

Notes from Hades

Another issue, another trip. This time, London. I arrived early Sunday morning, and when I got to my hotel, my room was not yet available. Since the hotel was right next to the London Eye, I took a "flight" on it. Despite the fact that the weather was slightly hazy, the view from there is pretty amazing. It's right across the river from parliament and Big Ben, and much of central London is visible. I still had plenty of time to kill afterwards, and so I took a walk and stumbled across the Churchill Museum and Cabinet War Rooms, part of the Imperial War Museum. Most of the area is the underground bunker in which the British Cabinet spent most of World War II, particularly during the Battle of Britain and the Blitz. Much of it has been preserved, and you can see the quite austere environment in which they functioned. The Churchill Museum is located in what was back then a storage room, and has quite a few interesting interactive exhibits spanning the entire life of Winston Churchill. The most interesting was a long table at the center which has touch sensitive panels along the side. It displays a timeline of Churchill's life, and the pads allow you to zoom in on particular dates of interest. You can easily spend hours there.

Later during my trip, I was able to have dinner with Chris Geggus. I also had dinner with a former subscriber, Mike Stewart. It was nice to reconnect with both of them.

Beyond that, the most notable item of interest was that I got back the results from my second foray into the Orange County Fair Home Wine Competition. This year, I entered three wines: my plum wine, a blackberry port, and a chardonnay. The chardonnay didn't get anything, but the blackberry port got an honorable mention, and the plum once again got a gold. I'm just about to start a new batch of plum, and based on my feedback, I am hoping to get double gold for two years from now with it. In next year's competition, I will be entering the plum wine I started last year. Wine making is not a quick process, especially if you want to do it right.

The next deadline is **Tuesday, August 18 at 5:00 p.m. Pacific Time. Please do not call or fax orders after 10:00 p.m. Pacific time.** My wife and I tend to retire early. Also, if you want to fax in orders, call first. We hang up on unannounced faxes.

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Pateel

Frontier Dog

Procyon

Pedagoguery

Kremlin

Gunslinger

Merchant of Venus

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Game Openings

Hunter. Silverton. Will start after Terrier ends. Have Dave Partridge, Michael Longdin, Ward Narhi, Cary Nichols, Bill Scharf, and Dave Hooton. This game is full.

Dogbreath. History of the World. Have Chris Geggus, Dave Partridge, Andy Lewis, Kevin Wilson, Dave Anderson, will take up to 2 more.

Basset. Outpost. Will start after Hound ends. Have Andy York, Cary Nichols, Dave Partridge, Dave Hooton, Eric Brosius, Andy Lewis, Michael Lowrey, and Kevin Wilson will take up to 2 more.

Bolognese. Machiavelli. Gunboat. This game will start after the next Machiavelli game ends. Have 5, will take up to 3 more. You are signed up: .

Boston Terrier. New World. This will use the exploration variant, plus the Non-Player Nations variant in the event I get less than 6 players. Have Andy York, Andy Lewis, Dave Partridge, Bob Robles, and Dave Hood, will take up to 1 more.

Purebred. Machiavelli. This game will start after the second Machiavelli game ends. Have Ward Narhi, Bob Robles, Pasquale Giovine, Dave Partridge, and Walt O'Hara, will take up to 3 more.

Wish List

Industrial Waste. Have Andy York and Dave Partridge, will take up to 2 more.

Silverton. Will start after Hunter ends. Have Eric Brosius, Dave Partridge, and Dave Hooton, will take up to 3 more.

Kremlin. Will start after Pateel ends. Have Walt O'Hara. Will take up to 5 more.

Seavarrers of Catan. Have Chris Geggus, Dave Partridge, and Dave Hooton. Will take up to 3 more.

Outpost. Will start after Basset ends. Have Eric Brosius, will take up to 9 more.

Goa. Will take up to 4.

In general, game ownership is recommended, but not required.

Note that a subscription to S.O.B. is not required to play in a game run by flier, but that a game fee will be charged to non-subbers.

S.O.B. is a zine of unusual postal games, and anything else I feel like including. Your publisher is:

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Subscriptions cost \$2.00 per issue (\$3.00 overseas).

Dog Park

Winter 1054

Miller Number 20077Apw10

Advanced Rules, Natural Disasters, Special Military Units, Moneylenders, Conquest, Gray Press, Ultimate Victory
Deadline for Spring 1055 8/18, Tuesday

We pause for building.

Fall 1054 Retreats

Byzantines retreat F Durazzo to garrison

Builds

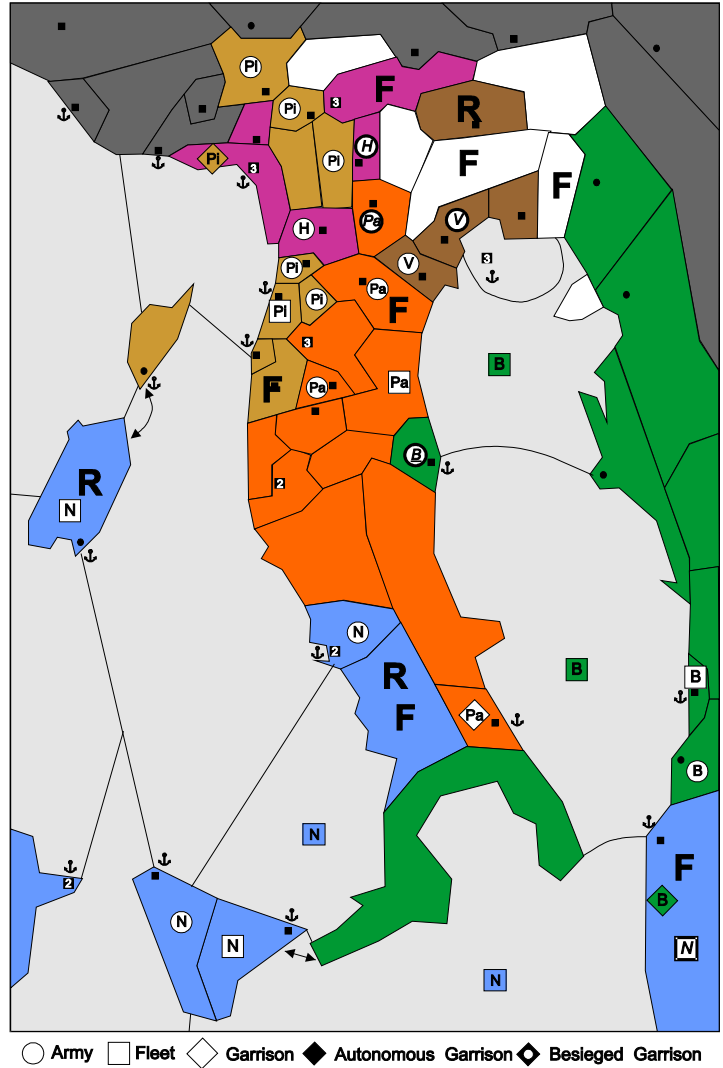
		Cost
Byzantines	Maintains A Ancona, F Upper Adriatic, F Lower Adriatic, G Durazzo, builds A Albania, F Ragusa	24
Holy Roman Empire	Maintains A Modena, builds A (Elite Mercenary) Cremona	9
Normans	Maintains all, builds A Palermo, A Naples	24
Papacy	Maintains all, builds A Arezzo	18
Pisa	Maintains all, builds A Lucca, F Pisa	21
Venice	Maintains all, builds A (Elite Mercenary) Padua	9

Your treasury:

Outstanding Loans

Spring 1056: 17 ducats due from the Holy Roman Empire (11 borrowed)
 Summer 1056: 15 ducats due from the Byzantines (10 borrowed)
 Fall 1056: 5 ducats due from the Holy Roman Empire (3 borrowed), 12 ducats due from the Papacy (8 borrowed), 24 ducats due from Pisa (16 borrowed)

Dog Park



Barking Up the Wrong Tree

Spring 1254

Miller Number 2007Bpw10

Advanced Rules, Natural Disasters, Special Military Units, Conquest, Gray Press, Ultimate Victory
Deadline for Summer 1254 8/18, Tuesday

Milan and Avignon continue to duke it out, while Aragon and Venice reclaim lost territory. The Pope moves south, as does Florence into the Pope's back yard.

