbf{PHY}_{\mathrm{c}} \geq 5$

Anti-reqs: Random walk

Cost: 2 triangle exp and 2 hexagon exp per rank

Activation: $\langle 21, 25, 29, 33 \rangle$ potential

Cooldown: $\langle 20, 17, 14, 11 \rangle$ seconds

Classifications: Active, Long, Single, Reflex, Attack, Debuff, Motive, $\mathrm{Chemical}$, Force, Physio

Description: You gain the ability to rapidly form huge polymer chains. Using this ability, you select a position anywhere that is not your location, and start forming a polymer in that direction (starting from your position). The chain grows at a rate of 4 hexes per second, and grows until it hits an obstacle or reaches a total length of $\langle 3, 4, 5, 6 \rangle$ hexes, whichever comes first.

If the chain hits an obstacle and that obstacle is an enemy agent, you and that agent participate in an attribute contest where $e_u = \max\{\mathbf{CHE}, \mathbf{PHY}\} - \langle 4, 3, 2, 1 \rangle$ and $e_t = \min\{\mathbf{CHE}_t, \mathbf{PHY}_t\}$. If you succeed in the contest, that agent takes

$$\left\lceil \frac{\langle 5, 6, 7, 8 \rangle (\mathbf{CHE} + \mathbf{PHY})}{5} \right\rceil + \langle 4, 8, 12, 16 \rangle$$

damage ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$) and the polymer grows around the agent and pulls them towards you as the polymer chain is retracted, at a rate of 4 hexes per second ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$ if the agent is friendly, $\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$ otherwise). If you lose the contest, nothing happens to the agent and the polymer chain retracts normally as if it had hit a wall.

The chain (regardless of whether or not it is pulling an agent with it) stops retracting once the end of it is 1 hex away from you. If the obstacle that the chain hits is a friendly agent, the same thing occurs as if they were an enemy, but the attribute contest is skipped and no damage is dealt. While the chain is being formed and while it is retracting, you cannot move (linearly or by turning) ($\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$).

Text:

> To repeat is to behave in a certain manner, but in relation to something unique or singular which has no equal or equivalent. And perhaps this repetition at the level of external conduct echoes, for its own part, a more secret vibration which animates it, a more profound, internal repetition within the singular. This is the apparent paradox of festivals: they repeat an "unrepeatable". They do not add a second and a third time to the first, but carry the first time to the "n$^{\text{th}}$" power. (G. Deleuze, "Difference and Repetition," [Différence et Répétition,] trans. P. R. Patton 1994, 1968)

van der Waals force

Pre-reqs: $\mathbf{CHE}_{\mathrm{c}} \geq 22$, $\mathbf{PHY}_{\mathrm{c}} \geq 14$

Anti-reqs: Vector field

Cost: 2 triangle exp and 2 hexagon exp per rank

Activation: $\langle 40, 44, 48, 52 \rangle$ potential

Cooldown: $\langle 50, 40, 30, 20 \rangle$ seconds

Classifications: Active, Long, Single, Reflex, Attack, Debuff, Motive, $\mathrm{Chemical}$, Force, Physio

Description: You choose an agent within $\langle 4, 5, 6, 7 \rangle$ hexes of your current position, and you and that agent become mutually attracted to one another by transient electrostatic forces for $\langle 3, 3.5, 3.5, 4 \rangle$ seconds. If the selected agent is an enemy, the initial use of this ability causes an attribute contest between you and the agent, where $e_u = \mathbf{CHE} + \left\lceil \frac{\mathbf{PHY}}{2} \right\rfloor + \langle 1, 2, 3, 4 \rangle$ and $e_t = \mathbf{CHE}_t + \left\lceil \frac{\mathbf{PHY}_t}{2} \right\rfloor$. Enemy agents that win the contest are unaffected by the movement portion of this ability but still take half of the damage.

The initial use of this ability deals

$$\left\lceil \frac{\langle 6, 7, 8, 9 \rangle \min\{\mathbf{CHE}, \mathbf{PHY}\}}{3} \right\rceil$$

damage to the agent if they are an enemy ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$). Regardless of whether or not the target is an enemy, for the duration of this ability ($\langle 3, 3.5, 3.5, 4 \rangle$ seconds), you and the target are both moved continuously towards one another at a speed of 3 hexes per second, or 0 hexes per second any time that the distance between you and the target does not exceed $\frac{3}{4}$ hexes ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$ for an enemy target, $\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$ for other targets, and $\mathrm{Active} \cap \mathrm{Reflex} \cap \mathrm{Motive} \cap \mathrm{Chemical} \cap \mathrm{Force} \cap \mathrm{Physio}$ as applied to you).

Description:

> van der Waals forces: The attractive or repulsive forces between molecular entities (or between groups within the same molecular entity) other than those due to bond formation or to the electrostatic interaction of ions or of ionic groups with one another or with neutral molecules. The term includes: dipole-dipole, dipole-induced dipole and London (instantaneous induced dipole-induced dipole) forces. The term is sometimes used loosely for the totality of nonspecific attractive or repulsive intermolecular forces. (IUPAC, "Compendium of Chemical Terminology," [the "Gold Book,"] 2nd ed., 1997)

Random walk

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 10$, $\mathbf{CHE}_{\mathrm{c}} \geq 8$

Anti-reqs: Polymerization

Cost: 3 triangle exp per rank

Activation: $\langle 21, 23, 25, 27, 29 \rangle$ potential

Cooldown: $\langle 12, 11, 10, 9, 8 \rangle$ seconds

Classifications: Active, Long, Multi, Attack, Physio, Chemical

Description: You select a position anywhere within $\langle 4, 4.5, 5, 5.5, 6 \rangle$ hexes of your current position, starting a random walk from there. Any enemy agent(s) that are within $\langle 1, 1.25, 1.5, 1.75, 2 \rangle$ hexes of the initial position that you choose take

$$\mathcal{U}\{\langle 10, 13, 20, 31, 46 \rangle, \\ \max\{\langle 2, 2, 3, 3, 4 \rangle (\mathbf{LOG} + \mathbf{CHE}),\ \langle 10, 13, 20, 31, 46 \rangle\}\}$$

damage. Any agent that is subject to this damage participates in an attribute contest against you each time the damage is inflicted, where $e_u = \mathbf{LOG} + \left\lceil \frac{\mathbf{CHE}}{2} \right\rfloor + \langle -1, -1, 0, 0, 1 \rangle$ and $e_t = \mathbf{LOG}_t + \left\lceil \frac{\mathbf{CHE}_t}{2} \right\rfloor$; if the target wins, they take only half damage.

