PYRAMID
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TECH AND TOYS IV
ULTRA-TECH ARMOR DESIGN
by David L. Pulver
HIGH-TECH BUILDINGS
by Matt Riggsby
HEXOPERSONALITY
by J. Edward Tremlett
THE ARROW OF PROGRESS
by Kelly Pedersen
TITAN FIGHTIN'
by Timothy Ponce
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Pale Blue: In This Issue
Brown: In Every Issue
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Cover
Christopher Shy

In This Issue

The future is only as awesome as the gear you put in it! That's why this issue of *Pyramid* is devoted to tech and toys – the latest in great ideas for your ultra-technological campaigns.

The next big things aren't just gizmos and doodads; it's also the promise of *High-Tech Buildings.* Author Matt Riggsby – co-author of ***GURPS Low-Tech Companion 3: Daily Life and Economics*** – expands the architecture rules of that supplement to new vistas, allowing for the construction of modern-age buildings and beyond. Pick your construction materials, choose options, and select amenities . . . but make sure you bring a big check!

If you're looking for a novel way to make your ultra-tech different, consider following *The Arrow of Progress.* Discover why archery might continue to be useful, learn what futuristic bows might have going for them, and unleash powerful new options for your post-modern fletchers. The discussion also includes ***GURPS*** stats for nine new bows, a dozen sensor arrows, and more.

Don't be caught unprepared in forthcoming fights; defend yourself in the centuries to come with *Ultra-Tech Armor Design.* This month, David L. Pulver continues the defensive design system detailed in two previous Eidetic Memory installments (*Pyramid #3/52: Low-Tech II* and *Pyramid #3/85: Cutting Edge*), showing you how to add options to ***GURPS Ultra-Tech*** to make just the armor you want. Don electromagnetic armor, fire up the psionic mind-shield circuitry, and stay hidden with infrared cloaking.

Diving into cyberspace can be incredibly useful . . . but it also opens you up to the dangers of a *Hexopersonality.* Long-time *Pyramid* contributor J. Edward Tremlett describes a systemless method of entering cyberspace, including plot possibilities and perils that arise from creating an inexact replica of your digital spirit.

Sometimes when armored battlesuits need to slug it out with giant robots, you want the *Titan Fightin'* to last more than a few seconds. This short article for ***GURPS*** shows you how to let two massive foes tussle in a way that keeps things exciting.

This issue also includes a Random Thought Table that examines how feelings can be useful in shaping the tech of tomorrow. Whether you want offense, defense, or just a cool place to live, this *Pyramid* has something that will make your future come alive!

Science is a history of superseded theories.

– Dr. Laurence J. Peter

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From the Editor

Get the Future Today, Before It's Too Late!

When I first became editor of *Pyramid,* last millennium, one of the first things I purchased was a big-screen monitor – 21", if I remember. I think it was 1600 × 1200 resolution if I pumped it up to its maximum, which involved it humming a bit and being a pain to look at. I'm pretty sure that most of the time I kept it at a lower resolution for my eyesight's sake. I don't remember how much it cost, but I know it was a huge purchase for me.

It was also a huge purchase literally, being a CRT screen. The desk I had it on could barely fit it and a keyboard in front of it, because the entire back of the thing stretched into infinity. I remember the monitor always being uncomfortably close.

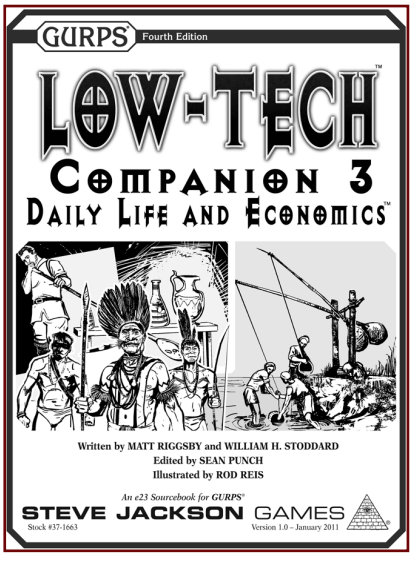
Just yesterday I had stopped by Goodwill – a used-goods shop that sells what people donate – and bought another monitor. It was a 21" digital LCD, less than 5" thick, including the adjustable base. Like my gargantuan monitor from the early 2000s, it was also 1600 × 1200. And this one cost be about $25. Sure, it was used, but even new monitors around that size can be had for under $100.

