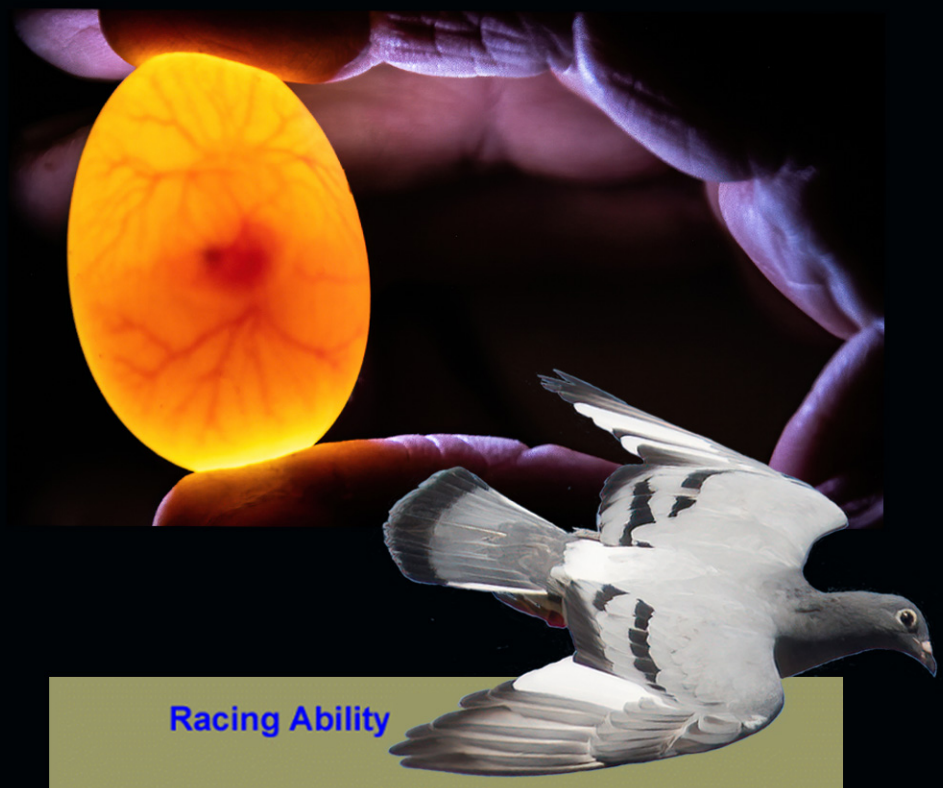
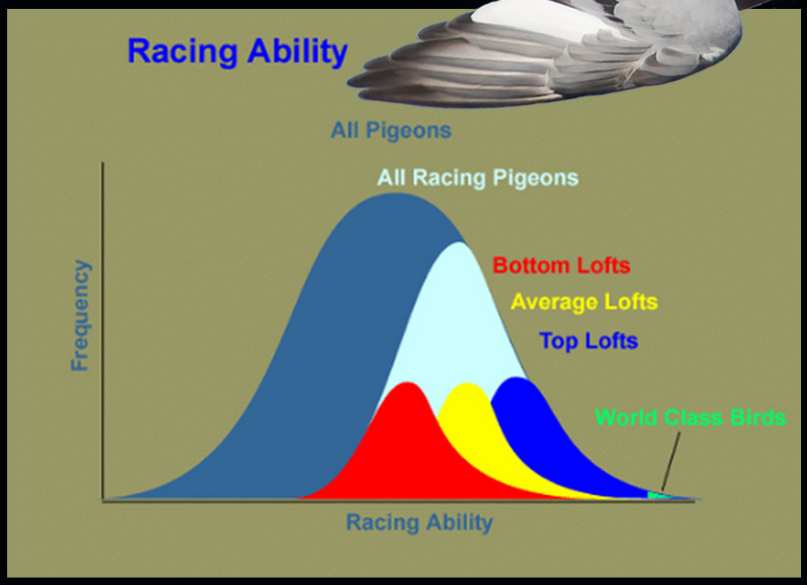
Genetics of Racing

Twenty Essential Concepts for Breeding Champions!





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Dave Shewmaker

Table of Contents

Preface

And suddenly a hundred years doesn't seem so long ago...