After the initial damage of the initial usage of this ability, the position jumps randomly to a different position to do the same damage (redoing the random number generation each time) in the same radius $\langle 1, 2, 2, 2, 3 \rangle$ times (for a total of $\langle 2, 3, 3, 3, 4 \rangle$ damage instances). Each jump occurs 1 second after the last, and the position that is jumped to differs from the previous position by exactly 1 hex. The position is thus chosen as an angle of $\mathcal{U}(0,\ 2\pi)$ radians (excluding 2π).

Text: "The lesson of Lord Rayleigh's solution is that in open country the most probable place to find a drunken man who is at all capable of keeping on his feet is somewhere near his starting point!" (K. Pearson, "The Problem of the Random Walk," *Nature*, vol. 72, p. 342, 1905)

Vector field

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 26$, $\mathbf{CHE}_{\mathrm{c}} \geq 13$

Anti-reqs: van der Waals force

Cost: 3 triangle exp per rank

Activation: $\langle 30, 35, 40, 45, 50 \rangle$ potential

Cooldown: $\langle 30, 26, 22, 18, 14 \rangle$ seconds

Classifications: Active, Region, Long, Multi, Attack, Buff, Motive, Neutral

Description: You choose two positions, both within 6 hexes of your current position and both within $\langle 2, 2.25, 2.5, 2.75, 3 \rangle$ hexes of one another. These two positions define opposing corners of a square vector field that lasts for $\langle 2, 2.5, 3, 3.5, 4 \rangle$ seconds. Enemy agents that are within

the square at the time that it is created or that enter it during its duration take

$$\left\lceil \frac{\langle 4,5,6,7,8\rangle(\mathbf{LOG} + \lceil \frac{\mathbf{CHE}}{2} \rfloor)}{2} \right\rfloor + \langle 1,3,5,7,9\rangle$$

damage ($\mathrm{Active} \cap \mathrm{Region} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Attack} \cap \mathrm{Neutral}$). Once the square has done damage to a given agent, it cannot damage that agent any more. Friendly agents (yourself included) that are within the square have their manual movement speed increased by one level ($\mathrm{Active} \cap \mathrm{Region} \cap \mathrm{Long} \cap \mathrm{Multi} \cap \mathrm{Buff} \cap \mathrm{Motive} \cap \mathrm{Neutral}$).

Text:

> The force on a portion of fluid in a gravitational or electric field is a vector, having magnitude and direction. The limit of the ratio between this force and the volume occupied by the portion of fluid, as this volume is decreased in size, defines a vector at each point in space, which is the *force field*. (P. M. Morse and H. Feshbach, "Methods of Theoretical Physics," pt. 1, sec. 1.2, 1953)

Graph III

Bloch wave

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 12$

Anti-reqs: Worldline

Preconditions: $\mathbf{PHY} \geq 12$

Cost: 6 triangle exp

Activation: 5 potential

Cooldown: 2 seconds

Classifications: Active, Close, Single, Debuff, Attack, Force, Physio

Description: You superimpose a crystal lattice over a single enemy agent within 1.5 hexes of your position, dealing damage and applying a debuff that lasts for 10 seconds. The debuff causes the lattice to persist, thus causing the target to become further imbricated and taking extra damage each time they are affected again by this same ability ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Physio}$). The target takes

$$\mathbf{PHY}\left\lceil \frac{\sqrt{\mathbf{PHY}}}{5} \right\rfloor + x\,\mathbf{PHY} - 2$$

damage, where x is the number of stacks of the debuff that are (just before this ability is activated) active on the target ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Force} \cap \mathrm{Physio}$). When you use this ability, two attribute contests are made between you and the target, where, in each, $e_u = \mathbf{PHY}$ and $e_t = \mathbf{PHY}_t$. If the target wins the first contest, they

take half damage from that use of the ability. If the target wins the second contest, the debuff from that use of the ability is not applied. Both contests always occur, even if the target wins the first one.

Text:

> The two factors above enumerated, namely the chemical and mineral composition of rocks, are scarcely of greater importance than their structure, or the relations of the parts of which they consist to one another. Regarded from this standpoint rocks may be divided into the crystalline and the fragmental. Inorganic matter, if free to take that physical state in which it is most stable, always tends to crystallize. (J. S. Flett, "Petrology," *Encyclopædia Britannica*, vol. 21, 11th ed., 1911)

Worldline

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 12$

Anti-reqs: Bloch wave

Cost: 6 triangle exp

Activation: 5 potential

Cooldown: 3 seconds

Classifications: Active, Close, Single, Region, Attack, Dot, Debuff, Motive, $\mathrm{Neutral}$

Description: You target a single enemy agent within 1.5 hexes of your position, causing their worldline (path) to be emblazoned upon the landscape for 4 seconds. The initial use of this ability deals $\mathbf{PHY} + 12$ damage ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Attack} \cap \mathrm{Neutral}$). The target is afflicted with a debuff that causes them to take damage every time they move (change position) during the 4 second duration, equal to $\lfloor x\,\mathbf{PHY} \rfloor$ damage, where x is the distance moved ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Dot} \cap \mathrm{Neutral}$). In addition, the target is afflicted with another debuff that causes the worldline that they trace out to slow those (including themselves) who cross it ($\mathrm{Active} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$). Enemy agents that cross the worldline (which is visible to all agents) have their manual movement and turning speed slowed by half for 2 seconds unless they win an attribute contest against you where $e_u = \mathbf{PHY}$ and $e_t = \mathbf{PHY}_t$ ($\mathrm{Active} \cap \mathrm{Region} \cap \mathrm{Debuff} \cap \mathrm{Motive} \cap \mathrm{Neutral}$). The worldline disappears entirely at the end of the duration of this ability. When you use this ability, two attribute contests are made between you and the target, where, in each, $e_u = \mathbf{PHY}$ and $e_t = \mathbf{PHY}_t$. If the target wins the first contest, they take half damage from the initial damage of the ability. If the target wins the second contest, the duration of the ability is halved to 2 seconds. Both contests always occur, even if the target wins the first one.

