



TeamWerk

THE OFFICIAL NEWSLETTER OF WERK THOROUGHBRED CONSULTANTS

Prospecting for an Outcross

by Jack Werk

The arrival of affordable personal computers in the early eighties has had a dramatic effect on thoroughbred breeding decisions over the past 20 years. Beginning in the late seventies, Steven Roman's dosage system gained national popularity, due largely to noted pedigree authority Leon Rasmussen's endorsement of dosage in his "Bloodlines" column in the Daily Racing Form. Not coincidentally, its popularity among breeders peaked during the eighties when personal computers were making their way into America's homes, enabling breeders and handicappers to construct dosage profiles. For handicappers, Roman dosage became the key to picking Kentucky Derby winners. And, it was the initially only game in town for breeders who were looking for a systematic way to analyze pedigrees, at least until they finally realized that it is a predictor of aptitude, not attainment.

Werk Thoroughbred Consultants was in the right place at the right time with its computerized approach to the evaluation of sire-line crosses, and, unlike dosage, nicks are not just a fad. Great breeders for over 200 years have used them in making their breeding and purchasing decisions. WTC was the first to use computer power to systematically identify and rate both favorable and unfavorable sire-line crosses. Today the Werk Nick Rating™ is recognized as the industry standard and is used by more breeders than any pedigree factor.

Computerized pedigree assessment also increased awareness of inbreeding at a time when it was favored by populational factors. As far as trends go, inbreeding is half-way between a fad (dosage) and a permanent fixture (nicks). This was best expressed by Rasmussen in his 1990 OwnerBreeder article titled "Take a Deep Breath" in which he advocated the need for inbreeding: "We breathe in (inbreed) and we breathe out (outcross). Right now, intelligent Thoroughbred breeding should be in a 'breathing in' mode." And Rasmussen was right on the mark in 1990. Now, 13 years later, the thoroughbred breed des-

perately needs to "breathe out" in my opinion.

The problem centers on the current practice of inbreeding to Mr. Prospector. I want to make it clear that I am not saying that inbreeding to Mr. Prospector hasn't worked. To date, there have been 49 unrestricted stakes winners inbred to Mr. Prospector worldwide, and six of those are G1 winners (Strategic Maneuver, El Corredor, Volponi, Storming Home, Whywhywhy, and Elusive City). But, twice the number of stakes winners were inbred to Northern Dancer at a comparable stage following his stud career. For a variety of reasons inbreeding to Mr. Prospector is not as effective as inbreeding to Northern Dancer, but this may also suggest that the overall effectiveness of inbreeding is cycling into decline.

It's true that Mr. Prospector has a disadvantage as to phenotype, but the main problem is the state of the population. Inbreeding to Mr. Prospector must cope with two conditions which, together, pose a significant challenge. The first is the success of the Mr. Prospector-Northern Dancer cross, which has yielded over 100 G1 winners worldwide. This in itself would have little effect on the prospects of inbreeding to Mr. Prospector. But those prospects have been preceded by a decade of inbreeding to Northern Dancer. The dominance of both Mr. Prospector and Northern Dancer in the stallion population means that the pressure is building to inbreed to both of these ancestors.

As Table 1 shows, 50 stallions stood in the U.S. for a stud fee of \$50,000 or more in 2003, and 52% of these stallions (26/50) carry a strain of Mr. Prospector while 58% (29/50) carry one or more strains of Northern Dancer. Furthermore, 30% (15/50) carry both! Meanwhile, just one in five has a pedigree free of both Mr. Prospector and Northern Dancer.

The top tier of the U.S. stallion population is affected most, precisely because of its success. Commercial mares are bred to the best stallions. The best progeny from these matings become breeding stock. Of the nine stallions standing for a stud fee of \$100,000 or more, four of them—Seeking the Gold, Kingmambo, Fusaichi Pegasus and Gone West—are sons of Mr. Prospector, and two of them—Danzig and Storm Cat—are sons of Northern Dancer. A.P. Indy is the only stallion standing for

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Table 1: U.S.-BASED STALLIONS WITH A STUD FEE OF \$50,000 OR MORE IN 2003

(1st, 2nd, 3rd, and 4th represent the generation
Mr. Prospector {Mr. P} or Northern Dancer {No. D} appears
in the pedigree of the stallion)