Builds

		Cost
Aragon	Maintains all, builds F Durazzo, F Messina	18
Avignon	Maintains F Provence, A Avignon, A Swiss, A Tyrolea	12
Florence	Maintain A Lucca, A Bologna, build A Florence, A Arezzo	12
Milan	Maintains A Savoy, A Turin, A Como, A Milan, A Modena, A Mantua, builds A Pavia, G Genoa, G Modena, G (Elite Mercenary) Savoy	33
Papacy	Maintains all, build G Ancona, A Perugia	18

Venice	Maintains all, builds F Venice, A Padua, A Treviso	24
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Orders

ARAGON (Scharf): A Bari to OTRANTO, F DURAZZO holds, F MESSINA holds, F Tyrrhenian Sea to SARDINIA, F WESTERN MEDITERRANEAN supports F Tyrrhenian Sea to Sardinia, F Central Mediterranean to TYRRHENIAN SEA

AVIGNON (Nichols): A Tyrolea to Como (DISLODGED, retreat Carinthia, garrison, OTB), A Swiss to TURIN, A AVIGNON supports Swiss to Turin, F PROVENCE to SAVOY

FLORENCE (Whyte): A LUCCA supports A Bologna, A Bologna supports A Lucca

(DISLODGED, retreat Florence, Pistoia, garrison, OTB), A Florence to URBINO, A Arezzo to PERUGIA

- MILAN (Renken): A SAVOY to SALUZZO, A PAVIA to Turin, A Turin to SWISS (DISLODGED, retreat Montferrat, OTB), A Como supports A Milan to Tyrolea, A Milan to TYROLEA, A MANTUA supports Venice A Ferrara to Bologna, A MODENA supports Venice A Ferrara to Bologna, G GENOA convert to F, G (EM) SAVOY convert to F, G MODENA supports A Modena
- PAPACY (Robles): A Rome to CAPUA, A Perugia to ROME, A ANCONA to AQUILA, A NAPLES supports A Aquila to Salerno, A Aquila to SALERNO, G ANCONA convert to F
- VENICE (Partridge): A Ferrara to BOLOGNA, A VERONA holds, A Dalmatia to HERZEGOVINA, A Padua to FERRARA, A Treviso to PADUA, F VENICE holds, F UPPER ADRIATIC supports A Ferrara to Bologna, F Albania to LOWER ADRIATIC

Treasury:

Spring 1254 Famine Losses

Autonomous garrison Ragusa, Avignon A Carinthia (if retreated there), Florence A Pistoia (if retreated there)

Summer 1254 Plague

Bad Year – Row and Column: Bergamo, Ancona (Papal F destroyed), Parma, Mantua (Milan A destroyed), Istria, Friuli, Sienna, Albania, Modena (Milan A and G destroyed), Urbino (Florence A destroyed), Pistoia

Press

Florence: As the little Ice Age sinks across northern Europe, leaving latitudes north of Florence in the grip of a cold war, the Florentine army packs its bags and heads south, to warm its icy fingers by means of a hot war with its heretical neighbour, the false-doctrined, fatuously worldly and significantly unspiritual so-called pope. May the world-famous marshmallows of Lucca be grilled to perfection upon the pyre of papal perfidity!

Next month:

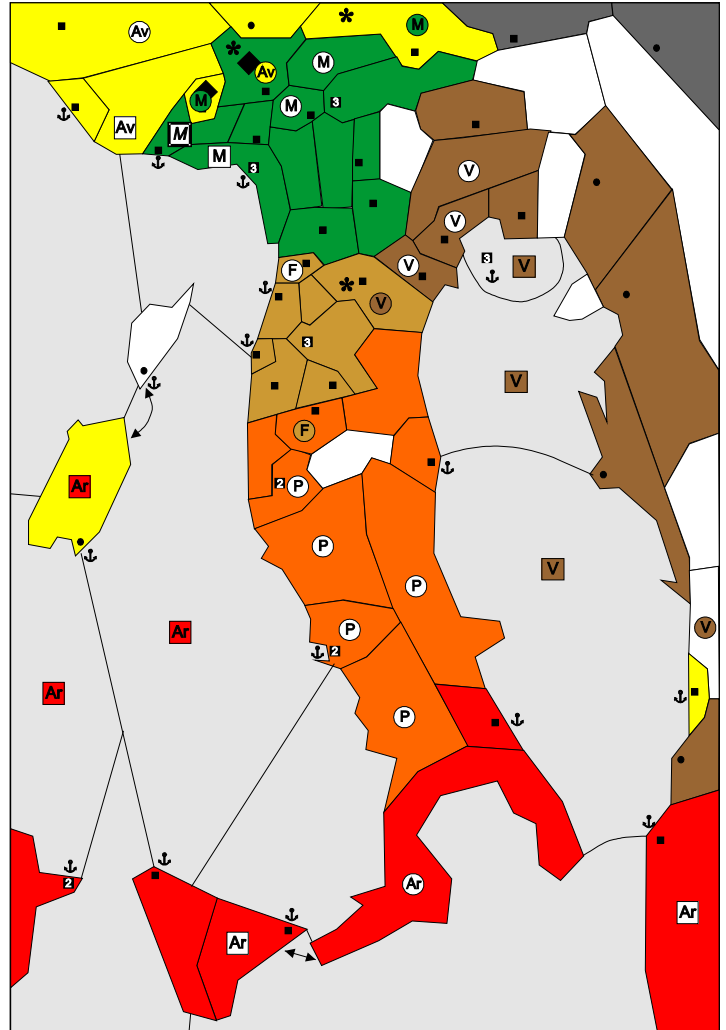
- Are Venetians blind, or is it just their world-view?
- Is a female from M' ilan a M'lady?

- Avignon or 'Ave he not? The choice is yours in our special free pull-out

S.O.B.

supplement.

- Putting the boot into Italy: if the shoe fits...
Barking Up the Wrong Tree



○ Army □ Fleet ◇ Garrison ◆ Autonomous Garrison ◇ Besieged Garrison

Doberman

Turn 14a

Turn 14b due 8/18, Tuesday

Available Cards

Set 1	Set 2	Set 3	Set 4	Set 5
Innovation	Raw Materials	Waste Disposal	Order	Growth
Advisor	Waste Disposal	Raw Materials	Growth	Raw Materials
Order	Innovation	Innovation	Innovation	Order

BIBCO selects set 1

PIT selects set 4

GOO selects set 5

100%Trash selects set 2

The Players

Player	Company Name	Play Order	Money	Loans	Raw Material Supply	Growth	Co-workers	Saved Card
Michael Longdin	100%Trash	4	\$16	60	2	15	5	Order
Dave Partridge	BIBCO	1	\$31	0	0	17	4	Bribery
Richard Weiss	PIT	2	\$17	10	7	19	3	Hiring/Firing
Eric Brosius	GOO	3	\$34	10	1	18	3	

GOO stands for General Olfactory Organization. BIBCO stands for Big Industry Buying Congressmen Outright

Player	Rationalization	Raw Materials	Waste Reduction	Waste Disposal	Victory Points
Michael Longdin	5/1	1/15	4/3	15	-18
Dave Partridge	4/3	1/15	1/15	9	65
Richard Weiss	3/6	5/1	1/15	8	39
Eric Brosius	3/6	2/10	1/15	2	56

Cards

100% Trash	BIBCO	PIT	GOO
Raw Materials	Innovation	Order	Growth
Waste Disposal	Advisor	Growth	Raw Materials
Innovation	Order	Innovation	Order

Discards

Advisor Waste Disposal Raw Materials Raw Materials Growth Waste Disposal Raw Materials
 Innovation

Terrier

Silverton

Turn 21 Phases IV- VI and Turn 22, Phases I-III
Turn 22, Phases IV- VI and Turn 23, Phases I-III, 8/18, Wednesday
Turn 21