Text:

He stepped up to one of the reporters. "Suppose we take you as an example. Your name is Rogers, is it not? Very well, Rogers, you are a space-time event having duration four ways. You are not quite six feet tall. You are about twenty inches wide and perhaps ten inches thick. In time, there stretches behind you more of this space-time event, reaching to, perhaps, 1905, of which we see a cross section here at right angles to the time axis, and as thick as the present. At the far end is a baby, smelling of sour milk and drooling its breakfast on its bib. At the other end lies, perhaps, an old man some place in the 1980s. Imagine this space-time event, which we call Rogers, as a long pink worm, continuous through the years. It stretches past us here in 1939, and the cross section we see appears as a single, discreet body. But that is illusion. There is physical continuity to this pink worm, enduring through the years. As a matter of fact, there is physical continuity in this concept to the entire race, for these pink worms branch off from other pink worms. In this fashion the race is like a vine whose branches intertwine and send out shoots. Only by taking a cross section of the vine would we fall into the error of believing that the shootlets were discreet individuals." (R. A. Heinlein, "Life-Line," *Astounding Science-Fiction*, vol. 23, no. 6, August 1939)

Copenhagen

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 20$, $\mathbf{ONT}_{\mathrm{c}} \geq 10$, Bloch wave or Worldline

Cost: 1 triangle exp and 1 pentagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: For you, classical concepts like position, time, momentum, and energy are the only possible way of talking about physical phenomena, and classical physics is an idealization of the universe that rests upon the assumption that the universe operates according to these concepts. Your physick score is increased by $\langle 2, 3, 5, 6, 8 \rangle$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind})$. This increase is further effectively increased by $\langle 1, 2, 2, 3, 3 \rangle$ when participating in attribute contests as the target of effect(s) of classification $(\mathrm{Attack} \cup \mathrm{Debuff}) \cap \mathrm{Unintuit}$ $(\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Mind})$.

Text:

The classical concepts—and not classical physics itself—are therefore necessary in any description of physical experience in order to understand what we are doing and to be able to communicate our results to others, in particular in the description of quantum phenomena as they present themselves in experiments. (J. Faye, "Copenhagen Interpretation of Quantum Mechanics," *The Stanford Encyclopedia of Philosophy*, Spring 2019 ed., https://plato.stanford.edu/archives/spr2019/entries/

qm-copenhagen/, 2019)

Many-worlds

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 28$, $\mathbf{ONT}_{\mathrm{c}} \geq 14$, Copenhagen

Cost: 7 triangle exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Infinite}$

Description: Every time that you fail in an attribute contest as a user producing effect(s) of classification $\mathrm{Attack} \cap (\mathrm{Physio} \cup \mathrm{Neutral})$, in which you had a nonzero probability of succeeding, both outcomes occur anyways and you do the arithmetic average of the damage that you would do for failing in the contest and the damage that you would do for succeeding.

Text: "O Hamlet, thou hast cleft my heart in twain." (W. Shakespeare, "The Tragedy of Hamlet, Prince of Denmark," act III, scene 4, 1599-1602)

Pilot wave

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 36$, $\mathbf{ONT}_{\mathrm{c}} \geq 18$, Many-worlds

Cost: 2 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Mind

Description: Using your knowledge of the universal guiding equation, you determine the future positions of particles to an incredible degree of accuracy. Your effective physick, chemick, and biologick scores are increased by $\langle 2, 4, 6, 8 \rangle$ when participating in attribute challenges as a user producing effect(s) of classification $\mathrm{Active} \cap \mathrm{Attack} \setminus \mathrm{Motive}$.

Text:

> Every branch of the global wavefunction potentially describes a complete world which is, according to Bohm's ontology, only a possible world that would be the actual world if only it were filled with particles, and which is in every respect identical to a corresponding world in Everett's theory. Only one branch at a time is occupied by particles, thereby representing the actual world, while all other branches, though really existing as part of a really existing wavefunction, are empty and thus contain some sort of "zombie worlds" with planets, oceans, trees, cities, cars and people who talk like us and behave like us, but who do not actually exist. Now, if the Everettian theory may be accused of ontological extravagance, then Bohmian mechanics could be accused of ontological wastefulness. (A. Valentini and H. Westman, "Combining Bohm and Everett: Axiomatics for a Standalone Quantum Mechanics," 2012)

Superdeterminism

Pre-reqs: $\mathbf{PHY}_{\mathrm{c}} \geq 44$, $\mathbf{ONT}_{\mathrm{c}} \geq 22$, Pilot wave

Cost: 3 triangle exp and 3 square exp per rank

Classifications: Passive, Reflex, Buff, Cancel, Unintuit

Description: You exploit the pre-established harmony of all events in space and time. The first rank of this ability makes it so that your effective physick, chemick, and biologick scores are increased by one thousand in every fourth attribute contest that you participate in as the user (Passive ∩ Reflex ∩ Buff ∩ Unintuit). The second rank has the same effect, but in every fourth attribute contest that you participate in as the target (Passive ∩ Reflex ∩ Buff ∩ Cancel ∩ Unintuit).