STALLION	'03 STUD FEE	MR. P	NO. D	Both
STORM CAT	\$500,000	1st		
A.P. INDY	\$300,000			
DANZIG	Private		1st	
SEEKING THE GOLD	\$225,000	1st		
KINGMAMBO *	\$200,000	1st	3rd	Both
FUSAICHI PEGASUS *	\$125,000	1st	3rd	Both
GIANT'S CAUSEWAY	\$125,000		2nd	
GONE WEST	\$125,000	1st		
DEPUTY MINISTER	\$100,000		2nd	
UNBRIDLED'S SONG	\$100,000	3rd		
RAHY	\$80,000			
EL PRADO	\$75,000		2nd	
POINT GIVEN *	\$75,000	3rd	4th	Both
PULPIT	\$75,000	2nd		
THEATRICAL	\$75,000		2nd	
THUNDER GULCH *	\$65,000	2nd	3rd	Both
COZZENE	\$60,000			
DIXIELAND BAND	\$60,000		1st	
FOREST WILDCAT	\$60,000		2nd	
WAR CHANT *	\$60,000	3rd	2nd	Both
AWESOME AGAIN *	\$50,000	3rd	3rd	Both
CORONADO'S QUEST	\$50,000	2nd		
DYNAFORMER	\$50,000			
FORESTRY	\$50,000		3rd	
GULCH	\$50,000	1st		
LEMON DROP KID *	\$50,000	2nd	4th	Both
MR. GREELEY	\$50,000	2nd		
SUMMER SQUALL	\$50,000		2nd	
TOUCH GOLD	\$50,000		3rd, 3rd	
WILD AGAIN	\$50,000			
RED RANSOM	\$45,000			
MT. LIVERMORE	\$40,000			
SILVER DEPUTY *	\$40,000	2nd	3rd	Both
CARSON CITY *	\$35,000	1st	4th	Both
CAT THIEF	\$35,000		3rd	
HENNESSY	\$35,000		3rd	
MARIA'S MON	\$35,000			
OUR EMBLEM	\$35,000	1st		
QUIET AMERICAN	\$35,000	2nd		
CAPOTE	\$30,000			
DIESIS	\$30,000			
DISTORTED HUMOR *	\$30,000	2nd	3rd	Both
DIXIE UNION *	\$30,000	3rd	2nd	Both
ELUSIVE QUALITY *	\$30,000	2nd	3rd	Both
GRAND SLAM *	\$30,000	2nd	3rd	Both
HIGH YIELD *	\$30,000	3rd	3rd, 4th	Both
JOHANNESBURG *	\$30,000	3rd	4th	Both
STREET CRY	\$30,000	2nd		
TIZNOW	\$30,000		4th, 4th	
WOODMAN	\$30,000	1st		

* Stallions with both Mr. Prospector and Northern Dancer in their pedigrees.

Table 2: Stallions who have gone to stud since 1998 standing for \$30,000 or more

Yr Stud	STALLION	'03 STUD FEE	MR. P	NO. D	Both
2001	FUSAICHI PEGASUS	\$125,000	1st	3rd	Both
2001	GIANT'S CAUSEWAY	\$125,000		2nd	
1998	UNBRIDLED'S SONG	\$100,000	3rd		
2002	POINT GIVEN	\$75,000	3rd	4th	Both
1998	PULPIT	\$75,000	2nd		
2001	WAR CHANT	\$60,000	3rd	2nd	Both
1999	AWESOME AGAIN	\$50,000	3rd	3rd	Both
1999	CORONADO'S QUEST	\$50,000	2nd		
2000	FORESTRY	\$50,000		3rd	
2001	LEMON DROP KID	\$50,000	2nd	4th	Both
1999	TOUCH GOLD	\$50,000		3rd, 3rd	
2001	CAT THIEF	\$35,000		3rd	
1999	DISTORTED HUMOR	\$30,000	2nd	3rd	Both
2001	DIXIE UNION	\$30,000	3rd	2nd	
1999	ELUSIVE QUALITY	\$30,000	2nd	3rd	Both
1999	GRAND SLAM	\$30,000	2nd	3rd	Both
2001	HIGH YIELD	\$30,000	3rd	3rd, 4th	Both
2003	JOHANNESBURG	\$30,000	3rd	4th	Both
2003	STREET CRY	\$30,000	2nd		
2002	TIZNOW	\$30,000		4th, 4th	

\$100,000 or more with a pedigree free of both Mr. Prospector and Northern Dancer!

As shown in Table 2, of the 50 stallions standing for \$30,000 or more, 20 of them have gone to stud since 1998 and 100% of them carry strains of Mr. Prospector or Northern Dancer. Of these 20 stallions, 18 carry strains of Mr. Prospector and the other two—Touch Gold and Tiznow—are both inbred to Northern Dancer! Moreover, 50% of them (10/20) carry strains of both Mr. Prospector and Northern Dancer.