Operations

Brown (Partridge) declines #107, operates #29 (\$20, 2 gold). Delivers 2 gold from Leadville to Denver for \$400, 2 silver from Westcliffe to Denver for \$400, buys 3 copper from Orange for \$600 and delivers it to Denver for \$1200, delivers 6 coal from Bowie to Denver for \$720.
Blue (Bolduc) operates #132 (\$50, 1 coal), #91 (\$30, depletes). Delivers 1 coal from Steamboat Springs to Denver for \$120. Gains \$1490 in passenger revenue.
Red (Scharf) operates #125 (\$20, 3 coal), #109 (\$20, depletes), #124 (\$40, 2 coal), #103 (\$30, 2 silver). Delivers 7 coal from Magdalena to El Paso for \$840, 2 copper from Tyrone to El Paso for \$800, and 1 copper from Pinon Altos to El Paso for \$400. Gains \$560 in passenger revenue.
Aqua (Lewis) operates #74 (\$20, 2 coal), #70 (\$40, 2 coal), #130 (\$80, 1 copper), #59 (\$40, depletes). Delivers 10 coal from Coalville to Salt Lake City for \$600 and 2 lumber from Dolores to Salt Lake City for \$600. Gains \$410 in passenger revenue.
Green (Longdin) operates #85 (\$30, 3 coal), #61 (\$20, 2 lumber), and #90 (\$40, 3 coal). Delivers 3 lumber from South Fork to Pueblo for \$600, 6 coal from Canon City to Denver for \$720, and 6 coal from Trinidad to Denver for \$720. Gains \$120 in passenger revenue.
Orange (Hooton) buys #50 for \$100, operates #63 (\$50, 2 lumber), #123 (\$40, depletes), #58 (\$40, 1 lumber), #82 (\$20, 3 coal), #55 (\$50, 3 lumber), #66 (\$30, depletes), #87 (\$30, 2 coal), #129 (\$40, 1 copper), #97 (\$40, 2 gold), #50 (\$50, 3 silver). Sells 3 copper to Brown for \$600, delivers 8 coal from Gallup to El Paso for \$960, 6 lumber from Lumberton to Santa Fe for \$480, and 3 coal from Durango to Santa Fe for \$240. Gains \$450 in passenger revenue.

Determine Price Changes

Gold: Remains at \$200 Copper: -3 to \$240 Silver: +5 to \$400

	Denver	Salt Lake City	Pueblo	Santa Fe	El Paso
Lumber:	Remains at \$200	Remains at \$300	Remains at \$200	-2 to \$40	+3 to \$160
Coal:	Remains at \$120	+1 to \$80	Remains at \$80	+2 to \$120	-3 to \$60

Turn 22

Move Prospectors and Surveyors

Brown (Partridge) no surveying, prospects the deck. **Aqua** (Lewis) no surveying, prospects #54
Blue (Bolduc) dismantles Fairplay to South Platte, prospects passenger line 23. **Green** (Longdin) surveys Divide to Cripple Creek, prospects #53.
Red (Scharf) no surveying, prospects #107. **Orange** (Hooton) no surveying, prospects the deck twice

Dispute Resolution

No disputes. Brown draws #78 (Coal at Bowie) and Orange draws claims #60 (Lumber at Pagosa Springs) and #49 (Silver at Silverton) from the deck – they each have first right of refusal. Brown spends \$0 (or \$80), Blue spends \$1260, Red spends \$100, Aqua spends \$80, Green spends \$120, and Orange spends \$0 (or \$40, or \$140, or \$180).

The Players

Player	Color	Starting Location	Money	Trains	Snowplows	Personnel
Dave Partridge	Brown	Denver	\$10,565	9, 15, 42, 42		S+2, S, P, P+2
Paul Bolduc	Blue	Denver	\$6,430	9, 15, 72, 72		S, S+1, P+2
Bill Scharf	Red	El Paso	\$9,555	9, 24, 72	+2, +4	S+1, S, P+1
Andy Lewis	Aqua	Salt Lake City	\$11,910	9, 15, 42, 72		S, S, P+2
Michael Longdin	Green	Pueblo	\$9,730	15, 24, 42, 72	+2, +5	S+2, S, P+1
Dave Hooton	Orange	Santa Fe	\$21,570	24, 42, 42, 42		S, S, P, P+1

Personnel in **Bold** are in jail.

Purchased Claims

#	City	Owner	Type	Goods	Operation
79	Bowie	Brown	Coal	1	\$40
29	Leadville	Brown	Gold	0	\$20
132	Steamboat Springs	Blue	Coal	0	\$50
102	Hillsboro	Red	Silver	6	Depleted
101	Lake Valley	Red	Silver	17	Depleted
125	Capitan	Red	Coal	6	\$20
117	Cloudcroft	Red	Lumber	8	Depleted
104	Mogollon	Red	Silver	7	Depleted
109	Pinos Altos	Red	Copper	1	Depleted
124	Magdalena	Red	Coal	0	\$40
103	Hillsboro	Red	Silver	2	\$30
107	Santa Rita	Red	Copper	N	\$50
36	Eureka	Aqua	Silver	1	Depleted
67	Coalville	Aqua	Coal	9	Depleted
68	Scofield	Aqua	Coal	2	Depleted
74	Elk Springs	Aqua	Coal	9	\$20
25	Bingham	Aqua	Gold	4	Depleted
70	Price	Aqua	Coal	15	\$40
130	Bingham	Aqua	Copper	5	\$80
54	Steamboat Springs	Aqua	Lumber	N	\$40
85	Canon City	Green	Coal	0	\$30
61	South Fork	Green	Lumber	0	\$20
90	Trinidad	Green	Coal	0	\$40
53	Lake City	Green	Silver	N	\$30
63	Lumberton	Orange	Lumber	0	\$50
58	Dolores	Orange	Lumber	3	\$40
82	Crested Butte	Orange	Coal	17	\$20
84	Durango	Orange	Coal	0	\$20
55	Walden	Orange	Lumber	8	\$50
87	Alamo	Orange	Coal	9	\$30
129	Dillon	Orange	Copper	0	\$40
97	Elizabethtown	Orange	Gold	2	\$40
50	Silverton	Orange	Silver	3	\$50

Purchased Passenger Lines

#	Type	Route	Payoff	Owner	Notes
3	A	Denver – Colorado Springs	\$50	Brown	
5	A	Denver – Pueblo	\$80	Brown	
12	B	Pueblo – Grand Jct.	\$150	Brown	Discard when 20 is taken. Good for \$150 toward card 20 or 21

Available Trains

Type	# Available	Cost
9	2	\$80
15	2	\$120
24	5	\$200
42	3	\$320
72	3	\$500

#	Type	Route	Payoff	Owner	Notes
1	A	Denver – Boulder	\$20	Blue	
10	B	Denver – Aspen	\$130	Blue	
17	C	Denver – Santa Fe	\$420	Blue	
7	A	Pueblo – Santa Fe	\$120	Blue	
22	C	Denver – Salt Lake City	\$800	Blue	
23	C	Salt Lake City – Santa Fe	\$900	Blue	
4	A	El Paso – Deming	\$60	Red	
18	C	Gallup – Santa Rosa	\$500	Red	
2	A	Salt Lake City – Provo	\$20	Aqua	
11	B	Salt Lake City – Grand Jct.	\$140	Aqua	Discard when 20 is taken. Good for \$140 toward card 20 or 21
9	B	Denver – Leadville	\$120	Green	
6	A	Santa Fe – Albuquerque	\$90	Orange	
13	B	El Paso – Santa Fe	\$140	Orange	
14	B	El Paso – Albuquerque	\$220	Orange	

Available Claims

#	City	Type	Claim	Operation
69	Scofield	Coal	\$40	\$30
71	Sunnyside	Coal	\$100	\$20
77	Craig	Coal	\$40	\$20
131	Hot Sulphur Springs	Lumber	\$40	\$20
121	York Canyon	Coal	\$100	\$30
72	Emery	Coal	\$60	\$30
26	Marysvale	Gold	\$120	\$40
115	Paxton Springs	Lumber	\$100	\$40
78	<i>Bowie</i>	<i>Coal</i>	<i>\$80</i>	<i>\$40</i>
60	<i>Pagosa Springs</i>	<i>Lumber</i>	<i>\$40</i>	<i>\$20</i>
49	<i>Silverton</i>	<i>Silver</i>	<i>\$140</i>	<i>\$40</i>

Claims in italics are pending a decision on first right of refusal.

