

# How to Find the Perfect Match?

by Monika Savier

Three years ago Hans Nagel, former WAHO president and brilliantly successful breeder of Arabian horses for almost 60 years, presented his new book *The Arabian Horse – Nature's Creation and the Art of Breeding*. This compendium of Arabian horse breeding is way more than an informative and fascinating read for those interested in the history and development of Arabian horses all over the world. Nagel's designated aim is to encourage breeders to embark on the path of the art and science of selection, one of the foundations of successful breeding no matter whether for the racetrack or for Arabian shows.

The basic prerequisite for planning matings is profound knowledge about all the visible and the genetic traits of both dam and sire – just importing a champion's semen is not enough if the breeder failed to first make an honest assessment of the mares in his stable and their potential of matching well with this stallion. It ought to be basic knowledge for breeders that their mares will mainly reproduce their own genetic make-up, no matter which stallion they choose. Objectively assessing one's own mares, however, is not an easy thing to do and is even painful sometimes. Strategic considerations need to be made

to counterbalance any possible faults of the mare, but also of the stallion. Trying to combine extremes will often go wrong. Improving the breeding stock by taking small steps is preferable – which implies that the breeding plan needs to span several generations, and good offspring cannot just be sold, but needs to be kept. That's the only way to consolidate the genetic make-up of your breeding stock: step by step.

Which leads back to that basic question of what to take as a guideline when trying to find the ideally matching sire for your mare: attend shows? Study pedigrees? Search for performance instead of beauty, or for the combination of both? In his book, Hans Nagel first presents different approaches to selecting for desired traits, then presents the methods of long-standing and famous studs, also explaining and substantiating his own methods of breeding on Katharinenhof Stud. The results are conclusive: you can do a lot of serious planning, but you will never know, a hundred percent, what the foal is going to be like. His advice: put up your very own breeding goals, methods, and plan, and then just give the desired stallion a try with your mare – then you will know more. Find here some basic explanations of time-tested breeding methods.



# Breeding Methods Explained

*by Dr. Hans Joachim Nagel*

*photos: G. Grasso, A. Khruscheva  
I. Klauenberg, W. Pawłowski,  
M. Savier, G. Waiditschka*

*Mares and foals heading out for pasture  
in Janów Podlaski, the legendary Polish state stud.  
In Polish breeding, overwhelming importance is  
allotted to the dam lines. Great care is taken that the  
high quality of these lines is preserved, since they are  
the basis for the female and also for the male side.  
Sires are mostly chosen from the stud's own stock,  
with outside stallions introduced only if new elements  
are required for the carefully monitored,  
long-term breeding aims*





### Choice of Breeding Methods

It is interesting to understand which methods are known and applied in animal breeding today, and which are the most applicable ones to horse breeding in general, and to the Arabian horse specifically. This summary begins with the most basic one, and covers all possibilities known today; there are no other secrets. The art of breeding superior horses lies in their proper application, combined with careful, honest, intelligent and objective evaluations.

1. A procedure with very little prestige is to breed **champions to champions** in order to obtain a new champion, without paying much attention to their origin. Or, in the same mindset, to breed a decent mare to a champion stallion hoping that another champion will be born. Most Arabian horse enthusiasts seem to believe this to be the fastest and easiest way to success, because show wins are the ultimate aim. However, mostly the results are very hazardous and doubtful, and the only knowledge required is to know show





*The vast Russian state stud of Tersk is renowned world-wide. In-depth know-how of genetics and a great number of horses made it possible for Tersk to set up a famous breeding program that is a cross breeding concept of different lines, all of them kept pure in the stud*



results and keep trying and hoping for that elusive champion. This kind of proceeding does not fall under any category of a serious breeding program.

2. Selection is the most efficient and main breeding tool. Professor Lush, one of the outstanding geneticists in the USA, gives the following brilliant definition: *“Causing and permitting some kinds of individuals to produce more offspring than other kinds do is selection. It is the number raised and added to the breeding herd, rather than the number born which matters, since those which are born but get no chance to reproduce cannot affect the composition of the future population”*.

3. The next method, called **single trait selection**, means to breed and select for one trait only, for example, for the black color or for speed. The first, to breed for color, is undoubtedly the easier goal, since the heritability patterns for color are well known. The latter one, applied in race horse breeding, requires considerable knowledge about the successful horse families and sires.