Prior to his first runners, which raced in 2002, Distorted Humor (Forty Niner-Danzig's Beauty, by Danzig) was not widely considered a likely candidate for leading freshman sire honors, and yet, he did just that! With an initial stud fee of only \$12,500, his first-crop stats from 67 foals are sensational to date. Through June 1, 2003, he has had 31 winners (15 of those 2yo winners), five SWs (two G1 winners and two G2 winners), and one Kentucky Derby and Preakness winner. A look at the inbreeding of Distorted Humor's five North American SWs (plus one Australian SW) may tell part of the story.

As shown in Table 3, none of the five U.S. SWs are inbred to Mr. Prospector or Northern Dancer and only Humorous Lady is even inbred within four generations (Raise a Native 4x3) And, in fact, three of the five are not only four-generation outcrosses but also five-generation outcrosses. Interestingly, the

Table 3: Distorted Humor's First-Crop SWS

SW	Horse	4-Gen Inbreeding	5-Gen Inbreeding
G1	Funny Cide	none	Ribot 5x5
G1	Awesome Lady	none	none
G2	Humorous Lady	Raise a Native 4x3	none
G2	Rockin' Robin	none	Tom Rolfe 4x5
R	Crackup	none	none

two that are inbred within five generations, Rockin' Robin and Funny Cide, are inbred to Tom Rolfe 4x5 and Ribot (Tom Rolfe's sire) 5x5, respectively. It's also worth noting that Distorted Humor's only Southern Hemisphere 2yo SW, Rinky Dink, is also a five-generation outcross.

This is what John Prather had in mind when he selected from among the Prestonwood Farm (now Win-Star) mares he deemed most compatible to Distorted Humor. Because Distorted Humor descends from both Mr. Prospector and Northern Dancer, "it was obvious to him to select mares that didn't possess either," according to The Blood-Horse (May 31, 2003). From the 14 mares he selected for Distorted Humor, three produced SWs, one of which was Funny Cide.

The last two decades have shown that there is a time for inbreeding. Even when the time is not right, the negative effects of inbreeding can be minimized when it is delivered through certain combinations of the very best strains. Inbreeding to Mr. Prospector, which in no way rivals the value of inbreeding to Northern Dancer, works best when Fappiano is involved. But the value of inbreeding to Mr. Prospector or to Mr. Prospector and Northern Dancer will not be decided in the final analysis by its direct effects alone. It has already yielded spectacular results and will continue to do so, if for no other reason than the sheer numbers. The real question we should be asking ourselves is what we are going to do with the future breeding stock from these matings? How many mares will be available for a G1-winning stallion with a world-class pedigree containing two strains of Mr. Prospector and two strains of Northern Dancer? And how many stallions will be available for

broodmares bred the same way. They can't all be bred to A.P. Indy!

Today, it is nearly impossible to import a commercially viable outcross. Breeders want to continue using the same methods that have lit up their computer screens and the auction tote boards for the last decade. So, our outcrosses must be "home grown" and enter the mainstream by a back door. There are only a few successful examples of home-grown outcrosses in recent years, but enough to be suggestive. Dynaformer started out his stud career at \$2,500 and now commands \$50,000. Saint Ballado started out in Florida at \$2,500 and was fetching \$125,000 before his death. Montbrook began at \$3,000 and he now books full at \$17,500. Kris S. went from \$5,000 in Florida to \$150,000 in Kentucky. Cherokee Run has gone from an initial stud fee of \$7,500 to \$25,000. Each of these stallions have pedigrees free of both Mr. Prospector and Northern Dancer. Would they have had the same level of success had they gone to stud 20 years ago? Probably not. But they too were and are in the right place at the right time.

Troubled waters lie ahead for breeders who do not adapt to altered populational conditions. The inbreeding patterns that have worked over the past 15 years are not going to work in the future. Many breeders are turning a blind eye to the declining effectiveness of close inbreeding. Those breeders who take advantage of available outcrosses will not only avoid the problems that are now beginning to arise from close inbreeding, but they will also develop the most viable breeding stock for the future.

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The Use of Diversity

Value of outcrosses evident in effects of inbreeding

by Roger Lyons

The frequency of inbreeding among the foals by any given stallion is determined largely by the relationship between the stallion's ancestry and the genealogical composition of the broodmare population. Because of Mr. Prospector's descent from Native Dancer and Nasrullah, 61% of his mates produced foals that were closely inbred (distance equal to 4x4, including 3x5). However, for any given broodmare, the stallion population still offers some choice about inbreeding. My purpose here is to investigate the genealogical conditions of effective inbreeding, with an interest in contributing to the distinction between good choices and bad ones.

