ABOUT THE AUTHOR

Professor Onsgard was an All-American swimmer when he was a student. As a college teacher and swimming coach he has produced a number of All American swimmers as he won a number of college championships. He has also excelled as a teacher of beginners from children to adults.

For more than 40 years he has also been a beach lifeguard for Los Angeles City and Los Angeles County. (You may have seen him on the Baywatch series on television.) During the most recent years he has been the director of the Los Angeles County Junior Lifeguard Program.

In the most recent international lifeguard championships he won all ten swimming, running and surfing events in his age group. When he writes about how to swim, water safety, how to use swimming for fitness—or for fun—you can believe that he practices what he preaches!

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Preface

Swimming Essentials attempts to meet the needs and interests of a vast audience. However, it serves only as an introduction to swimming, water safety, and aquatic recreation.

While the emphasis of this book is to teach the beginner to swim and the intermediate to improve his or her strokes, advanced swimmers will find valuable information, too.

The text begins with exercises and techniques to help the non-swimmer become comfortable in the water. Next, the beginner is taught how to move effectively in the water. Intermediate and advanced levels of swimming technique are then presented.

Most students in a beginning swimming class will be able to follow this instruction to progress into the intermediate level, and possibly the advanced level. The book takes the student as far as he or she is willing and able to go. The techniques of all major swimming strokes are thoroughly explored.

Today's heightened interest in fitness has brought more people into swimming, consequently, these subjects are explored in that light. Some readers may also be interested in competitive swimming from age group to high school—and beyond. Therefore, various aspects of competitive swimming are discussed throughout. The glossary explains commonly used aquatic terms.

This book is designed to get the non-swimmer swimming and those who can swim to enjoy the water more.

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PART 1  Introduction to Swimming
CHAPTER 1
The History, Science, and Benefits of Swimming
Outline
The Science of Swimming
Techniques for Beginners versus Advanced
The Physical Benefits of Swimming
Other Water Workouts
Recreational Aspects of Swimming
Water Safety
Swimming Competition
Clothing and Equipment
Summary

People have been swimming for a long, long time. Pictures of swimmers are found on Assyrian bas-reliefs made nearly 3,000 years ago, on the walls of ancient Roman buildings, and on 2,000-year-old pottery from Greece. One of the first books ever published (in 1538) was The Art of Swimming.

At one time the breaststroke was the most common stroke-at least in Europe and the United States. As competitive swimming developed, swimmers started looking for faster methods of propulsion. Speed swimming evolved from a dog paddle to the breaststroke, to the sidestroke, to the overarm sidestroke. In 1873 John Trudgen brought to England a stroke he had learned from the South American Indians, featuring an overarm stroke with one arm, then a sidestroke scissor kick, then another overarm stroke—one kick for every two arm-pulls. Eventually this Trudgenstroke was modified so that a kick was done between each arm stroke. With this double Trudgen, the body rolled from side to side with each kick.

In 1902, at the International Swimming Championships, an Australian named Richard Cavill introduced a hand-over-hand method of swimming coupled with an up-and-down kick that was labeled the Australian crawl. He shattered the world record for the 100 yards with a clocking of 58.4 seconds.

Four years later, C. M. Daniels became the first American swimming champion. After refining the crawl stroke and the kick, he was able to swim the 100 yards in 55.4 seconds with what became known as the American crawl.

In 1912 the legendary Hawaiian, Duke Kahanamoku, perfected the six-beat or six-kick crawl that became the standard type of kick in the crawl stroke for many years. With this new technique the Duke won both the 1912 and the 1920 Olympic 100-yard sprints.

As principles from the science of physics and the field of biomechanics have been applied to swimming, improved techniques for swimming strokes and for athletic conditioning have developed. Slow-motion films and videos, force
platforms, flumes, and other devices have helped expand our knowledge of locomotion in the water. The information thus obtained has benefited every swimmer from the novice to the Olympian.

**THE SCIENCE OF SWIMMING**

1. *Buoyancy of the body.* Some bodies are more dense than others and have greater difficulty floating. The greater the percentage of body weight in bone and muscle, the more dense the body will be. Women, who generally carry more fat than men, usually float higher than men.

2. *Center of buoyancy in the body.* This is the part of the body that floats the highest. It is in the area of the chest. This factor is especially important in the back float because proper flotation makes breathing easier.

3. *Drag.* The skin and its body hair create a resistance to momentum. Drag can be reduced by shaving body hair, wearing a swimsuit made with anti-drag materials, wearing a bathing cap, and oiling the body (sometimes done in competitive swimming).