Available Passenger Lines

#	Type	Route	Payoff	Cost	Notes
20	C	Salt Lake City – Pueblo	\$600	\$930	
24	C	Denver – El Paso	\$1000	\$1380	
19	C	Salt Lake City – Albuquerque	\$600	\$975	
21	C	Salt Lake City – Colorado Springs	\$600	\$930	

Available Snowplows

Type	# Available	Cost
Die +2	1	\$40
Die +3	4	\$80
Die +4	4	\$140
Die +5	5	\$200

Cats and Dogs

Epoch VI Empire Selection and Ming Dynasty

Deadline Epoch VI Timurid Emirates, Incas & Aztecs, Ottoman Turks, 8/18 Tuesday

Epoch VI Empire Draw

100% Pussycats (Longdin) keeps

Arachnids (Bolduc) keeps

Systematic Chaos (Cain) passes to The Time Traveler

Marching Through the Ages (Lewis) passes to the Royal Manticoran Historical Society

Royal Manticoran Historical Society (Wilson) passes to The Questioner

The Questioner (Partridge) passes to Systematic Chaos

The Time Traveler (Anderson) passes to Marching Through the Ages

Epoch VI

Systematic Chaos (Cain) plays Safavids. Army and Capital Persian Salt Desert (Arab army retreats to Lower Indus), army Lower Indus (vs. Arabs; S: 6, 2; A: 3, 3; S: 4, 1; A: 3, 2; wins), Persian Plateau (vs. Seljuk Turks; Sa: 5, 2; Se: 3; wins). MING DYNASTY: Plays Pestilence in Shatts Plateau (1 Carthaginian army in Shatts Plateau eliminated). Army and Capital Chekiang (Mongol army retreats to Great Plain of China), army Great Plain of China (vs. Mongols; Mi: 6, 3; Mo: 3; Mi: 5, 1; Mo: 6; loses), Great Plain of China (vs. Mongols; Mi: 5, 1; Mo: 5; Mi: 5, 4; Mo: 4; wins), Wei River (vs. Mongols; Mi: 5, 5; Mo: 2; wins), Tarim Basin (vs. Mongols; Mi: 3, 2; Mo: 4; loses), Tarim Basin (vs. Mongols; Mi: 6, 3; Mo: 3; wins), Mongolia (vs. Mongols; Mi: 5, 4; Mo: 2; wins), fleet Sea of Japan (vs. Royal Manticoran Historical Society; SC: 2, 2; RMHS: 3; loses), Sea of Japan (vs. Royal Manticoran Historical Society; SC: 5, 1; RMHS: 4; wins), army Korean Peninsula (vs. Mongols; Mi: 5, 1; Mo: 6, 3; loses). Builds Monument Checkiang. Points: Dominance in China (6), Presence in Middle East (2), India (3), Southern Europe (2), Southeast Asia (2), and Eurasia (1), 2 Capitals (4), 3 Cities (3), 3 Seas (3), and 6 Monuments (6) for 32 points.

Players

Player Name	Player Faction Name/Color	Empire Strength Points	Victory Points
Michael Longdin	100% Pussycats (green)	36	83
Paul Bolduc	Arachnids (blue)	40	66
Andy Lewis	Marching through the Ages (red)	50	116
Kevin Wilson	Royal Manticoran Historical Society (purple)	53	109
Dave Partridge	The Questioner (yellow)	53	107
Dennis Cain	Systematic Chaos (black)	54	133
Dave Anderson	The Time Traveler (orange)	55	127

Positions

Systematic Chaos: Fleets South China Sea, Bay of Bengal, Sea of Japan. GREEK CITY STATES: Army and city Crete. HAN DYNASTY: Army and city Yellow River, army East Indies. MALAYAN KINGDOM: Army, city, Fort, and Monument Malayan Peninsula. SAFAVIDS: Army and Capital Persian Salt Desert, army and Monument Persian Plateau, army Lower Indus. MING DYNASTY: Army, Capital, and Monument Chekiang, army and Monument Great Plain of China, Wei River, Tarim Basin, army Mongolia.

100% Pussycats: CIVIL WAR: Two armies and city Morea. CELTS: Two armies and a fort Albion, army and fort Pyrenees. KHMERS: Army Si-Kyang. SELJUK TURKS: Army, city, and Monument Eastern Ghats, army and Monument Upper Indus, armies Turanian Plain, Hindu Kush, Ganges Valley, Eastern Deccan.

Marching Through the Ages: Fleet Western Mediterranean. MAYANS: Army and Capital Central America, army Guiana Highlands. HSUING-NU: Army Mongolia. HUNS: Two armies and Monument Ganges Delta, armies Dniepr, Western Steppe. SOUTHERN IBERIAN KINGDOM: Army Southern Iberia. FRANKS: Two armies and Capital Northern Gaul, army and city Balkans, army and Monument Southern Apennines, armies Central Massif, Pindus.

The Time Traveler: Fleet Red Sea. INDUS VALLEY: Three armies Western Ghats. CARTHAGINIA: Two armies, Capital, and Fort Shatts Plateau, armies Libya, Western Gaul. MACEDONIA: Army and Monument Nile Delta. HIGHLAND KINGDOM: Army, city, and Fort Highlands. ARABS: Army, Capital, and Monument Arabian Peninsula, army and Monument Levant, Upper Tigris, armies Nubia, Upper Nile, Palestine, Middle Tigris. HOLY ROMAN EMPIRE: Army, Capital and Monument Central Europe, armies Dalmatia, Baltic Seaboard, North European Plain, Zagros.

Royal Manticoran Historical Society: Fleets Black Sea and Eastern Mediterranean. SUB-SAHARAN MIGRANTS: Armies East Africa and Madagascar. CIVIL WAR: Army and Monument Levant. SASSANIDS: Army and Monument Lower Tigris. BYZANTINES: Armies Northern Apennines, Western Anatolia, Eastern Anatolia. MONGOLS: Army, city, and Monument Hokkaido, army and city Yangtse Kian, Szechuan, Mekong, armies Eastern Steppe, Manchurian Plain, Korean Peninsula, Honshu, Chekiang, Irrawaddy.

The Questioner: ROMANS: Two armies Western Iberia. GUPTAS: Army Western Deccan.

Arachnids: Fleets North Sea, Atlantic Ocean. NORTH AMERICAN MIGRANTS: Armies Great Lakes, Great Plains. GOTHS: Armies Danubia, Caucuses.

VIKINGS: Armies Scandinavia, Ireland, Baltic Seaboard, West Indies.

Event Cards

Epoch VI Empire

Greyhound

Turn 5, Phase 7 and Turn 6, Phases 1 through 3
Deadline Turn 6, Phases 3 through 6, 8/18 Tuesday

Turn 5, Phase 7 – Purchase Tokens

Venice buys 15 tokens

Genoa buys 22 tokens

Barcelona buys 30 tokens

Paris buys 10 tokens

Hamburg buys 28 tokens

London buys 14 tokens

Turn 6, Phase 1 – Draw Cards

Done

Phase 2 – Buy Cards

Barcelona bought a card.

Phase 3 – Play Cards

Paris passes

London plays Civil War on Barcelona (must discard 15 tokens or \$38) and Metal (London gains \$96, Hamburg and Paris each gain \$6)

Venice plays Mysticism Abounds (Misery increases: Venice to 40, Hamburg to 90, Paris to 100, London to 125, Barcelona to 90, and Genoa to 100) and Revolutionary Uprisings (Misery increases: Hamburg to 100, Paris to 125, London to 150, Barcelona to 125, and Genoa to 125).

Genoa plays Grain (Genoa gains \$36, Hamburg gains \$16, and Paris and London each gain \$4), Charlemagne

Hamburg plays Fur (Hamburg gains \$28, Barcelona and Genoa each gain \$7), Johann Gutenberg, and Pirates/Vikings on Trebizond, Poti, and Erzerum

Barcelona plays Leonardo da Vinci (20: B, P, Q) and Cloth/Wine as Wine (Paris gains \$80, Barcelona gains \$45, and London gains \$20, shortage removed).

Played Leaders

Charlemagne (20: W) – Genoa only

Johann Gutenberg (30: O) – Hamburg and one other

Leonardo da Vinci (20: B, P, Q) -- Barcelona and two others

The Players

Player	Country	Misery	Tokens	Money	Order	Dominance	Ships	Cards	Advances
Michael Longdin	Venice	40	15	\$40	3	6	4	0	A, B, C, N, O
Dave Partridge	Hamburg	100	28	\$131	5	11	4	3	A, I, F, N, R
Bob Robles	Paris	125	10	\$183	1	12	6	2	A, E, F, I, N, V, W
Dave Hood	London	150	14	\$212	2	14	6	5	A, B, E, F, H, I, N, V, X
Steve Koehler	Barcelona	125	30	\$117	6	9	10	6	A, E, F, H, I, J, N, R, S, V, W, X
Robert Koehler	Genoa	125	22	\$101	4	8	4	3	F, I, V

Players are listed in reverse tie breaking order.