Table 1 (p. 7) lists for each of 83 sires the results of a survey of the ancestries of all mares that have produced at least one foal by him through 1999. The first step was to divide the mates of each stallion into two groups: those that produced at least one unrestricted stakes winner (G1-2-placed non-winners of stakes treated as stakes winners) by the stallion and those that failed to do so. Next, the number of close inbreds in each of the two groups was tabulated. If the proportion of dams that produced closely inbred stakes winners (SW%) is greater than the proportion of dams that produced closely inbred non-stakes winners (NSW%), then it can be inferred that on balance close inbreeding contributed favorably to the stallion's production. The InbNdx is derived by dividing the SW% by the NSW%. Thus, if SW% is greater than NSW%, the InbNdx for the stallion is greater than 1.0. Something about that stallion made him a relatively good source of closely inbred foals.

Quite apart from stakes production, a high frequency of inbreeding has two possible explanations. Either the stallion's breeding is such that this was inevitable, as in the case of Mr. Prospector, or popular pedigree analysis had its way. Broad Brush, for example, himself closely inbred to Turn-to, has never managed to shake the self-fulfilling prophecy that he would respond well to mares returning Turn-to. Based on the record of his runners, that approach has been statistically dubious from the beginning, yet 52% of his 1999 crop were produced by such mares, far in excess of Turn-to's 32% distribution in the stakes-producing broodmare population. In fact, Turn-to has been measurably favorable to Broad Brush only when descending through Cox's Ridge, but mere facts are no match for pedigree punditry that celebrates inbreeding without regard for the range of its effects.

The stallions in the table are ranked by the extent to which the proportion of SW producers yielding closely inbred foals exceeds that same proportion among NSW producers. For example, 27.7% of Mt. Livermore's SW producers yielded closely inbred foals against 15.5% of his NSW producers. Thus, his SW production of closely inbred foals exceeded his NSW production by 1.79 (InbNdx). By contrast, Kingmambo's InbNdx of only .53 indicates that his close inbreds performed half as well as his less inbred runners. Clearly, to some stallions closely inbred foals are an asset, to others a liability.

Outcrossed stallions

Of the 83 stallions listed, only 17 have a level of close inbreds from SW producers exceeding the level from NSW producers by an index that rounds off to 1.2. What distinguishes the mere 20% whose stakes production from close inbreds exceeds opportunity?

It would seem, judging from these 17 stallions, that the most obvious condition for the success of close inbreeding is that the stallion be a relative outcross. Eight of them—Affirmed, Clever Trick, Danzig, Diesis, Fappiano, Montbrook, Mt. Livermore, and Relaunch—are inbred no closer than 5x5, and another four are inbred no closer than 4x5—Housebuster, Kris S., Meadowlake, and Wavering Monarch. That leaves five stallions that are closely inbred, which, at 29%, is only slightly less frequent than the 37.5% of the major stallion population that is closely inbred. But there is more to this story.

Of the nine stallions that are inbred at 4x5 or closer, none descend in any way from Northern Dancer, and only three descend in any way from Mr. Prospector, two of these—Unbridled and Quiet American—through Fappiano. It seems wildly coincidental that Mt. Livermore, inbred no closer than 5x5, and his son Housebuster are the top two stallions listed in the table, but hardly less so that Fappiano, whose closest inbreeding is also 5x5, appears among the top 17 with two of his sons. And we need only look down the list to the 18th ranking stallion to find Cryptoclearance. Also, Unbridled's Song, not on the list for lack of a large enough sample, has a very large proportion of closely inbred stakes winners against opportunity so far.

Prevailing pedigree analysis explains the extent to which Fappiano figures in inbreeding to Mr. Prospector by noting his typological difference from other strains. Considering that 61% of Mr. Prospector's offspring were closely inbred, Fappiano's typological contrast with other strains of Mr. Prospector probably pales by comparison with his genealogical difference. He was one of the few outcrosses. Besides, inbreeding to Mr. Prospector has not been the hallmark of the best closely inbred offspring of Fappiano's descendants, nor even inbreeding to Raise a Native. Rather, In Reality and Dr. Fager have been the most reliable targets.

The larger context of Fappiano's viability with respect to close inbreeding suggests that it has less to do with his typological distinctiveness than with his hybrid vigor. His power as an outcross is such that his more inbred sons and perhaps even his grandsons have better results from closely inbred foals than any other branch of Mr. Prospector line.