Text:

> Recall Schrödinger's class of identically prepared students. We are told they can all answer any of a set of questions correctly, but each can only answer one, and then forgets the answers to the rest. It's an odd idea, but we can still test it: we ask the questions at random, and find that we always get the right answer. Of course it is possible that each student only knows the answer to one question, which always happens to be the very one we ask! But that would require a massive coincidence, on a scale that would undercut the whole scientific method. Or else we are being manipulated: somehow we are led to ask a given question only of the rare student who knows the answer. So we switch our method of choice, handing it over to a random number generator, or the throw of dice, or to be determined by the amount of rainfall in Paraguay. But maybe all of these have been somehow rigged too! Of course, such a purely abstract proposal cannot be refuted, but besides being insane, it too would undercut scientific method. All scientific interpretations of our observations presuppose that they have not have been manipulated in such a way. (T. Maudlin, "What Bell Did," *Journal of Physics A*, vol. 47, issue 42, 2014)

Graph IV

Selfish genetic element

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 14$, $\mathbf{ONT}_{\mathrm{c}} \geq 6$

Anti-reqs: Nonsense mutation

Cost: 2 hexagon exp per rank

Activation: $\langle 3, 4, 5 \rangle$ potential

Cooldown: $\langle 20, 18, 16 \rangle$ seconds

Classifications: Active, Long, Single, Debuff, Physio

Description: You select a single target within four hexes of your location, causing one of their genetic elements to display selfish self-transmission behavior below the phenotypic level — at the level of the genome. If you succeed in an attribute contest where $e_u = \mathbf{BIO} + \langle 0, 1, 2 \rangle$ and $e_t = \mathbf{BIO}_t$, this selfish genetic element is deleterious, causing the target

to have one of their attribute scores lowered by $\langle 3, 6, 9 \rangle$ for 12 seconds. Which attribute score is lowered is determined by uniform random selection from all attribute scores. If you fail in the attribute contest, the selfish genetic element's effects are neutral, and nothing occurs.

Text: "In many cases these chromosomes have no useful function at all to the species carrying them, but that they often lead an exclusively parasitic existence [...] [B chromosomes] need not be useful for the plants. They need only be useful to themselves." (G. Östergren, "Parasitic nature of extra fragment chromosomes," *Botaniska Notiser*, pp. 157-163, 1945)

Neutral theory

Pre-reqs: Selfish genetic element, $\mathbf{BIO}_{\mathrm{c}} \geq 21$, $\mathbf{ONT}_{\mathrm{c}} \geq 12$

Cost: 3 hexagon exp per rank

Activation: 2 potential

Cooldown: $\langle 20, 15, 10 \rangle$ seconds

Classifications: Active, Long, Single, Debuff, Physio

Description: You select a single target within four hexes of your location, causing the evolution of their attribute scores to be affected by drift effects due to random sampling. If you succeed in an attribute contest where $e_u = \mathbf{BIO}$ and $e_t = \mathbf{BIO}_t$, the target is afflicted with a condition that lasts for $\langle 6, 8, 10 \rangle$ seconds. An agent afflicted by this condition has their attribute scores modified every second, with one attribute score being increased by one and all other attribute scores being decreased by one. The attribute that is increased is determined by randomly sampling their attribute scores, that is, the probability of a given attribute being chosen is equal to the value of that attribute's score divided by the sum of all attribute scores. Negative attribute scores do not contribute to this sum, and the probability of choosing a negative attribute score is always zero. If the sum is zero, the choosing method is instead uniform random selection.

Text:

> To emphasize the founder principle but deny the importance of random genetic drift due to finite population number is, in my opinion, rather similar to assuming a great flood to explain the formation of deep valleys but rejecting a gradual but long lasting process of erosion by water as insufficient to produce such a result. (M. Kimura, "Evolutionary Rate at the Molecular Level," *Nature*, vol. 217, pp. 624-626, 1968)

Nonsense mutation

Pre-reqs: $\mathbf{BIO}_{\mathrm{c}} \geq 14$, $\mathbf{ONT}_{\mathrm{c}} \geq 6$

Anti-reqs: Selfish genetic element

Cost: 2 hexagon exp per rank

Classifications: Passive, Reflex, Close, Single, Buff, Debuff, Physio

Description: This ability creates a permanent buff on you (Passive∩Reflex∩Buff ∩ Physio). When the buff is active, every $\langle 24, 20, 16\rangle$ seconds, a randomly selected enemy agent within two hexes of your location (if there is one) is affected by a point mutation creating a premature "stop" codon. This causes the affected agent to be unable to activate abilities that cost potential to activate for $\mathcal{U}(1, \langle 1.5, 2, 2.5\rangle)$ seconds (Passive∩Close∩Single∩Debuff∩Physio), provided that you succeed in an attribute contest where $e_u = \mathbf{BIO}+\mathbf{ONT}$ and $e_t = \mathbf{BIO}_t+\mathbf{ONT}_t$.

Text: "If you want sense, you'll have to make it yourself." (N. Juster, "The Phantom Tollbooth," 1961)

Frameshift mutation

Pre-reqs: Nonsense mutation, $\mathbf{BIO}_c \geq 21$, $\mathbf{ONT}_c \geq 12$

Cost: 3 hexagon exp per rank

Classifications: Passive, Reflex, Long, Close, Single, Multi, Buff, Debuff, Attack, Heal, Cancel, Motive, Physio

Description: This ability creates a permanent buff on you (Passive∩Reflex∩Buff∩Physio). When the buff is active, every time you participate in an attribute contest as the target and you ultimately lose the contest, the contest is redone. If you succeed in the rematch, there is a $\frac{\langle 1,2,3\rangle}{4}$ probability that the effect(s) that would have occurred due to your loss of the contest are afflicted by a frameshift mutation, resulting in a completely different effect, randomly and uniformly selected from the following list:

- No effects are produced.
- A randomly and uniformly selected one of the user's (your opponent in the attribute contest) abilities that has a cooldown goes on cooldown, restarting the cooldown if it already was on cooldown (Passive ∩ Single ∩ Debuff ∩ Cancel ∩ Physio).
- The user takes $\mathcal{U}\{\langle 1, 2, 3\rangle, \langle 20, 40, 60\rangle\}$ damage (Passive∩Single∩Attack ∩ Physio).
- You are healed for $\mathcal{U}\{\langle 1, 2, 3\rangle, \langle 20, 40, 60\rangle\}$ (Passive ∩ Reflex ∩ Heal ∩ Physio).
- The user has their manual movement speed increased by one level for $\langle 3, 2, 1\rangle$ seconds (Passive ∩ Single ∩ Buff ∩ Motive ∩ Physio).
- You have your manual movement speed increased by one level for $\langle 1, 2, 3\rangle$ seconds (Passive ∩ Reflex ∩ Buff ∩ Motive ∩ Physio).
- A random and uniformly selected agent within eight hexes of your location has their manual movement speed set to paralyzed for two seconds (Passive ∩ Long ∩ Single ∩ Debuff ∩ Motive ∩ Physio).