Commodity Log

Commodity	Michael	Dave P.	Bob	Dave H.	Steve	Robert
Stone (2)	2	1	4	--	--	1
Wool (3)	--	1	1	4	2	1
Timber (4)	1	2	1	2	--	--
Grain (5)	--	2	1	1	--	3
Cloth (6)	3	1	1	--	--	2
Wine (7)	--	--	3	1	2	--
Metal (8)	--	1	1	4	--	--
Fur (9)	--	2	--	--	1	1
Silk (10)	--	--	--	1	1	--
Spice (11)	--	--	--	--	--	--
Gold (12)	--	1	--	--	1	--
Ivory (12)	--	--	--	1	2	--

*Cards***Shortage, Surplus****Gaspode**

Turn 11
Turn 12, 8/18 Tuesday

Turn 11

Andy Y. chooses the Builder (gains 1 doubloon), and builds a Coffee Roaster for 5 doubloons (1 credit for Builder), Dave passes, Andy L. builds a Residence for 7 doubloons (3 credit for Quarries), Chris builds a Large Market for 4 doubloons (1 credit for a Quarry), and Tom builds a Harbour for 5 doubloons (3 credit from Quarries).

Dave chooses the Trader, and trades 1 Indigo for 2 doubloons (1 plus 1 for the Trader bonus), Andy L. trades Sugar for 2 doubloons, Chris trades Coffee for 4 doubloons, and Tom trades Indigo (using Office) for 2 doubloons (1 plus 1 for Small Market).

Andy L. chooses the Craftsman (gains 1 doubloon) and produces 3 Coffee, 1 Sugar, 1 Indigo, and 3 Corn (gains 3 doubloons from the Factory), Chris produces 2 Corn,

1 Indigo, 1 Sugar, 2 Tobacco, and 1 Coffee (gains 5 doubloons from Factory), Tom produces 2 Corn, 1 Indigo, 2 Sugar, and 1 Tobacco, Andy Y. produces 1 Corn, 3 Indigo, and 1 Sugar, and Dave produces 3 Indigo and 1 Sugar.

Chris chooses the Captain, and ships 2 Corn on Ship 1 (3 VP), Tom ships 2 Corn on Ship 1 (2VP), Andy Y. ships 4 Indigo on Ship 3 (4VP), Dave ships 3 Indigo on Ship 3 (3VP), Andy L. ships 2 Corn on Ship 1 (2VP, ship sails), Chris ships 1 Indigo on Ship 3 (1 VP, ship sails), Tom ships 1 Tobacco on Ship 2 (1VP, ship sails). Andy Y. discards 1 Corn, Andy L. discards 2 Indigo and 1 Sugar, Chris discards 1 Sugar and 2 Tobacco, and Tom discards 1 Indigo and 1 Sugar.

Tom chooses the Settler and chooses a Tobacco plantation, Andy Y. chooses a Coffee plantation, Dave passes, Andy L. passes, and Chris chooses an Indigo plantation.

The Players

Player Name	Role	Plantations	Buildings	San Juan	Doubloons	Stored Production	VP
Andy York	Builder	Indigo, Indigo, Indigo, Sugar, Tobacco, Corn, Coffee, Sugar, Coffee	Indigo Plant (x3), Small Sugar Mill, Tobacco Storage (x2), Sugar Mill (x1), Coffee Roaster		3	1 Sugar	20
Dave Partridge	Trader	Indigo, Quarry, Corn, Indigo, Indigo, Indigo, Coffee, Tobacco, Sugar, Coffee, Tobacco, Corn	Small Indigo Plant, Hacienda, Indigo Plant (x3), Office, Small Sugar Mill	1	4	1 Sugar	14
Andy Lewis	Craftsman	Indigo, Corn, Quarry, Sugar, Quarry, Coffee, Quarry, Corn, Corn, Tobacco, Coffee, Sugar	Hacienda, Construction Hut, Small Indigo Plant, Small Sugar Mill, Coffee Roaster (x2), Factory, Large Warehouse, Residence		7	3 Corn, 1 Sugar, 3 Coffee	16
Chris Geggus	Captain	Corn, Tobacco, Tobacco, Quarry, Sugar, Coffee, Corn, Indigo, Indigo, Indigo	Small Market, Tobacco Storage (x2), Coffee Roaster (x1), Small Sugar Mill, Indigo Plant, Factory, Large Market		9	1 Coffee	19
Tom Howell	Settler	Corn, Tobacco, Quarry, Quarry, Quarry, Corn, Indigo, Sugar, Sugar, Tobacco	Construction Hut, Small Market, Tobacco Storage (x1), Small Indigo Plant, Office, Sugar Mill (x2), Harbour		3	1 Sugar	14

Player in bold is the Governor. Plantations and buildings in bold are manned. Buildings that can be manned by more than one colonist will have the number manning them in parentheses after the building name.

Available Items

Colonists: Supply: 2 Colonist Ship: 11

Trading House:

Cargo Ships: Ship 1 (capacity 6):

Ship 2 (capacity 7):

Ship 3 (capacity 8):

Victory Points: 41

Commodities

Corn: 7

Indigo: 11

Sugar: 8

Tobacco: 9

Coffee: 5

Buildings

Column 1	Column 2	Column 3	Column 4
Small Indigo Plant			Guild Hall
	Sugar Mill		
	Hospice (x2)		Fortress
		University (x2)	Customs House
	Large Market	Harbour	City Hall
Small Warehouse (x2)	Large Warehouse	Wharf (x2)	

Roles

Builder, Captain, Craftsman, Mayor (1d), Prospector (2d), Prospector (1d), Settler, Trader

Plantations

Sugar, Tobacco, Sugar, Coffee, Indigo

Discard Pile:

Robover

Turn 5

Turn 6, 8/18 Tuesday

Program Robots

Narbot and Jeeves schedule a shut downs for next turn. 100% Robotomy re-appears on the board at C12 facing East.

Robot	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
DizzyBot	Rotate Right (80)	Move 2 (700)	Move 1 (640)	Rotate Left (130)	U-Turn (10)
Slambot 9000	Powered down				
Jeeves	Rotate Right (140)	Move 1 (580)	Rotate Right (400)	Rotate Right (360)	Move 2 (690)
THX 1139	Move 2 (710)	Move 2 (750)	Rotate Right (100)	Move 1 (610)	Rotate Left (90)

Dalekbot	Rotate Left (70)	Move 2 (730)	Move 2 (760)	Move 1 (490)	Move 1 (560)
Narbot	<i>U-Turn (50)</i>	<i>Move 2 (720)</i>	<i>Rotate Right (160)</i>	<i>Move 1 (660)</i>	<i>Move 1 (540)</i>
100% Robotomy	Rotate Right (220)	Rotate Left (290)	Move 1 (590)	Rotate Right (380)	Rotate Left (170)
Protomax	Move 3 (840)	Move 3 (800)	<i>Rotate Right (200)</i>	<i>Rotate Left (110)</i>	<i>Rotate Right (300)</i>

Locked registers are in italics.

Phase 1

Protomax dashes ahead 3 to K15, THX 1139 moves ahead 2 to D11, 100% Robotomy rotates right to face south, Jeeves rotates right to face east, DizzyBot rotates right to face north, Dalekbot rotates left to face north, and Narbot makes a U-turn to face west. Conveyor belts: DizzyBot is moved to J15 and rotated to face east, THX 1139 is moved to E11, Dalekbot is moved to E21 and rotated to face east, 100% Robotomy is moved to D12 and rotated to face east, Jeeves is moved to I11, and Protomax is moved to K16. The gear rotates Jeeves to face south. Narbot shoots Protomax (register 4 locked), and THX 1139 is shot by the on-board laser.

Phase 2

Protomax zooms ahead 3 to K13, THX 1139 moves ahead 2 to E9, Dalekbot moves ahead 2 to G21, Narbot moves ahead 2 to J16, DizzyBot moves ahead 2 to L15, Jeeves moves ahead 1 to I12, and 100% Robotomy rotates left to face north. Conveyor belts: Narbot is moved to J18, Jeeves is moved to I13, Dalekbot is moved to F21, and 100% Robotomy is moved to D11 and rotated to face east. The pusher pushes DizzyBot to K15, and the on-board laser shoots THX 1139.

Phase 3

Dalekbot moves ahead 2 to H21, DizzyBot moves ahead 1 to L15, 100% Robotomy moves ahead 1 to E11, Jeeves rotates right to face west, Protomax rotates right to face east, Narbot rotates right to face north, and THX 1139 rotates right to face east. Conveyor belts: Narbot is moved to J20, Dalekbot is moved to G21, and 100% Robotomy is moved to F11. The on-board lasers shoot THX 1139 and Dalekbot.