All of this was a microcosm of thinking about futuristic tech and developments. Tomorrow is a moving target, and we're all aware of science-fiction roleplaying games whose idea of the future resulted in devices that were unfathomable at the time, but are now less powerful than a $50 child's wristwatch computer. (We just got our son a Kidizoom Smartwatch, and I'm pretty sure it's more powerful than my old Apple IIgs.)

Hopefully the articles in this issue will inspire you to dream big, push your neon visions in new and interesting ways, and help you create an awesome future. Just remember that today's cutting-edge technology is tomorrow's garage-sale find or child's wristwatch.

Write Here, Write Now

So what did you think of this issue's glimpse of the future? Did you see something that made your circuits hum with delight? Or did something slip into the uncanny valley? Let us know via the retro-communication called "email" at **pyramid@sjgames.com,** or join the rousing techno-discussion online at **forums.sjgames.com.**



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Cinder Block: Preformed concrete blocks, typically hollow to save a great deal of weight.

Concrete: Modern concrete is typically reinforced with grids and columns of steel bars.

Light Configurable Composite: This ultra-tech material is a matrix of plastics with a network of nanobots which can change its shape. Configurable composite buildings which are connected to a power source and are not completely destroyed may heal up to 50% of damage taken at a rate of 1% of the building's HP per hour at TL10, 2% per hour at TL11, and 4% per hour at TL12.

Heavy Configurable Composite: Similar to light configurable composite, this material is primarily metallic.

TL	Material	Cost	Weight	DR
5	Wood	$1.80	2.65	1
5	Brick	$0.57	7.7	8
6	Cinder Block	$0.34	3.9	3
6	Concrete	$1.11	15.5	9
10	Light Configurable Composite	$2.50	3	1
10	Heavy Configurable Composite	$4	16	6

Facing and Partition Materials

These materials are used exclusively for external facings and internal partitions. They must be used in conjunction with some other structural material (see *Simple and Complex Buildings* below).

Concrete Stucco: Similar to drywall, but with a thin layer of textured concrete on a metal or wooden lath backing fastened to a frame. Usually used as an exterior facing.

Drywall: Drywall partitions are 4-5" thick, with half-inch gypsum board sheets attached as facings to a wooden or metal frame, which may also contain wiring and insulation.

Metal Siding: Painted or otherwise coated steel or aluminum, about 0.025" thick. This is suitable for tool sheds and warehouses, not armor plating.

Plastic: Sheets of corrugated polycarbonate, PVC, and related composites like fiberglass. The material ranges from opaque to as transparent as glass, though less durable.

Plate Glass: A plate-glass facing consists either of one large, 1/2" sheet of glass or of two 1/4" sheets around an insulating air pocket, held in place by a metal frame. The pattern of glass sheets may be punctuated at intervals by structural members or metal strips, but at least 90% of the facing is transparent.

TL	Material	Cost	Weight	DR
6	Concrete stucco	$2.46	7.25	2
6	Drywall	$1.50	3	1
6	Metal Siding	$1.60	1.25	2
7	Plastic	$1.50	0.3	0
7	Plate Glass	$8.94	6.5	6

Internal Frames

The materials here indicate costs for pure supportive frames, without walls, floors, or ceilings. These may be used as a part of buildings which are largely composed of partition and facing materials but require a structural framework to hang them on; be used to supplement very tall buildings; or for both applications. Frames consist of thick, strategically placed pillars and a few connecting beams. They add to the weight (and therefore overall HP) of a building, but provide no real cover themselves.