- All agents within three hexes of your location are healed for 127 ($\text{Passive} \cap \text{Close} \cap \text{Multi} \cap \text{Heal} \cap \text{Physio}$).
- You take $\mathcal{U}\{\langle 3,2,1\rangle, \langle 25,20,15\rangle\}$ damage ($\text{Passive} \cap \text{Reflex} \cap \text{Attack} \cap \text{Physio}$).

Text: `d@V@d@z@h`

Graph V

Subjectivism

Pre-reqs: $\mathbf{ETH}_{\text{c}} \geq 5$, $\mathbf{ONT}_{\text{c}} \geq 5$

Anti-reqs: Moral constructivism

Cost: 1 pentagon and 1 hexagon exp per rank

Activation: $\langle 9,10,11\rangle$ potential

Cooldown: $\langle 36,30,20\rangle$ seconds

Classifications: Active, Long, Single, Reflex, Buff, Debuff, Mind

Description: You select a single agent (enemy or friendly, but not yourself) within $\langle 4,5,6\rangle$ hexes of your location and attempt to swap your moral status & beliefs with theirs. The effects of activating this ability are split into three cases:

$\mathbf{ETH}_c = \mathbf{ETH}_{c,t}$: No effects are produced (activation cost and cooldown work normally).

$\mathbf{ETH}_c > \mathbf{ETH}_{c,t}$: Your ethick score is increased by $\mathbf{ETH}_{c,t} - \mathbf{ETH}_c$ for $\langle 5,6,8\rangle$ seconds ($\text{Active} \cap \text{Reflex} \cap \text{Debuff} \cap \text{Mind}$). The target's ethick score is increased by $\mathbf{ETH}_c - \mathbf{ETH}_{c,t}$ for $\langle 5,6,8\rangle$ seconds ($\text{Active} \cap \text{Long} \cap \text{Single} \cap \text{Buff} \cap \text{Mind}$).

$\mathbf{ETH}_c < \mathbf{ETH}_{c,t}$: If the target is an enemy agent, you both participate in an attribute contest where $e_u = \left\lceil \frac{\mathbf{ETH}+\mathbf{ONT}}{2} \right\rfloor + \langle 0,0,1\rangle$ and $e_t = \left\lceil \frac{\mathbf{ETH}_t+\mathbf{ONT}_t}{2} \right\rfloor$. If you fail in the contest, no effects are produced. If you succeed, your ethick score is increased by $\mathbf{ETH}_{c,t} - \mathbf{ETH}_c$ for $\langle 5,6,8\rangle$ seconds ($\text{Active} \cap \text{Reflex} \cap \text{Buff} \cap \text{Mind}$). In addition, if you succeed, the target's ethick score is increased by $\mathbf{ETH}_c - \mathbf{ETH}_{c,t}$ for $\langle 5,6,8\rangle$ seconds ($\text{Active} \cap \text{Long} \cap \text{Single} \cap \text{Debuff} \cap \text{Mind}$).

Text:

> Why, then 'tis none to you, for there is nothing
> either good or bad but thinking makes it so.
> (W. Shakespeare, "The Tragedy of Hamlet, Prince of Denmark," act II, scene 2, c. 1600)

Noncognitivism

Pre-reqs: Subjectivism, $\mathbf{ETH}_{\text{c}} \geq 10$, $\mathbf{ONT}_{\text{c}} \geq 8$

Cost: 1 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Long, Single, Buff, Debuff, Mind

Description: This ability causes a permanent buff to be placed on you ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind}$). While under the effects of this buff, any time an enemy agent within $\langle 2, 3, 4, 5, 6, 7 \rangle$ hexes of your location activates an ability that produces effect(s) of classification Heal, there is a

$$\frac{\langle 9, 10, 11, 12, 13, 14 \rangle}{16}$$

probability that it will trigger an attribute contest between you and the enemy agent in question before the ability goes off. The attribute contest is such that $e_u = \mathbf{ETH} + \langle -1, 0, 0, 1, 1, 2 \rangle$ and $e_t = \mathbf{ETH}_t$ (with you as the user). If you succeed in the attribute contest, the enemy agent begins to confuse sentiments with ideas, and their effective ethick score is set to $\min\{\mathbf{ETH}_t, \mathbf{LOG}_t + \langle 3, 2, 1, 0, -1, -2 \rangle\}$ (again, with you as the user) for the purpose of the ability that they are using ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Mind}$).

Text:

> Our decisions concerning moral rectitude and depravity are evidently perceptions; and as all perceptions are either impressions or ideas, the exclusion of the one is a convincing argument for the other. Morality, therefore, is more properly felt than judg'd of; tho' this feeling or sentiment is commonly so soft and gentle, that we are apt to confound it with an idea, according to our common custom of taking all things for the same, which have any near resemblance to each other. (D. Hume, "A Treatise of Human Nature," 1738)

Error theory

Pre-reqs: Noncognitivism, $\mathbf{ETH}_{\mathrm{c}} \geq 15$, $\mathbf{ONT}_{\mathrm{c}} \geq 11$

Cost: 1 pentagon and 1 triangle exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Single, Buff, Debuff, Mind

Description: This ability causes a permanent buff to be placed on you ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind}$). Equipped with the knowledge that discerning moral rights and wrongs is akin to discerning the true color of a unicorn's horn, this buff causes the ethick and ontologick scores of other agents with whom you participate in attribute contests to be effectively lowered (for the purpose of each such attribute contest) by

$$\langle 1, 2, 2 \rangle + \left\lceil \frac{\langle 0, 0, 1 \rangle \mathbf{ETH}}{12} \right\rceil$$

($\mathrm{Passive} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Mind}$).