Judging from this short list, it would seem, finally, that the foals of even a closely inbred sire can be highly tolerant of close inbreeding if he has Hail to Reason in his ancestry. Four of the nine more closely inbred sires (including three of the five most closely inbred sires) among the 17 have this advantage—A.P. Indy, Kris S., Silver Ghost, and Silver Hawk, and note that the 19th and 20th ranking sires on the

Table I: Proportions of mates producing closely inbred superior runners and closely inbred non-superior runners.

Rank	Sire	SW Prod	Inb SW	SW%	NSW Prod	Inb NSW	NSW%	InbNdx
1	MT. LIVERMORE	47	13	27.7	573	89	15.5	1.79
2	HOUSEBUSTER	25	3	12	296	22	7.4	1.62
3	FAPPIANO	47	22	46.8	303	99	32.7	1.43
4	WAVERING MONARCH	25	11	44	437	143	32.7	1.35
4	MONTBROOK	16	4	25	146	27	18.5	1.35
6	CLEVER TRICK	46	18	39.1	752	219	29.1	1.34
7	DANZIG	136	52	38.2	512	149	29.1	1.31
8	RELAUNCH	77	15	19.5	461	69	15	1.3
8	A.P. INDY	37	15	40.5	273	85	31.1	1.3
10	SILVER GHOST	29	10	34.5	334	90	26.9	1.28
11	UNBRIDLED	26	11	42.3	307	103	33.6	1.26
12	QUIET AMERICAN	20	11	55	267	119	44.6	1.23
13	SILVER HAWK	55	15	27.3	479	107	22.3	1.22
14	MEADOWLAKE	35	14	40	497	165	33.2	1.2
15	AFFIRMED	65	13	20	555	95	17.1	1.17
16	KRIS S.	54	26	48.1	519	218	42	1.15
16	DIESIS	68	13	19.1	507	84	16.6	1.15
18	CRYPTOCLEARANCE	24	7	29.2	524	134	25.6	1.14
19	SEATTLE SLEW	96	35	36.5	608	196	32.2	1.13
20	SAINT BALLADO	34	8	23.5	293	62	21.2	1.11
20	GONE WEST	67	27	40.3	450	164	36.4	1.11
22	SKY CLASSIC	23	7	30.4	291	81	27.8	1.09
22	PROUD TRUTH	19	4	21.1	285	55	19.3	1.09
24	JEBLAR	23	6	26.1	297	72	24.2	1.08
24	CONQUISTADOR CIELO	57	28	49.1	596	272	45.6	1.08
26	SALT LAKE	23	6	26.1	421	104	24.7	1.06
27	COZZENE	48	14	29.2	480	133	27.7	1.05
28	MAJESTIC LIGHT	58	19	32.8	624	197	31.6	1.04
29	DEVIL'S BAG	36	8	22.2	587	126	21.5	1.03
30	REGAL CLASSIC	26	10	38.5	330	126	38.2	1.01
31	POLISH NUMBERS	30	11	36.7	285	105	36.8	1
32	DYNAFORMER	40	12	30	408	124	30.4	0.99
32	DIXIELAND BAND	81	27	33.3	640	215	33.6	0.99
34	MR. PROSPECTOR	149	90	60.4	660	406	61.5	0.98
35	PREMIERSHIP	19	8	42.1	468	202	43.2	0.97
36	CAPOTE	40	6	15	494	77	15.6	0.96
37	EL PRADO	29	10	34.5	312	113	36.2	0.95
37	CRAFTY PROSPECTOR	60	15	25	561	148	26.4	0.95
39	SUMMER SQUALL	25	14	56	222	132	59.5	0.94
40	WELL DECORATED	25	12	48	521	269	51.6	0.93
41	SEEKING THE GOLD	40	14	35	341	130	38.1	0.92
41	SARATOGA SIX	28	9	32.1	485	169	34.8	0.92