TL	Material	Cost	Weight
5	Masonry frame	$0.3	4
5	Wood frame	$0.19	0.51
6	Concrete frame	$0.32	5.5
6	Steel frame	$0.38	0.34
10	Light configurable frame	$1.20	1.25
10	Heavy configurable frame	$1.90	7

Obsolete Materials

A number of materials from ***Low Tech Companion 3*** aren't listed here: hard earth, thatch, rubble, and ashlar. Most of them simply aren't used in the modern world save in limited cases of poverty, historical research and reenactment, and tradition. Ashlar is the sole exception, and even then, cut stone is typically used as a decorative facing rather than an underlying structural material.

However, that doesn't mean they *can't* be used, and when they are, they're less expensive than at earlier TLs. Earth-moving equipment, chainsaws and brush cutters, and easy transportation make producing these materials vastly easier even when traditional techniques are used in the construction itself. Reduce costs for obsolete materials by 25% at TL5 and by 50% at TL6+.

Simple and Complex Structures

Smaller (50' tall or less) buildings made from materials listed under *Structural Materials* (pp. 6-7) may be constructed by the rules in ***Low-Tech Companion 3,*** p. 34: Find the volume of the structure and multiply it by a partition factor, the wall thickness, and the appropriate values for the material. (The partition factor is related to the number and size of interior rooms; see *Example Partition Factors,* p. 8, for ideas.) Further apply modifiers for construction quality and variants. To get weight, multiply the final value by the weight of the material from the materials table; this in turn determines HP. To get pre-amenities cost, multiply the value by the cost from the materials table.

However, composite buildings may be constructed of many different materials, combining items from all three categories. A complex building may have up to three separate components: an external facing, interior partitions, and a frame.

The external facing's cost, weight, etc. are calculated as though it were a separate structure with a partition factor of 0.25. The interior partitions are calculated as though a separate structure with a partition factor equal to the desired partition factor of the structure as a whole minus 0.25.

Example: An ivy-covered college dormitory with many interior walls and thus an overall partition factor of 1.25 might consist of a thick brick outside (partition factor 0.25) and wooden interior partitions (partition factor of 1.25 - 0.25, or 1).

Rocket Arrows (TL9+)

A rocket arrow is simply a shaft filled with rocket fuel, propelling the missile along its course at much higher velocities than a human archer could impart. A rocket arrow does not ignite for a short distance (usually 10 yards) after being fired, for safety. Within this distance, it does normal damage. Past this point, the engine kicks in and accelerates the arrow to beyond the speed of sound. After ignition, use the damage listed on the table below. A rocket arrow has no 1/2D range – it hits with full force out to the listed range.

> *Oliver Queen: It's a jettisoning arrow. Uses compressed CO_2 –*
>
> *Cisco Ramon: Compressed CO_2 to jettison high tensile strength polymer cables.*
>
> *– **Arrow** #3.8*

Rope Arrows (TL9+)

A rope arrow allows lines to be affixed with a well-aimed shot. It trails a light cord behind it that pays out with minimal friction, but it still introduces significant drag, so range is reduced to 1/5 normal. The arrow can be equipped with either a piton head or a grappling hook.

Treat a piton head as a smart piton (***GURPS Ultra-Tech,*** p. 76). The piton head inflicts impaling damage and has a (3) armor divisor against stone, concrete, and similar materials. To see if a piton is set properly, roll damage against the surface it impacts, using the DR for 2" of the material. An archer can target chinks in armor (p. B400) to reduce DR. If it penetrates and inflicts at least one point of damage, it is lodged. Testing to see if a piton head is secure requires an *IQ*-based Climbing roll at +1. A successfully set piton arrow can support up to 500 lbs. (limited by the strength of the surface it is set in). At TL10, burrow-dart technology (***Ultra-Tech,*** p. 155) allows the piton to set itself more firmly once it is implanted, increasing its weight limit to 1,000 lbs., if given at least one minute to burrow.