Text:

> If there were objective values, then they would be entities or qualities or relations of a very strange sort, utterly different from anything else in the universe. Correspondingly, if we were aware of them, it would have to be by some special faculty of moral perception or intuition, utterly diferent from our ordinary ways of knowing everything else. (J. L. Mackie, "Ethics: Inventing Right and Wrong," 1977)

Moral constructivism

Pre-reqs: $\mathbf{ETH}_{\mathrm{c}} \geq 8$, $\mathbf{ONT}_{\mathrm{c}} \geq 5$

Anti-reqs: Subjectivism, Moufang loop

Cost: 5 pentagon and 2 hexagon exp

Classifications: $\mathrm{Passive}$, Close, Multi, Reflex, Buff, Mind

Description: You constructively interfere with your allies, granting you ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Mind}$) and any allies ($\mathrm{Passive} \cap \mathrm{Close} \cap \mathrm{Multi} \cap \mathrm{Buff} \cap \mathrm{Mind}$) within a two-hex radius of your location a passive $\left\lceil \frac{x}{4} \right\rfloor$ bonus to nominal ethick score, where x is the arithmetic average of the canonical ethick scores of the allies within the radius (yourself included).

Text:

> The will is thought as a faculty of determining itself to action *in accord with the representation of certain laws*. And such a faculty can be there to be encountered only in rational beings. Now that which serves the will as the objective ground of its self-determination is the end, and this, if it is given through mere reason, must be equally valid for all rational beings. (I. Kant, "Groundwork of the Metaphysic of Morals," [Grundlegung zur Metaphysik der Sitten,] Ak4:427, trans. A. W. Wood 2002, 1785)

Moral naturalism

Pre-reqs: Moral constructivism, $\mathbf{ETH}_{\mathrm{c}} \geq 16$, $\mathbf{ONT}_{\mathrm{c}} \geq 10$

Cost: 2 pentagon and 1 hexagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, Mind

Description: Emboldened by your knowledge that moral properties supervene on natural ones, you gain a passive bonus to your nominal ethick score equal to

$$\left\lceil \frac{\mathbf{PHY} + \mathbf{CHE} + \mathbf{BIO} + \langle 0, 1, 2 \rangle}{\langle 24, 20, 16 \rangle} \right\rfloor .$$

Text:

> The idea of causal interaction with moral reality certainly would be intolerably odd if moral facts were held to be *sui generis*;

but there need be nothing odd about causal mechanisms for learning moral facts if these facts are constituted by natural facts, and that is the view under consideration. (P. Railton, "Moral Realism," *The Philosophical Review*, vol. 95, no. 2, pp. 163-207, 1986)

Moral nonnaturalism

Pre-reqs: Moral naturalism III, $\mathbf{ETH}_{\mathrm{c}} \geq 24$, $\mathbf{ONT}_{\mathrm{c}} \geq 15$

Cost: 2 hexagon exp per rank

Activation: $\langle 21, 22, 23, 24 \rangle$ potential

Cooldown: $\langle 30, 29, 27, 24 \rangle$ seconds

Classifications: Active, Long, Region, Reflex, Hot, Debuff, Cancel, $\mathrm{Suggest}$

Description: You select a hex within $\langle 4, 5, 6, 7 \rangle$ hexes of your location, and that hex and every hex within $\langle 2, 2, 3, 4 \rangle$ hexes of it is affected by an aura of moral nonnaturalism that lasts for $\langle 3, 4, 5, 6 \rangle$ seconds ($\mathrm{Active} \cap \mathrm{Long} \cap \mathrm{Region}$). An agent (possibly yourself) that is within this aura that attempts to activate any ability that produces effect(s) of classification $\mathrm{Attack} \cup \mathrm{Debuff}$ must succeed in an attribute contest against you (with you as the user) where $e_u = \mathbf{ETH}$ and $e_t = \mathbf{ETH}_t + \langle 4, 3, 2, 1 \rangle$, otherwise the ability fails and goes on cooldown (but does not consume any potential) ($\mathrm{Region} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Suggest}$). While you specifically are in the aura, you heal for $\langle 3, 5, 7, 11 \rangle$ energy per half-second ($\mathrm{Region} \cap \mathrm{Reflex} \cap \mathrm{Hot} \cap \mathrm{Suggest}$).

Text: "So much, then, for the first step which established that good is good and nothing else whatever, and that Naturalism was a fallacy." (G. E. Moore, "Principia Ethica," 1903)

Moral realism

Pre-reqs: Moral nonnaturalism IV, $\mathbf{ETH}_{\mathrm{c}} \geq 32$, $\mathbf{ONT}_{\mathrm{c}} \geq 20$

Cost: 5 triangle exp and 4 hexagon exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, Cancel, Mind

Description: In so knowing the objective truth of moral facts, you are immune to all effects of classification $\mathrm{Suggest}$.

Text: "In asking whether there are such normative truths, we need not answer ontological questions. There are, I believe, some such truths, which are as true as any truth could be." (D. Parfit, "On What Matters," vol. 2, 2011)

Nonabelian

Pre-reqs: $\mathbf{LOG}_{\mathrm{c}} \geq 4$

Anti-reqs: Moufang loop

Cost: 4 hexagon exp

Classifications: $\mathrm{Passive}$, Long, Single, Reflex, Buff, Debuff, $\mathrm{Neutral}$

Description: Whenever you activate any ability A, a buff is placed on you that lasts for $3 + \sqrt{\mathbf{LOG}}$ seconds ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Neutral}$). If an enemy agent activates the ability A while within five hexes of your location while you have this buff, the buff is instantly removed and you engage in an attribute contest with said enemy agent (with you as the user), where $e_u = \mathbf{LOG}$ and $e_t = \mathbf{LOG}_t$. If you succeed, the enemy agent is considered to have their logick, ontologick, and ethick scores multiplied by -1 for the purpose of that particular use of A ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Neutral}$).