Phase 4

Narbot moves ahead 1 to J19, THX 1139 moves ahead 1 to F9 (archive is relocated), Dalekbot moves ahead 1 to H21, 100% Robotomy rotates right to face south, Jeeves rotates right to face north, DizzyBot rotates left to face north, and Protomax rotates left to face north. Conveyor belts: Narbot is moved to J21, Dalekbot is moved to G21, and 100% Robotomy is moved to G11. The pusher pushes DizzyBot to K15. DizzyBot shoots Protomax (register 3 locked), Dalekbot shoots Narbot, eliminating the Gyroscopic Stabilizer, and the on-board laser shoots Dalekbot.

Phase 5

Jeeves moves ahead 2 to I11, Dalekbot moves ahead 1 to H21, Narbot moves ahead 1 to J21, Protomax rotates right to face east, 100% Robotomy rotates left to face east, THX 1139 rotates left to face north, and DizzyBot makes a U-turn to face south. Conveyor belts: Narbot is moved to J22 and rotated to face east, DizzyBot is moved to K16, Dalekbot is moved to G21, and 100% Robotomy is moved to H11. The gear rotates Jeeves to face east. 100% Robotomy shoots Jeeves (register 3 locked) and the on-board laser shoots Dalekbot.

Cleanup

THX 1139 is repaired one. Note: flags must be touched in order to count.

Players

#	Player Name	Robot Name	Color	Options	Position	Flags	Lives	Damage
1	Dave Partridge	DizzyBot	Blue		K16>S		3	1
2	Bill Scharf	Slambot 9000	Pink	Tractor Beam	A11>W		3	0
3	Chris Geggus	Jeeves	Yellow		I11>E		3	7
4	Dave Hooton	THX 1139	White	Recompile, Double-Barreled Laser	F9>N		3	2
5	Andy York	Dalekbot	Silver		G21>E		3	3
6	Ward Narhi	Narbot	Red		J22>E		3	9
7	Michael Longdin	100% Robotomy	Dark Green		H11>E		2	2
8	Cary Nichols	Protomax	Green	Abort Switch	K13>E		3	7

Your Program Cards:

Husky

Turn 1, Phases 3 through 5
Turn 2, Phase 2, 8/18 Tuesday

Players

Order	Player Name	Company Name	Color	Power Plants	Cities	Money
5	Michael Longdin	100% Power Mad	Green	04 Coal 2→1 (2)	1	53
2	Dave Hooton	Volksich Tzapverein (VoIT)	Orange	08 Coal 3→2	2	40
4	Dave Partridge	Spewing Massive Oid Gasses (SMOG)	Red	05 Hybrid 2→1	1	53
3	Andy York	Deutsches Elektrisch Arbeit Direktor (DEAD)	Yellow	07 Oil 3→2	2	35
1	Brad Martin	Renewal Energy Matters (REM)	Blue	10 Coal 2→2	2	44

Phase 3, Purchase Resources

100% Power Mad buys 4 coal for 5 Elektros
SMOG buys 2 coal for 4 Elektros

DEAD buys 3 oil for 9 Elektros.
VoIT buys 3 coal for 9 Elektros

REM buys 2 coal for 8 Elektros

100% Power Mad connects to Dortmund (10 Elektros)
SMOG connects to Essen (10 Elektros)
DEAD connects to Halle (10 Elektros) and Magdeburg (21 Elektros)

VoIT connects to Kiel (10 Elektros) and Lubeck (14 Elektros)
REM connects to Wiesbaden (10 Elektros) and Frankfurt-M (10 Elektros)

Phase 4, Connect Cities

Phase 5, Bureaucracy

Produce Electricity

100% Power Mad burns 2 coal and produces for 1 city, gaining 22 Elektros
SMOG burns 2 coal and produces for 1 city, gaining 22 Elektros
DEAD burns 3 oil and produces for 2 cities, gaining 33 Elektros

VoIT burns 3 coal and produces for 2 cities, gaining 33 Elektros
REM burns 2 coal and produces for 2 cities, gaining 33 Elektros

Replenish Resources

5 coal, 4 oil, 3 trash, and 2 uranium added to the fuel market.

Adjust Power Plant Market

Plant 46 moved to the bottom of the deck, replaced by plant 32.

Turn 2, Phase 1, Determine Player Order

Turn order remains unchanged.

Power Plant Market

Current Market

03 Oil 2→1
22 Eco X→2
06 Trash 1→1
32 Oil 3→6

09 Oil 1→1
35 Oil 1→5
13 Eco X→1
39 Nuclear 1→6

Future Market

Fuel

Price	1	2	3	4	5	6	7	8	10	12	14	16
Uranium									1	1	1	1
Trash					3	3	3					
Oil		1	3	3	3	3	3	3				
Coal			3	3	3	3	3	3				

Pateel

Influence Declaration

Turn 1 Cure through Health, 8/18 Tuesday

Initial Influence Declaration

KMFC declares 8 IP on Boremtodev and 5 IP on Wasolin

Politburo

Office	Politician	Condition	Influence
Party Chief	Nestor Aparatschik (A)	80	
KGB Head	Karel Krakemheds (E)	72	
Foreign	Igor Doberman (L)	65, weak	
Defense	Eduard Boremtodev (K)	66	8 (KMFC)
Ideology	Victor Wasolin (Z)	50	5 (KMFC)
Industry	Ludmilla Patina (S)	58	
Economy	Boris Badenuff (X)	53, weak	
Sport	Mikail Strychnin (T)	57	

Candidates: G, H, P, Q, R
People: B, C, D, F, I, J, M, N, O, U, V, W, Y
Siberia: None (yet)

Players

Faction Name

Bob Robles	Karl Marx Fan Club
Ward Narhi	Finlandia
Pasquale Giovine	Bolshevics Born in Calabria
Mike Scott	The California Connection
Bill Scharf	People are Heroes
Brad Martin	Zapadniye Front

Intrigue Cards

Undeclared Influence

Frontier Dog

Initial Setup

Turn 1, 8/18 Tuesday

Old Man (Bolduc) sets up in F18 facing F17
Shaggy (Lewis) sets up in G18 facing F17

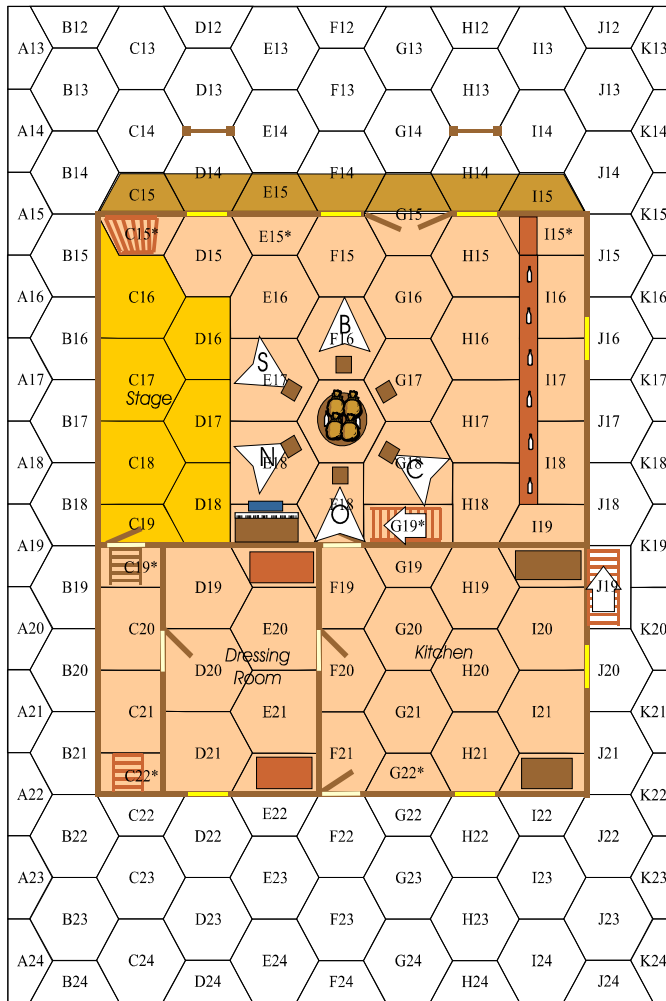
Banker (Pratt) sets up in F16 facing F15
Smith (Scott) sets up in E17 facing F17