The way one views time, changes over the course of a lifetime. When I was young, it was irrelevant; there was always tomorrow. History was an interesting subject, but it always seemed rather abstract. The American Civil War was as distant in my frame of reference as the Crusades of the Middle Ages. Now, as I enjoy my senior citizen discounts, I am struck with the thought that there is an entire generation of young people who most likely view the Vietnam War the same way I used to view the American Civil War. To me, Vietnam was yesterday. To them it is probably irrelevant.

My concept of time was first shaken with the death of my best friend thirty five years ago. His name was Don Lovejoy and he was the best animal breeder I have ever known. I first met him when I was twelve and for the next twenty five years he was my mentor. He was a rabbit breeder who over the course of fifty years took several breeds to a standard never before seen. From his Tortoise Dutch of the sixties to his Rex of the eighties, no one had anything that was close to the quality of his rabbits. Someone once wrote that "having a Lovejoy rabbit in the breeding barn was like having a Cadillac in the garage".

Don Lovejoy

We were having dinner at his house one night and he remarked he didn't feel so good. We buried him eighty nine days later. Most of those eighty nine days were greatly diminished by the effects of the chemo and the cancer as it rapidly progressed. We tried to tape record some of his thoughts on breeding, but we were too late. He was just too tired.

I had been under the influence of Don's thinking for about six years when I went off to college to study genetics. Fairly early on I was struck with the contrast between what Don believed and some of what I was being taught.

While most of my university studies were in the hard core sciences (chemistry, physics, molecular genetics, population genetics and such), I took a course in Animal Science where we were taught that inbreeding was not an appropriate strategy for animal breeding. This was the exact opposite of what Don believed and had practiced for decades with great success. I vividly remember to this day, an essay question I answered on an exam in this course. In my answer I defended inbreeding as an important tool in animal breeding. I was heavily marked down for my answer. It was a bit of a turning point in my genetics career. I realized there was an enormous amount of knowledge I needed to gain from my studies, but at the same time, I realized there was still work that remained to be done in the practical application of this knowledge.

Over the past fifty plus years I have been able to successfully apply what I have learned from Don and my academic studies to the successful commercial breeding of rabbits, swine, sheep and racing pigeons. In all cases, the concepts and principles have been the same. The breeding of racing pigeons has been the most challenging, due to the number of genes involved in the traits for which we are selecting. This actually makes racing pigeons the ideal species to use for the basis of this book, because if it works for the breeding of champion racing pigeons, it will work for any objective in any breeding program for any species.

It is not my intention in writing this book to say that my way of animal breeding is the only way. Far from it. There are many other successful breeders whose approaches vary considerably from mine. In some of these cases, the breeders follow many of the same concepts but apply them with different emphases. My intention here is simply to share what I have done and to explain why I have done it this way in the hope that it is helpful for some.

This is the book I wish Don had written. It captures most of what I know and believe to be true about the genetics of animal breeding. No doubt there are things here that still need development and some that may even prove, down the road, to be wrong. Its value though is that it preserves the hundred years of work of Don and Dave so that others can consider it, build on it and take it forward for the next generation.

There are many others who have made much larger contributions, but there still seems to be a need for a book which explains to the guys and gals with

manure on their boots, how to practically apply the science of genetics in their barns and backyards.

What must not happen is that these lessons of a hundred years of work are simply lost or that they are viewed by subsequent generations as being irrelevant.

Introduction

> *"Most gardeners are stuck in traditional horticultural land, a place where a blend of old wives' tales, anecdotal science, and slick commercial pitches designed to sell products dictates our seasonal activities."*
>
> Jeff Lowenfels and Wayne Lewis in their book *Teaming With Microbes*

The elegance of genetics is its simplicity

While it can be very advantageous to understand the many details of the field of genetics, none are of much value if one fails to understand and grasp the larger view.

Many breeders who study genetics miss this vital point, getting lost instead in a quagmire of details about DNA, chromosomes, dominant and recessive genes, epistasis, protein synthesis and scores of other sub-topics. It is a situation which has led to some pretty laughable declarations of how to use genetics to breed better animals. We will touch on some of these later in the book. The point I want to make here (like the marvelous quote above) is that it is easy sometimes to get lost in the details and get stuck in "traditional land" where many practices that are commonly followed are really nothing more than a mixture of old wives tales, fake science and snake oil pitches. Before we even realize it is happening, we have made them a habit we repeat year after year.