**REACTION**

![Diagram showing action and reaction forces in swimming](image)

**Law of action and reaction.** Movement of the swimmer's arms down produces an upward reaction behind.

4. *Frontal resistance.* This is created by the cross-sectional area of the body that faces the direction of movement. It includes the area of the head and shoulders and the legs as they drop below shoulder level. Frontal resistance to the water slows the speed developed by the propulsion of the arms and legs.

5. *Law of action and reaction.* Isaac Newton (1642-1727) formulated the law of physics stating that for every action there is an equal and opposite reaction. Applied to swimming, it means that for every pound of force generated in a backward direction, there will be a pound of force moving the swimmer forward. Of course, this forward force is reduced by the previously mentioned drag factors.

6. *Drag force.* The force developed by a hand and arm pushing directly against the water is drag force. This is the primary force moving the body through the water. In this theory the hands are thought of as paddles. The idea of drag force is related to Newton's principle.
Drag force theory--hands act as paddles.

Water flows over longer curved area
(a) on top faster than water flows over shorter flat area (b) on bottom, creating lift.

7. Kinetic theory of fluids. Daniel Bernoulli's (1700-1782) theory relating to gases and fluids, when applied to an airplane wing, explains that the longer curved area of the upper wing makes the air flow over it farther, and therefore faster, than it can flow under the flat part of the underside of the wing. Because it is flowing faster over the top of the wing, it creates a low-pressure area over the wing. As the wing moves toward this low-pressure area, it rises from the ground. This is called lift. The use of a propeller has similar lifting capabilities.

8. Aerodynamic lift theory. A more recent theory of swimming propulsion was that the hands and arms are more effective in propulsion if they created lift forces pulling the body forward rather than drag forces that push the body forward. The swimmer's hands would act as propellers (rather than paddles, as in the drag-free theory). There is evidence for both the lift and the drag theories of propulsion. The lift theory of propulsion also applies to the leg kick.3

Aerodynamic. The hands act as propellers
9. Current Research. Research topics today are (1) how to get better propulsion through deflecting the water backward (drag) so that the body is pushed forward and (2) how to move the hands and arms so that maximum "lift" is created and the body is pulled forward. The “push” theory has now won out. The emphasis now is on reducing the drag from the body, especially the shoulders and upper arms.

TECHNIQUES FOR BEGINNERS

The older method of swimming, in which the arms and legs are thought of as paddles, is still the simpler way for a beginner to learn a stroke. It tends to give the beginner quick success in the stroke. For those interested only in recreational swimming, this technique is sufficient.

THE PHYSICAL BENEFITS OF SWIMMING

Swimming has become a more popular pastime as its physical benefits have become known. In the past it was primarily a recreational pursuit. Today people are more aware of its aerobic aspect; and since other aerobic activities such as jogging or bike riding have more inherent dangers for injury, many are making swimming their aerobic exercise of choice.

Not only is swimming a safe type of aerobic exercise, it is also a full body exercise. While running and cycling primarily exercise the heart and the lower extremities, swimming works the upper and lower body as well as the heart.

Because of the high caloric output of swimming, it is an excellent method of controlling one's weight. It also effectively tones the muscles. A swimmer's body tends to have more lean body mass and less body fat than a non-swimmer's.

Other Water Workouts

The medium of water allows a person exercising to work against greater resistance than is possible in exercises done on land. Water aerobics (aqua-aerobics) and deep-water running are rapidly growing in popularity. The resistance of the water also aids the development of muscular endurance. Water workouts have been used by physical therapists for many years for people with muscle-weakening illness or injury, but it was recently that athletes discovered this application for general physical conditioning.

Water Safety

Swimming is a necessary skill for scuba divers, skin divers, and snorkelers; for windsurfers and bodysurfers; for boaters and for water skiers. An accomplished swimmer finds many recreational opportunities opened to him or
her.

Nearly 8,000 drowning deaths occur annually. Many could have been prevented if the victim had known how to act safely in the water or if someone had made certain that there was a lifeguard on duty. People can drown even in shallow water. A lifeguard should always be present when people are swimming.

Swimming Competition

Opportunities for swimming competition begin in early elementary school with age-group swimming. Next are high school and college swimming teams. Then the masters programs take over, with competition for every age group from the twenties into the eighties. There are ocean swims, lake swims, pool competitions, and triathlons available. If you like competition, swimming offers it for every age and every ability level.