4. A common method is called **“tandem selection”**. Basically, it’s a successive method of single trait selection, as only

one trait at a time is considered, but only for a certain period of time, often one generation. As soon as this time is over or the top priority trait has become consolidated, the next desired trait can be addressed – the next trait “rides tandem” after the first one.

5. One talks about **“index breeding”** when more than one characteristic or trait is favored through selection. Each of these favored traits will be given a “ranking”, i.e., a higher or lower index, and one would choose the offspring according to such a priority ranking. This system ideally requires a large population. In horse breeds which are controlled by a central breeding organization and under its guidance for improvement, such a system is often applied. It is well known in breeding dressage or jumping horses. However, Arabian horse breeders seem to be too individualistic to be subordinated by such a planned and expensive, comprehensive program.

6. **“Inbreeding”** is very clearly fixed in its definition as:

- breeding of father to daughter
- breeding of son to mother
- breeding of brother to sister

## BREEDING METHODS

### Inbreeding: Full Sister to Full Brother

Morafic	NAZEER	Mansour
		Bint Samiha
	MABROUKA	Sid Abouhom
		Moniet El Nefous
ANSATA SHAH ZAMAN	NAZEER	Mansour
		Bint Samiha
	MABROUKA	Sid Abouhom
		Moniet El Nefous

### Line Breeding: Within Bloodlines

SALAA EL DINE	ANSATA HALIM SHAH	Ibn Halima
		Ansata Rosetta
	HANAN	Alaa El Din
		Mona
NK NOURA	NAHAMAN	SALAA EL DINE
		Ameera
	NASHUA	SALAA EL DINE
		Lotfeia

### Cross Breeding: Egyptian/Polish Cross (Example)

VISION	Jamil (Egyptian)	Madkour I	Habdan
			Mona I
		Hanan	Alaa El Din
			Mona
Euni (Polish)		Bandos	Negatiw
			Bandola
		Eunice	Comet
			Epigona



Daily, the broodmare band of Tersk is led to pasture by herders riding Tersk-bred horses



*Weil / Marbach was a Royal stud before it became a state stud. With foundation sire Bairactar and foundation mare Murana I, breeding started as early as 1817. The stud was the first in Europe to adopt a concept of breeding pure Arabians according to a systematic concept of breeding*

- breeding half sister to half brother is a combination which some also consider to be inbreeding. Inbreeding is recommended when the intent is to create a homogeneous population.

7. “**Line breeding**” can be considered a milder form of inbreeding. It is the attempt to concentrate on a particular horse in the pedigree who is admired and preferred, in order to obtain offspring closely related to the particular horse. This procedure allows many choices: from a very closely related horse in the first or second generation position to horses more distant or even far distant. In German terminology, one talks about “Blutanschluss” (closing the gap between blood relatives). Line breeding starts where inbreeding ends, which means to breed uncles, aunts, cousins and more distant relatives to each other.

8. Very well known is the “**cross breeding**” method. Two horses of a certain origin are far removed from each other in their genetic make-up and are then mated for the purpose of producing a better

horse. Cross breeding between Arabian populations is common. The Arabians of Iran or the desert breeds of Saudi Arabia bred to Polish or Egyptian horses fall into such a category, as does the so-called “golden cross” of breeding Egyptian Arabians with those of Spanish origin. When bred to each other, one of the most obvious results from cross breeding is the fact that such offspring are normally bigger and healthier horses and, often, gifted with superior performance. This extra power and vitality of the offspring is called “hybrid vigor”, highly appreciated in all disciplines where good performance is required.

9. “**Outbreeding**” means to breed two different horse breeds with each other. The Anglo-Arab and the Warmblood are the result of such a procedure.

10. The best example for the next method, the “**upgrading system**”, is the Shagya horses of Babolna. Local Hungarian country mares were used in the past as foundation mares to create this breed.





They were crossed with Arabian stallions imported from the Arab countries. Their offspring were again bred to an Arabian stallion and so on for several generations, until the percentage of the Hungarian female part was greatly reduced. In this way, the Shagya breed has been developed, and then, after a certain time, Shagya horses were bred to Shagya horses with excellent results. However, from time to

time pure-bred Arabian stallions were again introduced into such a population, in order to maintain the type. At such a time, the choice of the stallion becomes a delicate matter, as it needs to be a special stallion who can add type but maintain the Shagya characteristics, and therefore it generally requires the testing of several stallions before a particular stallion can be used on a larger scale.