This book has one goal – to show in practical terms how animal breeders can produce generations of animals which excel in the traits for which they are breeding. It will be based on the science of genetics, presented within a framework of clear concepts and backed up by examples that come from decades of experience in animal breeding across multiple species.

As I said in the Preface, much of what will be discussed will be from the perspective of breeding racing pigeons. The intended audience though is much larger than the relatively small subset of people who breed racing pigeons. Many of the most important concepts about breeding I learned studying the genetics of bacteria and viruses. The one university professor who had more influence on my thoughts about animal breeding than any

other was G. Ledyard Stebbins whose book *Processes of Organic Evolution* doesn't contain a single sentence about commercial animal breeding. My point is that some of the most important concepts of genetics are best learned in situations far removed from where we will actually practice the genetics of animal breeding. Bacteria, for example, afford us a way to see how our genetic concepts work when applied over the course of a hundred generations. The bacteria *E. coli* can produce a new generation about every 20 minutes under ideal laboratory conditions, taking a little over a day to turn a hundred generations. Contrast this to beef cattle where the generation interval is 5 to 6 years and horses where it is 8 to 10 years. The lessons of a day in the bacteriology lab would literally require centuries to be conducted with cattle or horses.

So, why racing pigeons?

There are two reasons. First, racing is one of the most difficult challenges possible in animal breeding, whether it is horse, dog or pigeon racing. There are many genes involved, the environmental influences are quite large and the measures for quantitative selection are somewhat elusive. If you can successfully breed animals which consistently win races, you can successfully breed any species of animal for any trait.

Second, the generation interval for racing pigeons is quite short relative to many of the other animal species which people breed. This combination of difficult breeding objective and short generation interval make it an ideal model for learning about practical and effective breeding strategies.

The book is organized into two sections

In *Section One* (the first seven chapters), the emphasis is on presenting and explaining the key concepts of successful animal breeding as it applies to racing. Many details and examples are presented in an effort to explain the material in a concrete and meaningful way. However, it is important in reading this first section to keep a high level point of view. Do not focus too keenly (just yet) on implementation details. **The twenty concepts that are presented in *Section One* should be applicable to any breeding program.** There are though, many ways these concepts can be implemented and different breeders will successfully apply them in different ways. If you find that an example I give in explaining a concept in Section One is not the way you think it should be done, remember I am just giving the example to try to make the concept clear, not to advocate for the example.

This is such an important point that I want to give an example before moving on. Many pigeon breeders believe the structure of the eye is an important indicator of the breeding value of racing pigeons. This is generally referred to as the theory of "eye sign". I do not subscribe to this theory, preferring instead to place a very high emphasis on race results to a single loft. There are people who do not subscribe to my approach. The concepts of *Section One* though should be equally applicable to all breeders including those who believe in eye sign and those who do not follow it at all; it should be equally applicable to breeders who heavily emphasize race results as well as those who combine race results with other indicators in making breeding decisions.

The focus of *Section Two* (Chapter 8) is on implementation. Here, I take eight scenarios that describe situations readers might encounter and I explain how I would approach them using the concepts that have been presented in *Section One*. As was just mentioned, there are many different ways this can be done successfully and the material in *Section Two* is not put forth as the only way it can or should be done. *Section Two* is presented in great detail because I believe there is tremendous educational value in such a deep dive even for those who will implement the concepts of *Section One* differently in their own operations. Think of it this way – *Section One* explains what I believe are the universally true *what* and *why* and *Section Two* explains one person's approach to *how*. Let me draw an analog most pigeon fliers will relate to – you can't race successfully today without some method of motivating the racing birds. There are though many very different ways this motivation can be achieved ("widowhood" and the "natural system" being two examples[1]). The concept of motivation is critically important, but there are many ways that it can be achieved.

The Twenty Concepts

The book will put forth twenty high level concepts as a framework from which readers can gain a clear understanding of how to use genetics to achieve the racing objectives of their own breeding programs.

1 For readers who do not race pigeons, "Widowhood" is a system of flying cocks where the hens are only with the cocks on the day they return from the race (there are many variations) and "Natural" is a different system where both mates are always together but only raced when the eggs or babies are at a certain age (there are many variations in this system as well).