NCO (Geggus) sets up in E18 facing F17

Westerners

Side	Player	Character	Location	Bonus Cards	Skills	Delay	Endurance	Comments
A	Paul Bolduc	Old Man (O)	F18>F17	5, 7, 8	BR +1		25	
B	Andy Lewis	Shaggy (C)	G18>F17				20	
C	James Pratt	Banker (B)	F16>F15				20	
D	Mike Scott	Smith (S)	E17>F17	8	BR +2		30	
E	Chris Geggus	NCO (N)	E18>F17	9	BR +1		20	

Frontier Dog



	Hitching Post		Door		Bottle
	Stairs		Window		Money Bag
	Player (up)		Table		Player (dead)
	Gun		Chair		Aim Points
	Knife				Player (down)

Weapons

Character	Holstered	Gun Hand	Other Hand	Both Hands	Ammo
Old Man	C36c, Knife	Empty	Empty	Empty	C36c: △△△△△△
Shaggy	C45, Knife	Empty	Empty	Empty	C45: OOOOOO
Banker	SW45	Empty	Empty	Empty	SW45: OOOOOO
Smith	C45c, Knife	Empty	Empty	Empty	C45c: △△△△△△
NCO	C41, SBR	Empty	Empty	Empty	C41: OOOOOO

Procyon Initial Setup

Turns 1.1 through 2.1, 8/18 Tuesday

1st: Andy Lewis (Humans/Mystery Machine 5)

Has \$130 on hand. Die rolls: 1: 1, 2, 2 2: 2, 2, 3

2nd: Dennis Cain (Dell/Step 3 – Profit!)

Has \$118 on hand. Die rolls: 1, 4 (Use 1 * 3)

3rd: Bob Robles (Eepeeep/Beep Whine Squeel)

Has \$140 on hand. Die rolls: 1, 3, 5

4th: Andy York (Qossuth/Qossuth Entrepreneur Division)

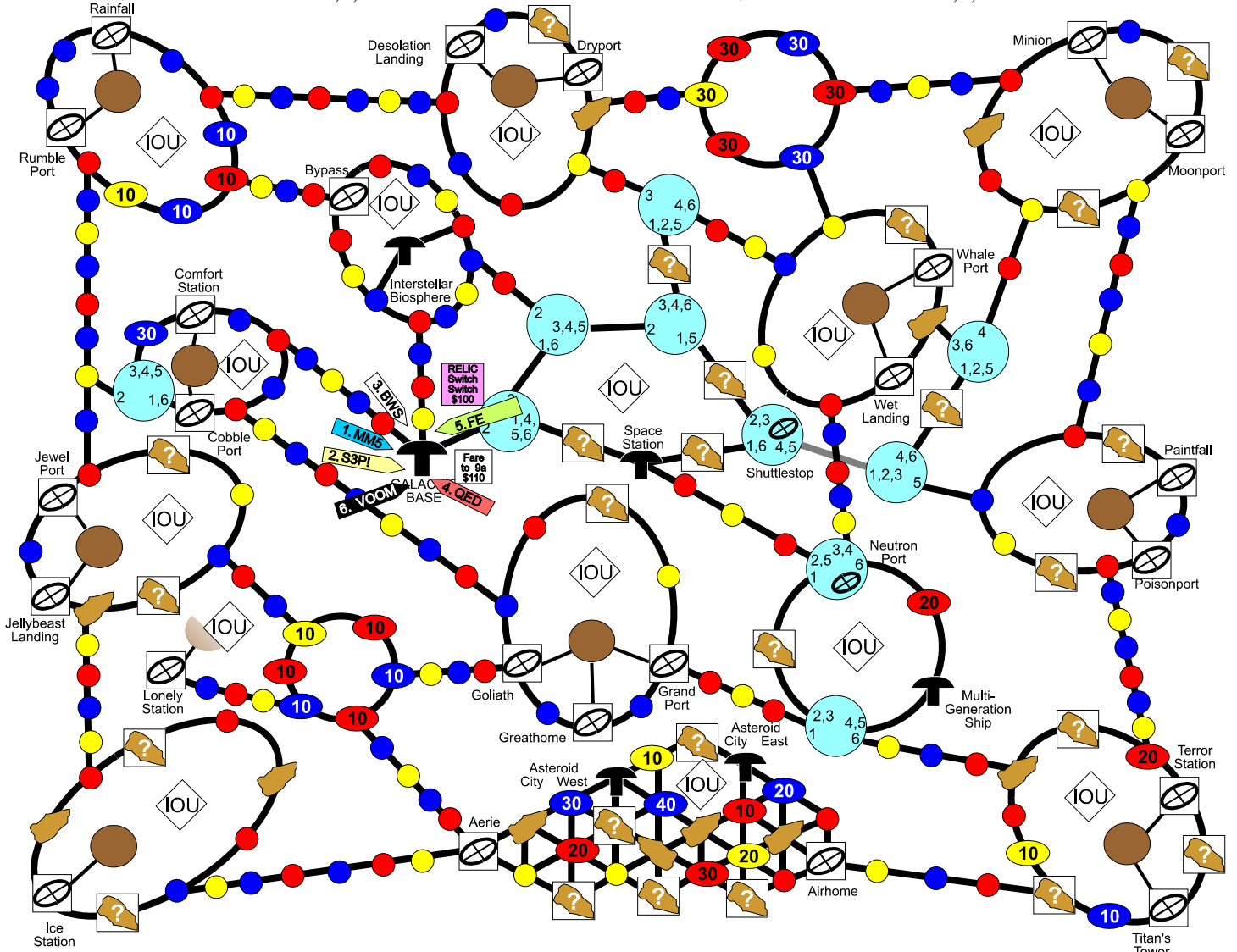
Has \$120 on hand. Die rolls: 2, 6 (Use 1 * 3)

5th: Chris Geggus (Niks/Fluffy Enterprises)

Has \$140 on hand. Die rolls: 2, 4, 6

6th: Dave Partridge (Whynoms/Venus-Orion Oligarch Merchante)

Has \$140 on hand. Die rolls: 2, 5, 6



1. Mystery Machine 5 \$130 Scout 1: 1 2 2 2: 2 2 3 Hold1 Hold2 Hull
--

2. Step 3 -- Profit! \$118 Needle 1: 1 4 (use 1*3) Hold1 Hold2 Hull
--

3. Beep Whine Squeel \$140 Scout 1: 1 3 5 Hold1 Hold2 Hull

4. Qossuth Entrepreneur Division \$120 Needle 1: 2 6 (use 1*3) Hold1 Hold2 Hull
--

5. Fluffy Enterprises \$140 Scout 1: 2 4 6 Hold1 Hold2 Hull
--

6. VOOM \$140 Scout 1: 2 5 6 Hold1 Hold2 Hull
--

The first 20 draws from the cup are as follows:

1a (Nillis): 2 Bionic Perfume

1b (Volois): Voll Silk

2 (Graw): Space Sice

3 (Niks): Demand for Voll Silk (+\$60), Demand for Space Spice (+\$60)

4a (Dell): Nothing

4b (Humans): Nothing

4c (Wraiths): Demand for Bionic Perfume (+\$60)

5 (Shenna): Nothing

6 (Yxklyx): 2 Immortal Grease

Upon discovery of each new culture, four more chits will be drawn from the cup, until it is its normal size after all cultures have been discovered. The use of the Combat rules was voted down 4 no votes and 2 abstentions.

Well, that about covers it. Happy trading!

7a (Zum): 3 Chicle Liquor, Fare to 4c (\$110)

7b (Eepeeep): Demand for Immortal Grease (+\$50), Demand for Finest Dust (+\$50)

8 (Whynoms): Nothing

9a (Chola): 2 Designer Genes

9b (Wollow): Nothing

10 (Qossuth): Demand for Designer Genes (+\$60)

Base: Fare to 9a (\$110), Switch Switch Relic

Pedagogy

Twenty years ago, scientists had only one example of how planets formed: our own solar system. Since then, an extraordinary deluge of discoveries have revealed dozens of solar systems, each one unique. The incredible diversity of solar systems out there have revealed some of the heretofore unknown complexities of planetary formation and evolution.