*Weil, later Marbach, featured a systematic concept of breeding Egyptian Arabian lines. Today, the stud is also renowned for its comprehensive range of vocational training courses for equestrians, from grooms to stud managers, from riders to riding instructors*



*The famous Nazeer son Hadban Enzabi was exported to Marbach from Cairo. He founded a female line that is renowned up to today*

11. In order to be complete, the “**reciprocal recurrent selection**” method should also be mentioned, a system well known and successfully applied in sheep and poultry breeding. In such a case, individual male lines and female lines are switched with each other, and the selection of better animals is then based on the performance of the offspring of both crosses. For large populations and for a small number of selection criteria such a system is suitable. Perhaps the basic idea of this procedure might also lead to some interesting results in other breeds. At least, the principal idea is worthy of further consideration.

From all of the above choices most Arabian breeders, at least those who are proud to have their own breeding program, have applied the combined “cross and/or line breeding system”. In very few cases the inbreeding system has been used and then in a more or less sophisticated way in particular cases. The best examples from the past of the former are the Gainey Fountainhead program and the Al-Marah program, and of the latter is the early Egyptian and the Babson program.

But there is another strong group as well which has used cross breeding as its concept. They argue in favor of their program from their own successful experience and can support it with well-known scientific reasons. The Polish and Russian studs have applied such a wider and alternative concept, as has been explained previously.

### **Inheritance**

What has been described above are different breeding concepts. Under each of these concepts particular procedures in heritability will take place. How the traits of an animal are transferred to the next generation, is a further and most exciting study and a great challenge in breeding. An expression one should always remember when breeding animals is the

technical term “probability”. Yet such a situation of uncertainty, whilst it can never be eliminated, can be increasingly better controlled, if one knows what to study and what to observe. The following explanation is a guideline for principal considerations, and it is more specifically explained in my previously published book, “Hanan - The story of an Arabian Mare and of the Arabian breed”.

### **Dominance**

Traits can be transferred from one generation to the other in a dominant form. For example, stallions are known who produce only grey offspring. This is dominance in color. Or they may consistently produce long ears, or good necks or bad front legs, or even, in very exceptional cases, every one of his offspring looks like the sire himself. This is a massive dominance. In history, such stallions have existed. They were rare to find and they could be the founder of a whole new type or even breed. Horses who fit this mold to a greater or lesser degree are Nazeer (Mansour x Bint Samiha), Skowronek (Ibrahim x Jaskoulka), Ansata Ibn Halima (Nazeer x Halima), Ansata Halim Shah (Ansata Ibn Halima x Ansata Rosetta), NK Hafid Jamil (Ibn Nejdy x Helala), El Shaklan (Shaker el Masri x Estopa), and Gazal Al Shaqab (Anaza el Farid x Kajora).

Dominance is, however, mostly partial. In practice, it concerns one trait, or a few which are definitely transferred from one generation to the other. A close inspection of the offspring of a certain stallion will disclose such abilities. Dominant traits are visible, meaning they appear in the phenotype.

### **Recessivity**

The classical example of this form of inheritance is the chestnut color. Only if one recessive trait meets another recessive trait, will the recessivity become evident.





*Babolna, Hungary's historic state stud, has a tradition of training every horse that is intended for the breeding program to carriage driving and also to riding*



*The historic premises of Babolna, set in a scenic landscape, lend themselves to horse training – a brilliant way of propagating the Arabian breed that Babolna has maintained with a century-old special breeding program*

For example, if a chestnut horse is bred to another chestnut horse, then a chestnut foal will always be the result. Certain health problems are also known to be recessive. A horse who is a carrier of CID will only breed another CID horse when both, sire and dam, are CID carriers. If only one parent is a carrier, the offspring may or may not be a carrier. Again, in certain populations there are definitely several traits which are inherited in such a form, but they are not easy to detect and are mostly overlooked.

### **Intermediate Heritability**

This is probably the most common form, and the progeny will show traits, or a formation of traits, which are partly taken from the sire and partly from the dam. Body size, length of ears or tail carriage, and many other traits can be found in this category. The appearing trait is a medium or a mixture of both parents.