I have chosen to introduce the first two concepts in the Introduction instead of the main body of the book. This is because they really transcend the topic of *Racing Genetics*. They are absolutely essential for any successful breeding program, but they also apply to just about any other endeavor the reader might undertake. Some readers might be tempted to skip over them, but I wouldn't recommend it. This is where many people make their first, and often times irreversible, mistake.

Concept 1 – *Keep an open mind, but think for yourself; make evidence based decisions.*

A widely quoted definition of insanity is “doing the same thing over and over again and expecting different results”. A lot of people think it was Albert Einstein who said it. Turns out, it probably wasn't. I think this fact and the quote itself, are a good starting point for *Concept 1*. How much of what you are doing in animal breeding is based on things that you have been told and you just assumed were true? And how long have you been doing them, over and over again, getting the same result, but still expecting them to eventually work? Some of it is, no doubt, true. But is it all? Which parts are bogus and have been holding you back? Which parts are true and are the keys to the successes you have had?

Concept 1 is not an end point that we attain, but a continuous process in which we challenge everything, constantly look for ways to improve and make our decisions based on facts and unbiased data. And then we challenge those decisions.

Keep an open mind

In other words, everything you think you know is open to being challenged. It also means engaging in behaviors which promote those challenges - behaviors like listening and observing. When was the last time you sat in your loft and just watched your birds for two hours or more? The last time you were in a discussion with someone, who did the most talking? Failing to keep an open mind means you are missing an opportunity to correct the misunderstandings that we all have and which hold us back from achieving our goals.

Think for yourself

There is a timeless essay by Earl Nightingale called “The Strangest Secret”. It was first broadcast in the fifties, but it's points are still spot on today. Nightingale's thesis was that “people just don't think”, instead spending their lives on “auto pilot”. He doesn't say that people are incapable of thinking, just that they largely don't. It is like exercise, it takes some effort. So the first part of “thinking for yourself” is to make sure you are an active thinker, constantly asking those “who, what, where, how, when and (most importantly) why” questions of every subject pertaining to your breeding operation. The second part is to hold yourself accountable for the answers and not just believe everything you hear or read. Few questions will have a single, universally agreed upon, answer. And those answers can change over time. For example, is mitochondrial DNA an important issue in animal breeding? We will discuss this later in the book (Chapter 3), but for now it is a good example of a question where there are two possible answers (and two camps supporting those answers), each one demanding a very different approach to the breeding program. How do you know which one to follow? You keep an open mind, listen to the various proponents, ask questions, look at the data and facts and then draw your own conclusions. And then, you keep an open mind as you go forward in case new ideas or data suggest you don't have it completely right.

Make evidence based decisions

Lets go back to the quote at the beginning of this *Introduction*.

> *“Most gardeners are stuck in traditional horticultural land, a place where a blend of old wives' tales, anecdotal science, and slick commercial pitches designed to sell products dictates our seasonal activities.”*

The word *science* really should have been in quotes since an anecdote is not science. Back when you were in school you probably studied “the scientific method”. It is a process where, after careful observation, a hypothesis is formed of how something works. An experiment is then designed whose resulting data will either reinforce the hypothesis or raise contradictions or questions which will in turn require a modification of the hypothesis and then a new experiment. The process is repeated over and over until eventually we get to a point where we have a well developed understanding of how

something works based on the experimental data. Often, down the road, new observations are made and our “understanding” undergoes further evolution or, in some cases, gets completely turned on its head and we go in a new direction.

The manner in which the experiments are done is really quite important. Great effort is taken to minimize bias and construct the experiment so measurable data can be gathered which will either support or discredit the hypothesis.

Concept 1 requires a thought process which is very similar to the one embodied in the scientific method. We must at all times attempt to minimize bias and draw our conclusions based on repeatable and measurable data. When possible, we should actually conduct experiments in the breeding barn to evaluate our various ideas and reinforce/contradict our concepts of breeding. Many times though, there are just too many variables in a real world situation and we may not really be able to design scientifically rigorous experiments. We can still think like a scientist though and attempt to make evidence based decisions whenever possible.