Rank	Sire	SW Prod	Inb SW	SW%	NSW Prod	Inb NSW	NSW%	InbNdx
41	NOTEBOOK	30	11	36.7	314	125	39.8	0.92
44	SILVER DEPUTY	37	13	35.1	368	142	38.6	0.91
44	RUNAWAY GROOM	44	7	15.9	579	101	17.4	0.91
46	SKYWALKER	32	9	28.1	308	97	31.5	0.89
47	STORM BIRD	53	15	28.3	509	163	32	0.88
47	KNOWN FACT	44	6	13.6	553	85	15.4	0.88
49	BLUSHING GROOM	82	37	45.1	368	191	51.9	0.87
50	PHONE TRICK	44	7	15.9	702	129	18.4	0.86
50	MISWAKI	75	23	30.7	812	290	35.7	0.86
52	WITH APPROVAL	30	12	40	359	171	47.6	0.84
52	RED RANSOM	35	13	37.1	533	236	44.3	0.84
52	CARSON CITY	48	16	33.3	448	178	39.7	0.84
55	LEAR FAN	44	7	15.9	531	103	19.4	0.82
55	GLITTERMAN	20	9	45	307	168	54.7	0.82
57	GILDED TIME	24	7	29.2	366	135	36.9	0.79
57	FIT TO FIGHT	27	9	33.3	560	236	42.1	0.79
59	NUREYEV	120	34	28.3	449	164	36.5	0.78
60	WOODMAN	71	16	22.5	837	248	29.6	0.76
61	PLEASANT TAP	20	3	15	166	33	19.9	0.75
62	STORM CAT	94	28	29.8	488	197	40.4	0.74
63	WOLF POWER	28	4	14.3	456	90	19.7	0.73
64	THEATRICAL	55	12	21.8	406	127	31.3	0.7
65	STAR DE NASKRA	42	9	21.4	573	179	31.2	0.69
66	GREEN DANCER	81	11	13.6	798	159	19.9	0.68
67	BROAD BRUSH	66	12	18.2	330	89	27	0.67
68	PLEASANT COLONY	56	7	12.5	405	76	18.8	0.66
69	RUBIANO	17	6	35.3	277	151	54.5	0.65
70	WILD AGAIN	61	16	26.2	603	247	41	0.64
71	DEPUTY MINISTER	64	9	14.1	582	130	22.3	0.63
72	LORD AVIE	56	9	16.1	611	163	26.7	0.6
73	JADE HUNTER	25	5	20	262	95	36.3	0.55
74	KINGMAMBO	34	6	17.6	236	78	33.1	0.53
75	RAHY	47	5	10.6	444	95	21.4	0.5
76	EL GRAN SENOR	48	9	18.8	279	116	41.6	0.45
77	LOST CODE	34	2	5.9	446	64	14.3	0.41
78	WAQUOIT	19	1	5.3	342	48	14	0.38
79	DAYJUR	19	3	15.8	253	109	43.1	0.37
80	BATES MOTEL	26	2	7.7	411	87	21.2	0.36
81	NASHWAN	27	1	3.7	278	31	11.2	0.33
82	GULCH	45	3	6.7	434	91	21	0.32
83	TWO PUNCH	29	2	6.9	463	106	22.9	0.3

Key to table: The table covers the dams of Northern-Hemisphere foals through 1999 and racing through April 13, 2003. SW Prod = producers of winners of unrestricted stakes (including 2nd in G1-2 races) or blacktype-qualifying foreign stakes; Inb SW = number of stakes producers that yielded close inbreeding (distance equal to 4x4 or closer); SW% = percentage that yielded close inbreeding; NSW Prod = producers of non-stakes-winners; Inb NSW = number of NSW Prod that yielded closely inbred foals; NSW% = percentage that yielded closely inbred foals; InbNdx = SW% / NSW%.

list are Seattle Slew and Saint Ballado, respectively. Hail to Reason's frequency in the contemporary stallion population as a whole is only 16% by comparison.

The effectiveness of inbreeding depends on the level of genealogical variety that mediates the relationship between the given stallion and the population of his possible mates. If the stallion is himself an outcross, then he is more likely to provide that variety, which may have residual benefits for his more inbred descendents. By inference, the consistency of a stallion's production from close inbreds depends on the genetic diversity he brings to the foal, either by virtue of his outcrossed breeding or by virtue of some key genealogical counterpoint that he brings to his mates, such as Hail to Reason.

Strains of contrasting type

It is striking that, apart from Fappiano and his descendents, only Silver Ghost—out of a Hail to Reason-line mare, by the way—among the 17 with highest InbNdx descends in any way from Mr. Prospector. The only exception to the Fappiano connection, in fact, is Rubiano, with a low proportion of SW producers against opportunity. For what it's worth, Rubiano is probably the best stallion that has yet been produced by a Nijinsky II mare, pending the performance of Bahri and Broken Vow. What a difference this might make as far as inbreeding is concerned is suggested by the fact that, of the 17, only Danzig, relatively outcrossed, is descended in any way from Northern Dancer. It is astonishingly apparent that the stakes production from closely inbred foals of stallions influenced by Northern Dancer or Mr. Prospector (except through Fappiano) tends to fall below their overall stakes production.