Text: "[T]hough it must, at first sight, seem strange and almost unallowable, to define that the product of two imaginary factors in one order differs (in sign) from the product of the same factors in the opposite order […]" (W. R. Hamilton, "On quaternions; or on a new system of imaginaries in algebra," *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, vol. 25, issue 163, 1844)

Monoid

Pre-reqs: Nonabelian, $\mathbf{LOG}_{\mathrm{c}} \geq 9$

Cost: 2 hexagon exp per rank

Cooldown: $\langle 36, 25, 16 \rangle$ seconds

Classifications: $\mathrm{Passive}$, Close, Single, Reflex, Cancel, $\mathrm{Neutral}$

Description: You gain the ability to selectively neutralize effects into the identity effect (i.e. the effect that does nothing). Any time that a friendly agent within $\langle 1, 2, 3 \rangle$ hexes of your location (yourself included) would be affected by an effect of classification $\mathrm{Debuff} \cup \mathrm{Suggest}$ and this ability is not on cooldown, there is a

$$\left(\langle 3, 4, 5 \rangle \sqrt{\mathbf{LOG}} \right)\%$$

chance that the effect is turned into the identity effect and this ability goes on cooldown ($\mathrm{Passive} \cap \mathrm{Close} \cap \mathrm{Single} \cap \mathrm{Cancel} \cap \mathrm{Neutral}$, or $\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Cancel} \cap \mathrm{Neutral}$ if the affected agent is you).

Text: A very commonplace monoid that we all know and love just happens to also be the free monoid! The set of (possibly empty) strings over a given alphabet forms a monoid, when equipped with string concatenation as the monoid operation and the empty string as the identity element.

This is a free monoid over the set of strings of whatever particular alphabet we have in mind, mostly because the definition of associativity looks a lot like string concatenation: $(ab)c = a(bc)$ is essentially the same thing as $\mathrm{ab} \parallel \mathrm{c} = \mathrm{a} \parallel \mathrm{bc}$. This means that every ugly semigroupoid is just waiting to be turned into beautiful free monoid by a Kleene star.

Semigroup

Pre-reqs: Monoid, $\mathbf{LOG}_{\mathrm{c}} \geq 16$

Cost: 2 hexagon exp per rank

Cooldown: $\langle 25, 16, 9 \rangle$ seconds

Classifications: $\mathrm{Passive}$, Long, Single, Reflex, Buff, Debuff, Cancel, $\mathrm{Neutral}$

Description: This ability causes a permanent buff to be placed on you ($\mathrm{Passive} \cap \mathrm{Reflex} \cap \mathrm{Buff} \cap \mathrm{Cancel} \cap \mathrm{Neutral}$). While you have this buff and it is not on cooldown, whenever an enemy agent within $\langle 3, 5, 7 \rangle$ hexes of your location activates an ability of classification $\mathrm{Active} \cap (\mathrm{Buff} \cup \mathrm{Debuff}) \cap \mathrm{Cancel}$, you engage in an attribute contest with that enemy agent (with you as the user), where $e_u = \mathbf{LOG}$ and $e_t = \mathbf{LOG}_t + \langle 2, 1, 0 \rangle$.

If you succeed in the contest, you thwart your enemy's inversion — or cancellation — of effects, and the ability that the enemy agent was activating is thus thwarted, consuming the normal amount of potential and going on cooldown but producing no effects ($\mathrm{Passive} \cap \mathrm{Long} \cap \mathrm{Single} \cap \mathrm{Debuff} \cap \mathrm{Cancel} \cap \mathrm{Neutral}$). Whenever the attribute contest is triggered (regardless of whether or not you succeed at it), this ability/buff goes on cooldown.

Text: Semigroups are very similar to monoids, and as a generalization of monoids they were historically the first grouplike structures to be studied other than groups themselves. Since semigroups don't require an identity element, the empty set equipped with its binary operation is (vacuously) a semigroup, which I call *the spooky semigroup*.

Moufang loop

Pre-reqs: $\mathbf{LOG}_\mathrm{c} \geq 7$

Anti-reqs: Nonabelian, Moral constructivism

Preconditions: $\mathbf{LOG} \geq 1$

Cost: 5 hexagon exp

Cooldown: 5 seconds

Classifications: $\mathrm{Passive}$, Single, Debuff, Cancel, $\mathrm{Neutral}$

Description: Your enemies' abilities are not as well-behaved as they seem at first blush, and every time that an enemy agent within 4 hexes of your location activates an ability of classification Active, there is a $\lfloor \log_2(\mathbf{LOG}) \rfloor \%$ chance that a random (and uniformly selected) one of their other Active abilities is activated, although the extra ability only consumes potential and, if the cooldown is less than 30 seconds, goes on cooldown (restarting the cooldown if it was already on cooldown); that is, the extra ability activation produces no effects. If this ability is triggered, it goes on cooldown and cannot be triggered again until the cooldown has expired.

Text:

However, in March 1938 [Moufang] received a letter from the Minister of Education informing her that the policies of the Third Reich required a professor to be a "leader" of the students in more than just the academic sphere; since the student body was almost exclusively male, they did not think it feasible to appoint women professors. They did not, however, have any objection to her holding a job which involved only research. Since there were no permanent positions in universities which consisted of research alone, Moufang left academic life and joined the Krupps Research Institute in Essen where she remained until 1946. (A few years earlier, Emmy Noether had been dismissed from her position at Göttingen.) (B. Srinivasan, "Ruth Moufang, 1905–1977," *The Mathematical Intelligencer*, vol. 6, issue 2, pp. 51-55, January 1984)

Alternative loop

Pre-reqs: Moufang loop, $\mathbf{LOG}_{\mathrm{c}} \geq 13$

Cost: 4 hexagon exp

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Neutral}$

Description: This ability places a permanent buff on you that causes Moufang loop to activate two randomly (and uniformly) selected "extra abilities" rather than just one upon being triggered, and halves the cooldown of Moufang loop.

Text: "$A \cdot BC = AB \cdot C = ABC$, if A, B, C be quaternions, but not so, generally, with your octaves." (W. R. Hamilton, July 1844; quoted in J. Baez, "The Octonions," *Bulletin of the American Mathematical Society*, vol. 39, no. 2, pp. 145-205, 2002)

Power-associative loop

Pre-reqs: Alternative loop, $\mathbf{LOG}_{\mathrm{c}} \geq 21$

Cost: 1 pentagon exp per rank

Classifications: $\mathrm{Passive}$, Reflex, Buff, $\mathrm{Neutral}$

Description: Every time that you activate an ability that produces effect(s) of classification Active and the last ability that you activated before that was that very same ability, you are affected by a buff that raises your effective logick score by $\langle 1, 2, 2, 2, 2, 3 \rangle$ for $\langle 2, 3, 5, 6, 8, 9 \rangle$ seconds. (It is implied that this buff "stacks" with itself because it is not specified otherwise — but just to be clear — it does.)