Concept 2 – *If you don't know where you want to go, you will never get there.*

I know, “Duh!” Except it is really quite amazing how many breeders don't have a firm handle on this point. Lets take a person who breeds racers. At first, one might be tempted to say the goal of the breeding program is to **produce winners**. In pigeon racing it is not uncommon for a club or region to be dominated for a period of time by a breeder who has a marvelous pair of birds. This “Golden Couple” will often produce winner after winner for several years. Then, all of a sudden, the winning abruptly stops. The pair has reached the end of its breeding life and the breeder once again finds himself back in the pack with the rest of his competitors.

So, perhaps the goal of the breeding program should be to **produce winners who breed winners**. We are getting closer, but here is another scenario that happens with regularity in pigeon racing. A breeder will purchase several outstanding racers from different flocks and breed them together in various combinations. They produce some winners who are, in turn, retained for breeding after their racing careers. These birds though do not produce many

winners. Despite their outstanding heritage, the flock has regressed and the winning frequency falls back again to the level of the rest of the competition. In other words, the birds are winners and they breed winners, but those winners do not carry it on to subsequent generations.

So then perhaps the goal of the breeding program should be to **produce animals which breed winners generation after generation after generation.**

This last statement is actually the goal of my breeding program. It makes sense to me. But now let me give you another example that also makes sense and is completely different. My point in making these two strikingly different examples is that the **right goal is the one that fits your objectives**.

I have a friend whose goal is to produce the finest racing pigeon (singular, not plural) that has ever been bred. Instead of narrowing the gene pool of his flock to produce a high percentage of outstanding racers (my approach), he wants a broad gene pool with no limits on the top end. Both outcomes (his and mine) are possible, but they take two completely different breeding programs. The right breeding strategy for me is wrong for him and vise versa.

Know what you want to accomplish. You can't take even the first step if this is not clearly known and understood. You will also need to stay the course. Your goals can and should evolve, but frequently changing goals can destroy a breeding program.

Section One – The Big Picture

> *"Simple can be harder than complex. You have to work hard to get your thinking clean to make it simple. But it is worth it in the end, because once you get there, you can move mountains." - Steve Jobs, co-founder of Apple, Inc*

Steve Jobs was talking specifically about product design when he made that statement, but the wisdom of what he said applies almost universally to any activity in which you are trying to create or understand something. It certainly applies to anyone who is trying to understand the genetics of animal breeding.

How powerful would it be if we could reduce the complexity of animal breeding genetics to a single, simple concept?

We are going to begin this book with a statement of just such a concept. It can be expressed in a single thirteen word sentence. Understand it and you will be fully equipped to reach your breeding goals.

You will notice that Jobs didn't equate *simple* with *easy*. He actually called out the fact that it takes hard work to think in simple terms, but "once you get there, you can move mountains". So while we might be able to reduce it to a single sentence, it is going to take the rest of this book and a lot of thinking and pondering on your part to get to the point where you understand it. Once understood though, you will find it both simple and hard to forget.

Chapter 1 – Achieving Real Genetic Progress

Here it is - the simple, thirteen word sentence that tells you everything you need to know. Understand it (truly understand it) and you will be fully equipped to reach your breeding goals.

Concept 3 – *Genetic progress is a function of selection accuracy, selection intensity and generations turned.*

What this means is that there are three factors which contribute to the genetic progress of any given breeding goal[2]. If all three factors are positive, you will make genetic progress. If you increase all three factors, you will make more progress. If you increase two factors, but decrease the third *more*, you will regress away from your goal. Make any one of these factors zero and you will make zero progress. Make Selection Accuracy negative[3] and you will move *away* from your goal.

Everything we do in our breeding program should be geared toward maximizing each of these three factors. If you are not making the progress in your breeding program that you expect, this is where you have to turn your attention. Since we all have a limited amount of time with which to reach our goals, it is vital that we not spend it standing still or worse, moving backwards. Given the tremendous investment in time and money most animal breeding entails, we want the fastest genetic progress possible.

Let's look now in more detail at each of these three factors.

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2 There are actually four factors that influence genetic progress. The fourth being the diversity of the gene pool. In other words, if you don't have the alleles (all the different versions of a particular gene are called alleles) you need in your gene pool, you are not going to make the progress you desire. I am leaving this one out of the general equation because in citing this concept, I am treating the gene pool as that of "*all racing pigeons*". There will be separate discussions in the book on the impact (both positive and negative) of adding additional alleles to the gene pool of "*an individual's loft*".