### **Correlations**

This item describes two or more positive traits which are linked, or negative traits





*El Zabraa, the state stud of Egypt, is where the pasbas pooled the most refined horses they could find all over Arabia. The type they maintained here set world-wide standards*





*A broodmare band in El Zabaraa state stud. The stud is renowned for their standards of horsekeeping as well as for the horses themselves*

which are linked at the same time. Also positive and negative traits are often found to be connected to each other or vice versa. A positive correlation is found when a certain desirable characteristic brings with it another desirable characteristic; e.g., a nice head and a finely sculptured beautiful neck. A positive and a negative correlation could be a beautiful round eye, but it always comes with ears that are too long in the same offspring. Such correlations can be very strong and difficult to break, and to change stallions or mares is often the only solution in order to overcome such a problem. To work with mares who themselves have several of such negatively connected traits means real trouble for the whole breeding program.

### **Nickability**

This occurs when a certain sire and a certain mare always produce perfectly nice foals. This is called “good nickability”, and such nickability might also work well

over two generations. This occurs where the sire and the sire of the dam “nick” perfectly together, and this is a well known formula for successful offspring, as has been explained in the Al-Marah Chapter. In such a case, the mare line on the dam side is practically overplayed, but this is not always the case; normally it works only when both sire and dam, on the female side, are already a good combination. Such situations are a very lucky find and would mean that progress can be made very quickly for a breeding program.

Nickability was and remains a successful formula in most of the existing breeding programs, as it has also been in the programs mentioned previously. Once detected, it is a happy “ad hoc” situation. The efforts made to seek intensively for such combinations will be generously rewarded. As a fact and in general, it is easier for a breeder to select for traits which are visible - dominant ones - than which are invisible i.e. recessive. The first can be

*Horse management is an important part of El Zabraas breeding concept: shaded paddocks provide exercise and social interaction. El Zabraa's Straight Egyptians are registered in the most famous, and closed, stud book there is, producing high-quality offspring from that well consolidated stock and breeding program*



immediately bred for selectively, possibly in one or two steps, but the second has to be discovered first, before selection can take place.

#### **The roles of Stallions and Mares**

In addition to the above and whatever system is applied, certain remarks should be made concerning the role and the importance of stallions and mares.

#### **Mares**

The historical Arabian Bedouin breeders strongly believed in the importance and superiority of a mare line. Modern research in genetics has confirmed this idea, and the influence of a mare on her foal is rated to be, at least, 10% higher than the influence of the stallion. Also, as a principle, the mare plays the role of the more permanent and conserving part. Her traits and characteristics are more solid, her structure is more difficult to change, both in a positive and in a negative direction. Therefore, the choice of the mare line, with all its traits, is of vital importance for success. To upgrade a mare line is difficult and can take generations.

#### **Stallions**

The stallion has considered to be the dynamic part. A stallion's role is to bring new, better, or additionally required improvements into the herd. Some traits can be influenced faster than others, as their heritability is higher. Body size is highly heritable, fertility is low, tail carriage medium, just to name a few examples. It is apparently quite a common observation that the stallion has greater influence on the front part of a horse and the mare has more on the hind part.

Advocates of this observation refer in this respect to an obvious, easily recognizable fact, when breeding a horse to a donkey. In such a case a hinney tends to have the front part of a horse and the rear part of a donkey, while a mule resembles more the front part of a donkey and the hind part of a horse. This looks somewhat amusing and simple, but it does seem to be factual, since many results confirm such facts.

Even a suitably appealing stallion can, after all that has been said above, either damage or boost a good population of horses tremendously, and it is advisable to test a stallion carefully before he is used on a larger number of mares. A stallion has to



prove he is able to introduce the required improvements. However, it is possible to use a stallion who, besides having some excellent and desirable characteristics, also has certain unwanted faults which are clearly evident; for example, a very small stature or sickle-hocked hind legs. Two outstanding stallions illustrate the value of intelligent breeding decisions and knowledge, as Skowronek is an example of the former, and NK Hafid Jamil of the latter. Aswan, not perfect either, is the third one who was blessed to be in the hands of very wise breeders. Since one can obviously see the faults, they could be of a dominant nature. However, if such a stallion is bred to a correct mare, and only those offspring are retained for breeding which do not show such a negative trait, the problem can be bred out, with the good and desirable qualities hopefully retained. The three above mentioned stallions have proved the truth of this conclusively, as evidenced by their numerous outstanding progeny. This is not possible when one has to deal with a recessive undesired trait.