It all starts with a giant cloud of gas and dust. Dust in this context are tiny grains, typically micron-sized, of heavier elements: carbonates, silicates, and iron, typically, along with various ices such as water, carbon dioxide, and ammonia. These grains form in the outer atmospheres of red giant stars. The deep convecting layers of such stars dredge up elements formed in the latter stages of nuclear fusion and the strong stellar winds of the stars blow the elements away to cooler realms where they condense. The cloud starts to collapse. In the center, a protostar forms, while the remainder of the collapsing cloud forms a disc of gas and dust around it. The ratio of gas to dust in the disc varies in both time and space. The farther away from the protostar, the more gas. In addition, as the protostar ages and starts its transition into a star, the radiation it gives off tends to blow the gas out of the disc. So, the older the disc, the less gas it has. For the case of planetary formation, however, we can consider the starting point as early, when there is still plenty of gas around.

When the star is about a million years old, the protoplanetary disc surrounding it starts to sort itself out. The dust grains therein collide, sometimes sticking together, sometimes breaking apart. Those hit by direct sunlight re-radiate the energy as heat, ensuring that even the darkest areas of the disc get heated. The temperature, density, and pressure of the gas generally decrease as you get further from the star. Because of the balance of these forces, the disc tends to rotate more slowly than an independent body at the same distance would. Smaller dust grains get swept along with the gas, but larger grains, those more than about a millimeter in size, want to rotate faster, and thus experience something of a "headwind", which causes them to spiral inward. Depending on the size of the star, there is a point, usually from 2 to 4 astronomical units away, where ices, especially water ice, start to vaporize. This is referred to as the "snow line". The snow line is important for a number of reasons. It separates the inner, volatile-poor part of the disc from the outer, volatile-rich part. As dust grains cross that line, its volatiles boil off, typically causing an accumulation of water right at the snow line. It also causes a drop in pressure inside the snow line. This drop in pressure causes the gas to rotate more quickly, and thus dust grains experience a tail wind causing them to spiral out. So, at the snow line, you get an accumulation of dust particles, along with a slush of ices and organic molecules, which encourage the dust particles to stick together. Eventually, the dust grains pack themselves into kilometer-sized planetesimals. Planetesimals form throughout the disc, but the formation is much quicker at the snow line, and the interactions there will frequently throw them into irregular orbits that land them far inside or outside the snow line.

Once most of the mass of dust is bound up in planetesimals, another process takes over. Elliptical orbits tend to circularize due to drag effects of the gas. The planetesimals collide and grow, with larger ones sweeping up a zone and capturing smaller ones in that zone. How big they can grow depends on where they are. In

the inner parts of the disc, these planetary embryos would top out at about 0.1 earth masses, while in the outer parts, they could easily top 4 earth masses. Planetesimals can also grow larger at the snow line or on the edges of gaps within the disc, where planetesimals tend to accumulate. Interactions between the embryos will tend to thin the herd quite a bit, with some thrown clear of the burgeoning solar system, and others thrown on collision courses with the central star. What you eventually get is an oligarchy of moon- to earth-sized planetary embryos.

The defining moment in the formation of any planetary system is the formation of a Jupiter-mass planet. Such a planet typically starts as an embryo about the size of the earth that accumulated 300 times its mass in gas. There are a few competing processes that affect this. The first is the fact that infalling gas heats up. In order for it to settle on the growing planet, it must cool off. The efficiency of the cooling depends on a number of factors, not least of which is the composition of the gas and the opacity of the outer layers. Competing against this is the fact that a planetary embryo of this size generates waves in the surrounding gas. These waves generate an unbalanced torque on the planet, slowing it down and causing it to spiral inward. Since the inner areas of the disc are both poorer in gas and warmer, this poses problems. First of all, there is less gas to accumulate, and secondly, cooling is less efficient in warmer surroundings. The inward spiraling does tend to stall at the snow line, where the gas head wind turns into a tail wind. The accumulation of material here also helps to encourage planetary growth. This may well be the reason why Jupiter is where it is, since the snow line in the early solar system would be just inside its current orbit. The bottom line on gas giant formation is that embryo growth, embryo migration, and gas depletion within the disc would all tend to occur at roughly the same rate, and which wins out is determined largely by the luck of the draw. Only about 10% of sun like stars examined so far have gas giants around them. Once the gas giant reaches a certain point, growth accelerates at a rapid rate. Within 1000 years, a Jupiter-mass planet can gain half of its eventual mass. The planet stabilizes when it becomes massive enough that it moves the disc rather than the disc moving it. Gas interior to the planet gets pulled back by the planet's gravity, causing it to spiral inward, while the opposite happens with gas exterior to the planet. Thus the planet clears a channel in the disc, slowing or stopping planetary growth. How big it gets depends on the density of the disc and the timing of when the planet forms.

The formation of the first gas giant has profound affects on the system as a whole. First of all, it can trigger the formation of additional gas giants, as well as terrestrial planets. The gas giant clears out a gap in the disc at its orbit. This gap acts as a moat, allowing material to pile up outside its orbit and thus encouraging the formation of an additional gas giant right there. Gas giants also help to foster the formation of terrestrial planets. Planetary embryos, when they form, have nearly circular orbits. However, since there is little gas in the inner disc, the only way terrestrial planets can grow is for the embryos to coalesce. The gas giant can foster this process by perturbing the orbits of the embryos, or by flinging planetesimals from the outer disc into the inner disc.

Many of the planetary systems we have observed contain gas giants very close to their parent stars – so close that they could not possibly have formed there.

How did they get there? The most likely explanation is that the disc did it. Friction within the disc can cause it to slow down and spiral in. This spiraling can drag the gas giant with it, until it is so close to the star that tidal affects circularize and stabilize its orbit.

The final process that takes place during the formation of a planetary system, is the clean-up. When most of the gas has been blown away, and most of the planetesimals have been absorbed into planets, there is still quite a lot of debris left over. Gravitational interactions between the debris and the planets take care of this.

The debris either gets flung out of the system entirely, or it gets flung into the inner system where it either hits a planet or the central star. These interactions cause the planets orbits to migrate, and the migration could very well cause an instability that wildly relocates a planet, perhaps even ejects it from the system entirely. It could easily take a billion years before things settle down to a state similar to what we have in our solar system.

Next time, does quantum theory predict a Big Bounce?

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Standbys

Anybody who gets onto my standby list automatically receives one free issue of *S.O.B.* In addition, if you actually submit standby orders, you get another free issue. So, let's get those people standing by. The current standby list is:

Machiavelli (gunboat and regular): Steve Koehler, Bill Scharf, Bob Robles, Mike Scott, Ward Narhi, Paul Bolduc, Pasquale Giovine, Andy York, Cary Nichols, Lee McConnell, Dave Partridge, Dale Horsely, Brad Martin **Dune:** Steve Koehler, Paul Bolduc, Kevin Wilson, Ward Narhi, Andy York, Cary Nichols, Bill Scharf, Dave Partridge, Brad Martin **New World:** Andy York, Bill Scharf, Cary Nichols, Dave Partridge, Brad Martin **Merchant of Venus:** Paul Bolduc, Carrie Lewis, Bob Robles, Andy York, Cary Nichols, Dave Partridge **Outpost:** Michael Lowrey, Kevin Wilson, Andy York, Cary Nichols, Bill Scharf, Dave Partridge, Brad Martin **History of the World:** Andy Lewis, Paul Bolduc, Kevin Wilson, Chris Geggus, Andy York, Cary Nichols, Dave Partridge, Brad Martin **Stellar Conquest:** Paul Bolduc, Kevin Wilson, Andy York, Cary Nichols, Dave Partridge, Brad Martin **Liftoff!:** Dennis Cain, Andy York, Cary Nichols, Bill Scharf, Dave Partridge, Brad Martin **Age of Renaissance:** Bob Robles, Michael Lowrey, Cary Nichols, Dave Partridge, Michael Longdin, Brad Martin **Kremlin:** Andy York, Andy Lewis, Pasquale Giovine, Cary Nichols, Bill Scharf, Dave Partridge, Michael Longdin, Brad Martin **Silverton:** Cary Nichols, Bill Scharf, Dave Partridge, Brad Martin, Andy York, Eric Brosius **Settlers of Catan:** Michael Lowrey, Chris Geggus, Cary Nichols, Dave Partridge, Brad Martin, Andy York **Gunslinger:** none **Industrial Waste:** Michael Longdin, Brad Martin **Puerto Rico:** Brad Martin, Andy York **Power Grid:** Brad Martin, Andy York **Robo Rally:** Andy York

Standby Calls