A grappling-hook arrow includes short-range sensors to detect whether it has reached a secure place to deploy. When it does so, it brakes by pulling on its own line and extends its hooks, which include gecko adhesive (***Ultra-Tech,*** p. 83) to attach more securely. The sensors can detect whether an object is relatively solid (so light foliage or water won't trigger them), but they can't distinguish between strong or weak points, so a user must still test the line with an *IQ*-based Climbing roll. A successfully set grappling-hook arrow can support up to 500 lbs., or 750 lbs. at TL10 or higher. If shot directly at someone, a grappling arrow does crushing damage, with a (0.5) armor divisor. The Hook technique (***GURPS Martial Arts,*** p. 74) can be employed with a grappling-hook arrow, for an additional -2.

Once a rope arrow has reached its attachment point, the ring that holds the line moves up the shaft until it rests at the point that will cause the least strain. Meanwhile, the built-in ascender may begin drawing a stronger rope to the arrow. This takes one second per yard of line. If a stronger rope is not drawn, the line the arrow trails can support up to 100 lbs. (200 lbs. at TL10, 400 at TL11, or 800 at TL12).

Per arrow with 200 yards of standard line: $100, LC4. The dispenser for the line is $500, 0.5 lb., LC4, and can be added to a standard quiver or attached to a belt or other harness.

If monowire technology (***Ultra-Tech,*** p. 103) is available, rope arrows can use it for the initial line. The dispenser also includes special guides and grips to allow an archer to fire an arrow with such a dangerous substance attached. Even so, critical failures on the Bow roll become much more dangerous! Monowire is far lighter and stronger than the line usually used, so range is only reduced by 1/2, and the monowire can effectively support as much weight as the attachment point is capable of carrying, no matter the tech level. However, climbing a monowire line requires special tools to avoid cutting off extremities, so a climber *must* either have them or take the time to draw a different line to the arrow.

Per arrow with 400 yards of line: $500, LC3. $1,000 for the dispenser, LC3, 0.5 lb.

Sensor Arrows (TL9+)

Arrows can be constructed with various types of sensors built in and transmitters to communicate what they detect. The number and quality improve as the tech level advances. An arrow's feed can be monitored, in which case the observer rolls against the relevant skill or attribute, possibly with a bonus from the sensor's quality. The arrow also includes a tiny computer with software sufficient to process data, giving it the relevant skill to analyze the information it collects.

Rocket Arrow Table

Terms and notation are as defined on pp. B268-271.

Bow (DX-5)

TL	*Weapon*	*Damage*	*Acc*	*Range*	*Weight*	*Rcl*	*Cost*	*LC*	*Notes*
9	Rocket Arrow	6d×3 imp	3	1,900	0.25	2	$100	2	
10	Advanced Rocket Arrow	6d×6 imp	4	1,900	0.25	2	$200	2	[1]
11	Hyper-Rocket Arrow	6d×12 imp	5	1,900	0.25	2	$400	1	[1]

Note

[1] These can have their maximum velocity reduced, to extend flight range. Divide damage by the same factor that range is multiplied by. For example, increasing an advanced rocket arrow's range to 2,850 yards, a 1.5× increase, would reduce its damage to 6d×4.

DR is the armor's DR. (If it varies, use the DR applicable vs. burning damage, and use the lowest location's DR.) All TL10+ *laminate* armors include additional layers of radiation-absorbing materials; treat their DR as 10 times higher for this purpose.

WM is from the armor material.

Look up the area density (AD) on the table below to find the Protection Factor (PF):

AD	*PF*	*AD*	*PF*
1-9	0.5*	100-119	50
10-19	1	120-199	100
20-39	2	200-399	200
40-59	5	400-599	500
60-79	10	600-799	1,000
80-99	20	800-999	2,000

* Treat this as PF 1 against most radiation; the fraction 0.5 is used only when calculating effective PF against less penetrating radiation (e.g., solar flares and Van Allen belt radiation) which is resisted with 20 × regular PF and so would be PF 10.

Example: The suit's diamondoid laminate had WM 0.03. Multiplying this by DR 35 × 10 (for TL10+ laminate) gives an AD 10.5, which means we have PF 2 (PF 40 against less penetrating radiation like solar flares, etc. where even thin protection is effective).