Mr. Prospector's problem certainly has much to do with the intensity and frequency of inbreeding among his offspring, but the lack of viability of inbreeding in descent of Mr. Prospector is also attributable to Raise a Native's limitations, which come to light by contrast with his contemporary, Northern Dancer. These two ancestors come to meet in the ancestry of Kingmambo, a stallion with half the representation by close inbreds among SW producers than among NSW producers. However, Kingmambo happens to have a normal rate of stakes production from mares returning Northern Dancer, with 20 SW producers from 132 such mares. His poor performance with close inbreds generally is largely attributable to inbreeding to Raise a Native. He currently has only two stakes winners from 32 such mares. Danzig, an outcross, is really the only major NA stallion for which inbreeding to Northern Dancer has had a significantly high rate of success against opportunity (13 SW producers among 41 mares), but inbreeding to Raise a Native is a lot worse generally. What is wrong with Raise a Native line?

The production of Raise a Native and Northern Dancer differed strikingly as to the genealogical variety of the mares that produced their best strains. Raise a Native had far fewer superior strains than Northern Dancer, which in itself limits the supply of diversity on which inbreeding can feed. That supply is further limited by the high rate of inbreeding among the foals of Mr. Prospector, whose dominance makes him a frequent participant in inbreeding to Raise a Native. Most of Northern Dancer's sons have sired only half the

proportion of closely inbred offspring as Mr. Prospector did. What this means is that the residual supply of genetic diversity in descent of Northern Dancer is much greater than in descent of Raise a Native. Thus, it is possible to inbreed to Northern Dancer through genealogically variable strains, many combinations of which will contribute contrasting capacities to the resulting foal.

Inbreeding through strains of contrasting type has been central to the breeding of the last 25 years, but there is a price to be paid. The record of close inbreeding, especially involving stallions in descent of Raise a Native and Northern Dancer, the two most dominant sire lines, clearly suggests that inbreeding feeds on a limited supply of genetic diversity and, in so doing, consumes it.

The international outcross

By fits and starts since the time of Eclipse, pedigree breeding has yielded a population in which diversity in every sense has been in decline, skewed especially in the direction of speed and precocity. One of those fits began around the turn of the 19th century when the first in a series of important European breeders committed their operations to outcrossing. The benefits of this were realized by North American breeders during the 1930s and 40s. The sires that were imported during this period yielded offspring that were highly outcrossed. These offspring of the international outcross were born during the period from the late 1940s to the early 1960s. According to a recent study by Steven A. Roman (http://www.chef-de-race.com/articles/thoroughbred_decline.htm), that period yielded the highest concentration of "the greatest racehorses of the 20th century."

Because breeding stock like Somethingroyal (1952) were outcrosses themselves, heavily influenced by an outcrossed parent, or outcrosses to a significant proportion of the population (Dr. Fager and In Reality), their offspring tended to be highly variable as to type. Most inbreeding to Somethingroyal, for example, crosses her two sons Secretariat and Sir Gaylord. It turned out that some horses inbred to her through these contrasting strains had a special blend of speed and stamina, one that supported deployments of tactical speed on a contingent basis, and that running style proved so advantageous that the method which yielded it has dominated breeding for the last 25 years or so. Outcrossing could sometimes accomplish the same thing, as in the case of Fappiano, and with enormous benefits, but inbreeding to those products of the international outcross through strains of contrasting type mediated this favorable blend on a much more reliable basis.

Arguably, Dr. Fager and In Reality, both born in 1964, mark the end of the era of important ancestors whose influence was bound up with the diversity represented by the international outcross. That Buckpasser (1963), Damascus (1964), and Nijinsky II (1967) represent the more specialized horses that characterize our era is suggested by the results of inbreeding to those ancestors so far. With the exception of A.P. Indy, Miswaki, and, to a lesser extent, Seeking the Gold, other eligible stallions have a poor rate of success from foals inbred to Buckpasser, and, so far, no real stars have resulted from inbreeding to Damascus. Horses inbred

to Nijinsky II have not worked in North America where tactical speed prevails. This points out the greater emphasis on speed by North American racing, but, in a larger sense, it is symptomatic of a population headed for much more highly focused specialization within a narrower range of capacities.

The offspring of a sire or dam born after 1964 were much more similar to one another than the offspring of the outcrossed sires and dams of the previous era. Consequently, horses inbred to Mr. Prospector, Secretariat, Seattle Slew, etc. are going to be much more specialized with respect to peak age, distance, and running style. They will not be able to cope with the range of racing conditions that were met by the greatest runners of the late 20th century.