3 Selection Intensity and Generations Turned can't really be negative.

Selection Accuracy

It is so important that we be accurate in our selection. It is hard enough to breed better animals when we can actually see the trait for which we are selecting (for example color on an Opal Rex rabbit). It is incalculably harder when we are selecting for something as intangible and elusive as racing ability.

Keep this in mind: what we think we are selecting for is not always what we actually select. When we stock that bird who won a prestigious futurity[4] race and mate it with the dam of four different first place winners, we are certain we have made a selection which will genetically improve our loft. Sometimes it does, but not always. There are just too many variables for it to be that simple.

As we discuss *Concept 3*, we are using the word "selection" in the context of what *actually happens* and not in the context of what we *think or hope will happen*.

Let's look at an example.

In pigeon racing it is very common for people to attempt to identify traits which are correlated to racing excellence. The idea is that if birds with (I'll make up something ridiculous here) long beaks are the best racers, then we can select for long beaks much more easily and with much greater accuracy than actually taking the time and spending the money to race them.

Lets assume I am correct in stating that "beak length" has absolutely nothing to do with "racing ability". A pigeon breeder who selects for breeding those birds who have long beaks is not selecting at all for racing ability. Despite their intention to select for improved racing ability (through longer beaks) they have in fact done no such thing. After years of such an approach, they will likely end up with a loft full of birds with longer beaks, but their pool of genes for racing ability will not have been affected at all. Their *selection accuracy* for the genes responsible for racing ability will have been zero[5].

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4 A *futurity race* is a centralized race in which the birds are sent as youngsters from many different locations to another location(s) from which they are trained and later raced. A type of futurity race that is very popular today is the *one loft races*. Throughout this book when I refer to *futurity races*, I am including the *One Loft Races*.

I am not suggesting by this example that correlated traits are not useful, just that if they are not truly an accurate measure of what you are selecting for, they can impact your genetic progress.

The best selection metric is a **direct measure** of the trait for which we are selecting. If we are trying to breed pigeons which win sprint races, then we should somehow be measuring racing performance in sprint races. When a direct measure is available, there is less reason to select birds based on indirect measures such as correlated traits. And while I believe direct measures are generally more accurate than indirect measures, this is not to say direct measures are absolutely accurate. They too can be inaccurate and misleading if not carefully measured and evaluated.

Great care must be put into the choice of the metric and the gathering of the data. Let's continue with our example of someone trying to breed sprint pigeons. Is the number of combine wins[6] in the sprint races a good measure of racing performance? Consider this scenario. Two nest mate youngsters are raised and one is placed on your young bird team and the other is given to a club member who places it on their young bird team. At the end of the race season, the results show that the bird in your loft was 1st to your loft in all five of the sprint races that were on the schedule, but never placed in the top ten in any of the races at the club or combine level. The nest mate flown by the club member was 1st to his loft, 1st club and 1st combine in two of the sprint races and was not in the top ten in any of the other races (loft, club or combine). What can you conclude?

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5 Since we stated that beak length had nothing to do with racing ability, the selection accuracy is zero and therefore progress is zero. However, if the example selected for a trait that actually negatively influenced racing ability, then it would have been possible for our progress to have been negative (i.e. we would have lost ground and moved backwards).

6 For the readers who don't race pigeons, let me explain a little about how pigeon races are organized. There are two kinds of pigeon races – local competition and centralized races (races where birds are sent as babies from many different lofts across the country (or even the world) to a single loft (or a small group of lofts in one particular location) which then trains the birds and races them to that one loft on the day of the race). In the local races, a flier typically enters a dozen or so birds into a club competition and the birds fly to the lofts where they were born. The winning bird is the one with the fastest speed (since the actual distances covered will vary for each loft). Many of the clubs are organized into combines. The club results are then rolled up to the combine level. So as an example, a flier in a local competition might have his first bird to his loft place 8th in the club and 23rd in the combine.