Conceit is the finest armour a man can wear.
– Jerome K. Jerome

Step 6: Calculate Time to Don and Concealment

The base time to don for high-tech or ultra-tech armor is three seconds per piece.

Armor is flexible if it uses a flexible material, or uses a rigid material plus scale construction; otherwise it is rigid. Any single piece of armor that covers any of the leg locations *and* one or more other locations (besides feet) takes twice as long to don, even it's flexible, or five times as long if it is rigid.

Armor can be put on in only 2/3 the time by omitting properly securing the armor, tightening straps, and adjusting the fit. For quickly donned armor, the GM should assesses -1 to DX until it can be securely fashioned. Sealed armor (see below) also may not be properly sealed, if donned hastily; roll vs. NBC Suit or Vacc Suit skill to avoid this.

It generally takes half the specified time to remove securely fastened armor.

Example: The armor covers everywhere but the head, so it falls under "covers leg and one other location (besides feet). Additionally, it's rigid, therefore takes five times as long to don, or 15 seconds.

Concealable?

Rigid armor is not concealable. Armor made of flexible materials or scale *may* be concealable, depending on how thick it is.

Armor with *more than half* the maximum DR is not concealable. It can only pass as heavy clothing such as a trench coat, biker leathers, etc. Reduce LC by 1.

Armor with *up to half* the maximum DR can be concealed under clothing or pass as ordinary civilian outerwear.

Armor with *no more than one-quarter* the maximum DR can pass as light clothing such as T-shirts, evening wear, skin-tight suits, etc. and be worn beneath clothes. Increase LC by 1 to max LC4.

Armor with *no more than one-sixth* the maximum DR can be disguised as swimwear, lingerie, or other diaphanous clothing. Increase LC by 1 to max LC4.

Example: The armor is rigid, so it's not concealable.

Step 7: Calculate Weight and Cost

Use the formula below to calculate the weight and cost of the armor. To instead calculate the weight and cost *per point* of DR, just use "DR 1" in the formula.

Armor weight (in pounds) = LSA × WM × CW × DR.
Armor Cost = armor weight × CM × CC.

LSA is the location surface area from the *Coverage Table* (p. 20).

WM is the material weight from the *Armor Material Table* (p. 22).

CW is the construction weight multiplier from the *Construction Table* (p. 23).

DR is Damage Resistance.

CM is the material cost from the material *Armor Materials Table.*

CC is the construction cost multiplier from the *Construction Table*.

The final weight and cost should be rounded to two significant figures – that is, round $246 to $250, or 13.5 lbs. to 14 lbs.

Example: The chest armor has LSA 5.25 (chest) × WM 0.03 (diamondoid laminate) × CW 0.8 (plate) × DR 45 = 5.67 lbs., Its cost is the armor weight 5.67 × CM $200 (diamondoid laminate at TL11) × CC 1.5 (plate) = $1,701. The armor on the rest of the body is LSA 14 × WM 0.03 × CW 0.8 × DR 35 = 11.76 lbs. Cost is 11.76 × CM $200 × 1.5 = $3,528. As this is a single piece suit, the weight is 5.67 + 11.76 = 17.43 lbs., rounded to 17 lbs. The cost is $1,701 + $3,528 = $5,229, rounded to $5,200.

Cut: Stylish or Fashion Original (Optional)

Armor – even if it's not concealable (e.g., parade or tournament armor) – can be attractively styled. Apply this as a modifier to the calculated cost. *Stylish* armor is four times the above cost. *Fashion originals* are 20 times the above cost. Stylish or better armor can also include "authentic" appearing replicas of period armor made from inauthentic materials.

About *GURPS*

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Errata. Everyone makes mistakes, including us – but we do our best to fix our errors. Up-to-date errata pages for all ***GURPS*** releases, including this book, are available on our website – see above.

Rules and statistics in this book are specifically for the ***GURPS Basic Set,*** *Fourth Edition.* Page references that begin with B refer to that book, not this one.

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