The international outcross maximized the genealogical variety that was available to late 20th-century breeders, and they consumed that variety as if there were no tomorrow. The price paid for that watershed was a world-population decline in diversity. That is partly why the current globalization of breeding is not yielding outcrosses.

The genealogical economy

Pedigree is ordinarily understood as an unfolding of the relationship between ancestry and performance. According to this theory of thoroughbred evolution, the game begins with a set of values and expectations represented by the conditions of racing, and pedigree follows from that. This theory certainly does explain the breeding of the English racehorse prior to the late 18th century, but since that time the tail has been wagging the dog. Pedigree began to take a priority over racing, and that initiated a form of development that has important implications for the availability and use of diversity.

Until the late 18th century, English racing had been largely a yeoman tradition that determined how horses were bred. That is to say, pedigree was determined by the tradition of racing. With the rise of industrial and agricultural wealth, the titled classes became increasingly tantalized by the commercial prospects of fabricating and exporting a “tradition” all their own. To this end, the concept of pedigree was circumscribed by principles of exclusion that imposed an economy of scarce genealogical resources. This adapted pedigree to an altogether new function: to regulate commodity value.

It did not matter that this economy could not reproduce horses capable of meeting the traditional conditions of racing. The exercises of political and financial power by which the English racehorse was appropriated to commercial interests were beholden to no tradition of racing whatever. The formation of a genealogical economy meant that, thereafter, pedigree would determine the kind of racing that could take place.

Throughout the course of its development, commercial thoroughbred breeding has faced a major structural challenge. Population growth, which always results from the success of the commercial market, chronically threatens to rarify the benefits of the genealogical economy. The only way to counter this effect of “over-production” and restore a favorable distribution of commodity value is to delimit the genealogical parameters of the population even further.

This has been accomplished mainly, but not exclusively, by adjusting the conditions of racing to favor the commercial core of the population, relegating peripheral genealogical resources to a non-conforming status. The first major structural change occurred in the late 18th century with the founding of the English classics, designed to put the hybrid model out of business, and most recently the Breeders’ Cup races were designed to favor increasingly specialized runners. Within the framework of these major structural changes, small but significant incremental adjustments that marginalize “excess” genealogical resources occur continually. Market breeding “trends” such as the inflation of stallion book size also have an important role in narrowing the genealogical composition of the population.

The legitimacy of these market steering mechanisms depends in part on the willingness of buyers to accept the inbreeding that follows as a matter of course. Their perception of inbreeding is shaped by a pedigree analysis that promotes the most commercially necessary “patterns.” This analysis consists of nothing more than anecdotal treatments of individual runners that happen to have been successful. Since this approach is valued because it fosters unqualified confidence in inbreeding, it has no need of research methods that would recognize the genealogical boundary conditions of successful inbreeding or elucidate its broader population effects.

Thus, the evolution of the thoroughbred is determined by the commercial market’s need to resolve its contradictory structural imperatives of genealogical scarcity and population growth. The problem is that the only possible resolution—a narrowing of the genealogical base—guarantees a perpetual decline in genetic diversity.

The system of signification we know as pedigree organizes that process and, at the same time, masks it. Since the late 18th century, “the sport of kings,” which, just like aristocracy itself, is unable to reproduce itself on the basis of commercial motives and expectations, has fed on the old yeoman tradition of racing, exploiting its popular appeal and, even more importantly, consuming the residue of genetic resources it had preserved for centuries.

At the same time, historical imagination has mythologized titled participants as the guardians of the thoroughbred since time immemorial and celebrated pedigree as their guiding light. Since the founding of the General Stud Book, this fiction has served to sublimate the commercial nature of that stewardship, along with the ways in which it has systematically eroded the genetic diversity of the population. All along, the delimiting effects this has had on the capacities of individual runners have been masked by changes in the structure and conditions of racing.

Until the next major adjustment occurs, which may not happen for another ten years or more, breeders who resist the pressure to inbreed to ancestors born after 1964 will have an advantage, provided they find ways to exploit both the residual opportunities for outcrossing and inbreeding methods that have potential for blending contrasting capacities. For some time to come, but not forever, horses bred this way will be better adapted to the system of racing than the specialists that the commercial market has in store for the future of the breed. 🐾

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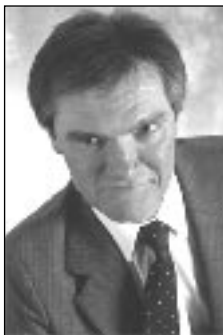
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