It has been noted many times that, although the dam and sire play the most important roles, the grandparents also show a significant influence. The foal that is born is the object which needs to be studied closely. Consequently, prudent breeders, when choosing a stallion, will ask to see the parents of a stallion before they make a final decision. At the least, this will minimize the risk of a mistake which would have been easy to discover.

### **Pure Breeding**

This section deals with the genetic impact of pure breeding. It has in principle no relationship to the term "pure-bred Arabian" which is used commonly by the public in describing the Arabian breed. This terminology has a historical connotation. The pedigree certificate issued by the appropriate National Society is the corresponding historical documentation

about each registered pure-bred Arabian, listing all of its known ancestors of certain past generations and should be understood as follows: This horse goes back in all its generations to stallions and mares which belong to one or the other Arabian strain, without any mixture or interference of any outside, foreign blood.

These so-called Arabian strains are cause for many breeders to have a lot of unanswered questions; certain people have given them too great an importance.

The reality is different:

- To breed according to strains is obsolete.

There is no base at all to do so. To breed according to families is the correct way.

- Strains today are a nice ornament and a historical remembrance. When these strain names are used for the Katharinenhof horses as an affix, this should be seen as paying homage to traditional historical habits.

- Strains are an old method of genealogy according to the old Latin dictum of "mater semper certa est". A strain relates to a certain female line only; no consideration of the corresponding sire, as stallions are not on record prior to about 150 years ago. The strain-name of the dam is given to all her offspring from generation to generation. However, a Siglawy horse in Iraq and a Siglawy horse in Egypt have practically nothing in common, unless it happened that they are from the same family source.

- The origin of the strain names is obscure.

There are many stories and reports about how these strains and their names came up.

It appears that they relate to one particular horse in history, who becomes the source of everything that follows. For curious breeders, it is recommended to study the so-called "Abbas Pasha Manuscript" and other relative documents.

The scientific approach regarding this purity is totally different. However, the issue of purity created a great deal of confusion when connected to the term "asil", which

has been used by a group of breeders, who applied this word only to a certain group of horses. The word "asil" (or "asyl") translates into the English word for "pure". However, in the Arabian language the word "asil" is used to describe an authentic Arabian horse. It does not mean that there exists a certain section within the breed which deserves such a name. All Arabians are pure or asil, and the ones which are of mixed blood are, in the understanding of Bedouin breeders, simply not Arabians. The fact that a horse has a long or a short pedigree – i.e., its known history is longer or shorter – does not qualify it for one or the other category. Only the definite proof that its blood is mixed to a certain degree makes it an "impure horse" and therefore not asil. Regrettably, history could not offer any reliable instrument or means of determining purity of blood, as there was no blood test or DNA, such as is available today. History offered only two choices: one is a matter of belief, and the other is the reality of the living horse. It is realistic to assume that all of the early foreign buyers who purchased their Arabians from the hands of the Bedouins, or those who chose them as foundation horses for their studs were knowledgeable, and careful enough to give first priority to a physical examination of the horse as such, before deciding whether or not to purchase it. They were probably aware that one should not believe too much in a Bedouin's statement, and this fact is supported by the fact that the Abbas Pasha emissaries asked as many witnesses as possible to authenticate their purchases, as is well documented in the Abbas Pashas manuscript. It is both illogical and ludicrous that certain persons of the present day should claim for themselves the legitimation to argue and to judge the purity of present day Arabians on the basis of paperwork. Such ideas and proceedings should be treated with contempt and completely ignored.

According to the scientific approach, an

animal would be considered as "pure" in its genetic make-up, if its offspring look alike and being alike means that their homozygous genes are clearly in surplus. Compared to any other horse breed, the Arabian horse could still be considered to occupy a special position in this respect. Their degree of homozygosity is considered to be higher than that of other breeds, an opinion generally accepted; how much, however, they vary from each other is different from case to case. An Arabian with a lot of good Arabian points fitting into a population indicates that it is a valuable member of the pure bred Arabian population.

All animals contain in their genetic make-up a certain percentage of homozygosity. It is a general assumption that half of their genes are homozygous. The other remaining part is heterozygous. When homozygous genes match each other in the process of proliferation, then in such a case the homozygosity increases and other gene variations will disappear. The practical view for such increase is based on the amount of inbreeding with the goal being to concentrate the desirable genetic material and to preserve it for future generations. In order to obtain such a high percentage of homozygosity, a strong closed inbreeding or line breeding programme must be applied.