Lets start with the question of which of these two birds is most likely the best sprint racer. The answer is that you can't say. They were raced in two completely different environments. The environmental factors which contributed to their respective successes and failures could be so different that there was no genetic difference that was even measured. Perhaps you are a beginner and don't know the first thing about young bird racing and the other club member is a master who has been winning at the top of the sport for decades. Or, maybe he had an outbreak of a disease such as coccidiosis and your team went the entire season in perfect health. We will discuss this in much more detail later in the book, but in general, the only race results which should be considered as a selection metric are **results to the same loft**. Such an approach minimizes, as much as is practically possible, the environmental differences between birds that are being compared. The measured differences in race performance then will more likely be due to the genetic component.

Now for the question of whether either of these birds is worthy of selection as a breeder. The answer here is that they are both promising. More data would be helpful and could lead to a more reliable decision, but if we were forced to make a decision at this point in time, I would definitely be interested in breeding both of these young birds and seeing how their offspring fly in sprint races. If I could only breed from one, I would probably select the one from your loft who was five times first to your loft. He was 5 for 5 while his nest mate was 2 for 5[7]. It doesn't mean he is the best one, just that if I have to choose one, he is more likely to be the best based on the data[8].

So how do we quantify this? There are so many variables involved in pigeon racing that absolute measurements are probably not very useful and **relative measurements are much more meaningful**. Speed of flight is an example of an absolute measurement. Many good sprint races are won with speeds in the neighborhood of 1600 to 1800 yards per minute. However, there is an American Racing Pigeon Union record of a bird that flew 2957.578 yards per minute (that is over 100 miles per hour!). Should we value that bird over all others since he has the fastest speed? Certainly not, since so much of a bird's speed will depend on the winds the bird encounters over the course of the

7 In making this decision I am assuming both fliers entered approximately the same number of birds in each of the races.

8 There is actually quite a bit more that goes into the decision making process for choosing breeders that will be discussed in Chapter 7. For this example, let assume all other considerations are equal.

race (head winds, tail winds and even cross winds which can cause them to fly a longer distance). A better approach is to use the relative measure of percentiles. A bird which is 1st out of a race of 15 birds (to a single loft) has beaten 14/15th of the birds or 93.3% of all birds in the (loft) race. We could also look at it as placing in the top 6.7% of the birds (1/15). A bird placing 2nd out of 15 would be in the top 13.3% (2/15) and a bird 1st in a One Loft Race with 628 birds in the race would be in the top 0.16% (1/628). This last example of 0.16% is very good and would be good even if the race had been held during a strong headwind which kept the winning bird to a speed of 900 yards per minute.

There are many other relative measures that you might want to utilize. You might also want to keep track of the "time to win". This would allow some granularity beyond placement percentile. So if you had two birds that both placed 2nd to the loft in a group of 15, you could distinguish between these two results if you knew that one was ten seconds behind the winner and the other was twelve minutes behind the winner. There are many other possibilities and we will discuss this topic more, later on in the book.

There are times, of course, when direct measurement is either not possible or too restrictive to be our only metric. When this is the case, it is very appropriate to use indirect measures, such as measures for correlated traits. For example, if you were to attend an estate auction of the birds of a prominent and successful breeder but for which no records were available, you would definitely look very carefully at every phenotypic[9] trait for which you believe there is a correlation to racing performance. In such a situation, overall conformation, wing structure and alertness might all be very appropriate decision criteria. Be very careful though when you use these indirect measures at the expense of direct measures when they are available. Years ago I had a family of absolutely gorgeous birds that literally looked like they had been sculpted by an artist. They were perfect handling birds. I have never seen any better to this day. They also could not fly home to the loft if I released them in my driveway.

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9 Geneticists use the term *phenotype* to refer to what we observe an organism to be and the term *genotype* to refer to the actual genetic composition of the organism. For example, in humans the gene for brown eyes is dominant over the gene for blue eyes. So a person who has brown eyes but also carries the gene for blue eyes would be described as having a *phenotype* of "brown eyes" and a *genotype* of "brown eyes/blue eyes".

Even if you use an outstanding metric for measuring race performance (such as placement percentile) it is still a good idea to understand what all of the various traits are which collectively result in “winning”. Such an understanding can be very helpful in keeping balance in the selection process and properly weighing the data under varying conditions. It is not just the data that must drive your decisions, but the interpretation of the data as well.

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This is a preview of the book Genetics of Racing published by Shewmaker Genetics (2021).

Full details on the book as well as ordering information can be found the our web site: www.shewmaker.com (Select the Tab called “The Book Project”)