Text:

	0	**a**	**b**	**c**	**d**
0	0	a	b	c	d
a	a	0	c	d	b
b	b	d	0	a	c
c	c	b	d	0	a
d	d	c	a	b	0

Subassociativity

Pre-reqs: Power-associative loop VI, $\mathbf{LOG}_{\mathrm{c}} \geq 31$

Cost: 1 hexagon exp per rank

Classifications: Passive, Long, Multi, Debuff, Mind, Unintuit

Description: You radiate forms of subassociativity: every 2 seconds, you afflict every enemy agent within $\langle 3, 4, 5, 6 \rangle$ hexes of your location with a debuff that lowers their effective logick score by

$$\left\lceil \frac{\mathbf{LOG}}{\langle 10, 9, 8, 7 \rangle} \right\rceil$$

for 2 seconds unless they succeed in an attribute contest where $e_u = \mathbf{LOG}$ and $e_t = \mathbf{LOG}_t - \langle 0, 0, 1, 1 \rangle$.

Text: "...For want of anything worse." (J.-Y. Girard, "Locus Solum: From the rules of logic to the logic of rules," 2000)

7 Shadows

At any time, the player may spend eight experience points of any *one* of the four experience types (i.e. elementary shapes, see section 3.4 for more on experience) in order to get a **shadow**. Once the player spends experience to get a shadow, they cannot obtain any more shadows, nor can they get rid of the one that they already have (although it can be disabled on a level-by-level basis; see section 3.2 for more on levels).

A shadow looks like its corresponding player, but a bit smaller, and with a darker and more subtle color. Also, the shape of a shadow is the shape of the experience used to obtain it. Shadows really are just like players: the same rules apply to them for energy and potential (see section 4), each one has a class corresponding to its shape (like the player does; see section 2), the base speed of its class, access to the abilities of its class (see section 6), &c. If a shadow is destroyed, it is destroyed permanently. Since, in that case, the player no longer has a shadow, the player may spend another eight experience points of some type (not necessarily the same type as their previous shadow) to obtain another shadow if they wish.

However, no one controls shadows. They behave automatically, and they generally do things to cooperate with their corresponding player. A shadow receives a copy of every typed experience point that its corresponding player obtains, and it additionally obtains an untyped experience point every time it receives a point of the same type as its own elementary shape (i.e. the same way that players obtain untyped experience). The player may spend their shadow's experience points on their shadow's abilities and attributes (see section 5 for more on attributes). This, paired with the player's ability to turn on/off their shadow for any particular level, comprises all of the direct control that the player has over their shadow.

8 Key

$\mathbf{PHY}, \mathbf{CHE}, \mathbf{BIO}, \mathbf{LOG}, \mathbf{ONT}, \mathbf{ETH}$	The (nominal) Physick, Chemick, Biologick, Logick, Ontologick, and Ethick attribute scores of the player, respectively (see section 5).
$\mathbf{PHY}_{\mathrm{c}}$, $\mathbf{CHE}_{\mathrm{c}}$, ... , $\mathbf{ETH}_{\mathrm{c}}$	The *canonical* Physick, Chemick, ..., and Ethick attribute scores of the player, respectively (see section 5).
$\mathbf{PHY}_t$, $\mathbf{CHE}_t$, ... , $\mathbf{ETH}_t$	The (nominal) Physick, Chemick, ..., and Ethick attribute scores of the target of the ability in question.
$\langle \triangle, \square, \ldots, \lozenge \rangle$	$\triangle$ is the value that this expression takes on when the ability in question is at level 1, $\square$ is the value for level 2 of the ability, &c. (see section 6).
$\frac{x}{y}$	The division of x by y, as ordinarily defined over the real numbers.
$\%$	Per cent, e.g. $48\% = \frac{48}{100} = 0.48$.
$\lfloor x \rfloor$, $\lceil x \rceil$, $\lceil x \rfloor$, $\mathrm{round}(x)$	The floor of, ceiling of, integer part of, and nearest integer (round half even) to x, respectively. E.g. $\lfloor 3.5 \rfloor = 3$, $\lceil 3.5 \rceil = 4$, $\lceil 3.5 \rfloor = 3$, $\mathrm{round}(3.5) = 4$.
$\lvert x \rvert$	The absolute value (a.k.a. magnitude or modulus) of x.
$\mathrm{sgn}(x)$	The signum of x, that is, 1 whenever $x > 0$, -1 whenever $x < 0$, and 0 whenever $x = 0$.
e, $\exp(x)$, $n!$, $n!!$	Napier's constant (viz. $\frac{\mathrm{d}}{\mathrm{d}x}\mathrm{e}^x = \mathrm{e}^x$), e^x, and the factorial and double factorial (a.k.a. semifactorial) of the natural number n, respectively.
$\emptyset$	The empty set.
$\{\triangle, \square, \lozenge\}$	The set containing the elements $\triangle$, $\square$, and $\lozenge$.
$S \cup T$, $S \cap T$, $\overline{S}$, $S \setminus T$	The union of the sets S and T, the intersection of S and T, the complement of S, and the difference of the sets S and T (i.e. $S \cap \overline{T}$), respectively.

$\min\{\triangle, \square, \lozenge\}$, $\max\{\triangle, \square, \lozenge\}$, $\min(S)$	The minimum (least) element of the set $\{\triangle, \square, \lozenge\}$, the maximum (greatest) element of $\{\triangle, \square, \lozenge\}$, and the minimum element of the set S, respectively.
$\mathcal{U}\{a, b\}$	A single sample from the discrete uniform distribution in the range a to b (both integers such that $a \leq b$). That is, a random uniformly-weighted selection from the set $\{a,\ a+1,\ \ldots,\ b-1,\ b\}$.
$\mathcal{U}(x, y)$	A single sample from the continuous uniform distribution in the range x to y (both real numbers such that $x \leq y$). That is, a random uniformly-weighted selection from the set $\{z \in \mathbb{R} \mid x \leq z \leq y\}$.
$[P]$	The Iverson bracket of the proposition P.