At the same time, this method increases the prepotency of every single horse. In applying such a programme however, careful attention has to be paid to good or bad genes, since both types of genes are or might be existent, and both types can become dominant. In this respect line breeding or inbreeding can become a danger, but only if used carelessly or with "stable blindness".

Unfortunately, some of the known bad genes relate to health problems and are recessive; they belong to the heterozygous part, such as S.C.I.D. or the C.A. condition. If the status of each horse is known, one can avoid the spreading of these negative traits





*About 350 Arabian horses of all ages are living in the marvelous State Stud of El Zabara near Cairo with its unique oriental flair*

by selective choice of stallion and mare. One can even eliminate such problems in certain groups of horses by adopting a clearly designed severe selection procedure. In order to embark upon a programme like the one at Katharinenhof, it is of vital importance to examine the following:

- To make sure that the basic stock is free from such bad genes which would influence the health of the offspring later on.

- To choose such horses in which a certain degree of inbreeding can be assumed and which already have a higher degree of homozygosity in their genetic make-up. In this respect, one can talk of a certain percentage of inbreeding.

- The newest studies by computer simulation about breeding cousins to cousins, which takes place extensively in certain breeding programmes, have revealed that the so-called "genetic drift", where certain gene variations increase and others disappear, is rather positive, if it is done consistently. A certain degree of

variations will even be better maintained with the advantage that an animal can adapt better to different conditions of life, due to a higher degree of hybrid vigour. When all variations are exhausted, progress comes to its end. The fear of close breeding - at this level - seems therefore, to increasingly lose its horror.

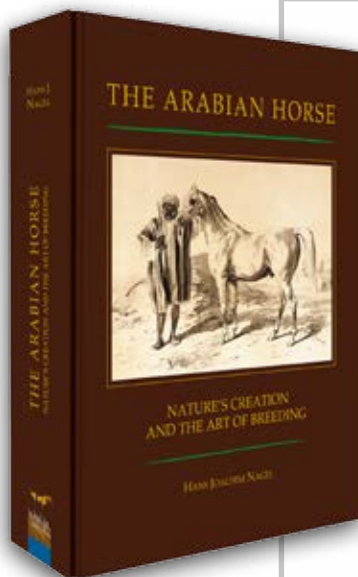
This above excursion is written only to inform people and make them aware about what they are doing and the risk that, theoretically, they may run when one is working with a small and limited number of horses or a small genepool. Therefore, under practical aspects, a very severe evaluation of all offspring born is needed and a strong degree of objectivity is required in what to select and which animals should be removed from the herd. This will eliminate doubts and worries later on.

In considering the above, Katharinenhof's programme is based on a specific kind of line breeding and inbreeding, consisting of 4 damlines and 1 sireline, in order to

concentrate and to increase in this way the positive elements in the total population and yet leave enough room for variations. Under this scheme, it is assumed that one finds in each of the chosen mare-lines specific positive elements which should be spread over the whole population. The way to do so is by means of the stallions. Hopefully, a stallion is born out of such a mare-family which has picked up such positive elements and is able to transmit these elements into the other families. This requires strong selection on the stallion side. Those who do not show such positive traits or are not able to transmit them, are not suitable and must be removed. As mentioned before, it is therefore quite important that stallions are chosen which are not too dominant,

but only in one or the other trait for which they are selected. It must also be very clear that the foundation stock is of vital importance. It has to be studied and known as well as possible. The El Zahraa Egyptian horse population was chosen as a source for Katharinenhof's concept, mainly for three reasons:

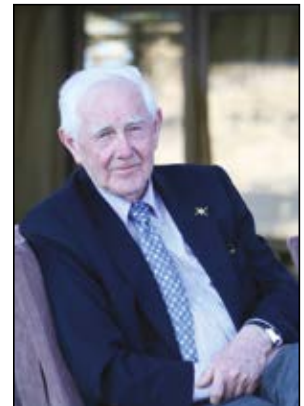
- This population was not too big;
  - It can be assumed that the homocygosity had already reached a higher level;
  - The type of horse bred in El Zahraa remained very close to the type of Arabian which reflected an original type which described as "the Southern type".
- The final result of such a method should be the increase of desirable qualities of the whole group or in each family, and not only of a few single animals. ○



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by Hans J. Nagel

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