Synchronized swimming is a special type of competition in which the participants use the pool as their arena to create a series of graceful and beautiful moves to music. Formerly, and appropriately, called water ballet, it is truly a type of dance in the water. It has been an Olympic sport since.

Clothing and Equipment

Tank suits are most comfortable for swimming. They give more support, reduce water resistance, and dry more quickly than the normal beach wear of bikinis for women and boxer-type shorts for men. They are generally made from nylon, Lycra, or other such materials and can usually be purchased at sporting goods stores or specialty shops.

Goggles are used by many swimmers to avoid the temporary eye irritations that may be caused by chemicals used to disinfect the water.

Face plates are used not only for skin diving and scuba diving but also by some people in swim classes because they afford protection to those whose nasal mucous membranes are sensitive to the water.

Bathing caps are required in some pools in order to reduce the amount of hair that may clog the drains and filters. Many people prefer to wear caps in order to protect their hair from the pool chemicals or to keep their hair out of their
Swim fins are not only used for skin diving and scuba diving but are often used in swim workouts to help strengthen the legs and aid students in learning to kick correctly.

Floats (pool buoys) are used to hold the legs up when the swimmer is working on the arm pull.

A kickboard is used to hold up the upper body when the swimmer is working on the kick.

Paddles or webbed gloves are used to increase resistance to the arm stroke. Care should be taken when using these aids, though, because they can cause excess shoulder irritation of the rotator cuff muscles.

Deck shoes are often used to reduce the chances of slipping on a pool deck or to avoid contact with athlete's foot fungus when showering.

Warm-up clothing such as sweat clothes are often worn to class, especially at outdoor pools.

Nose clips are helpful to those bothered by water in the nose. Backstroke swimmers use them quite often.

Ear plugs are helpful to those bothered by water in the ears. They help prevent irritation and infection of the ears.

Equipment.
(clockwise from left) floats, paddles, goggles, kickboard, swim fins, tank suits, bathing cap.

Summary
- Swimming has a long history
- Swimming as an art and sport has benefited from the application of science to swimming technique and overall physical conditioning.
- Swimming is not only an enjoyable recreation itself but also allows us to pursue other recreational pastimes such as scuba diving, surfing, and snorkeling.
- Competitive swimming events are available for every age group and for nearly every ability level.
- Swimming is an outstanding way to develop cardiovascular fitness and to control one's weight.
- There are many types of swimsuits and swim aids.
CHAPTER 2
Getting Accustomed to the Water

Outline
Standing Up in the Water
Bringing the Head Out of the Water Floating
jellyfish  (Turtle or Tuck) Float
Prone Float
Checklist for the Prone Float
Back Float
Checklist for the Back Float Summary
Drills for Learning Rhythmic Breathing
A few people find it difficult to become comfortable in the water.
Whether it is the change in temperature (from the air), the feeling of buoyancy, or something else that bothers them, these fears must be overcome before swimming can be learned.

Heated swimming pools may vary in temperature from the high sixties (Fahrenheit) to the mid-eighties. The higher the temperature, the more comfortable it is for the swimmer who is not exercising briskly. As a workout becomes more strenuous, the water temperature should be reduced.

If the water temperature is uncomfortably cool for you, take some time to get used to it before immersing yourself. Try splashing some water on your face and body. Once you are in the water, do some exercises to warm up your muscles. Run in place, or move your arms back and forth through the water. As your muscles warm up, the water will feel cool and soothing - refreshing rather than chilly.

When properly maintained, swimming pool water is cleaner than drinking water, so you need have no fear of ingesting it or getting it in your eyes or nose. The only possible problem is that the chemicals used to make the water safer might slightly irritate the mucous membranes of your eyes. For this reason many people wear swimming goggles, which are available at every sporting goods store for about $15.

Suggestions follow for becoming comfortable in the water:

1. Someone who has never been in a pool should first hold onto the side and feel the water. Next, hold the pool gutter or a lane line and walk a short distance. Then walk in the water without holding onto anything. First walk along the side of the pool, then walk away from the edge of the pool toward its center. If there is very shallow water (about two feet deep) in the pool, try sitting in it and begin to familiarize yourself with the feeling of buoyancy that the water gives. The legs will start to float to the surface. Relax the arms, and feel them float upwards, too.

2. The next step is to stand in waist-deep water and submerge yourself, first to chest level, then to shoulder level, then to the chin. Now feel the softness of the water. Slowly put your face in the water, then slowly take it out. Do this several times. Remember to do it slowly so that the water isn't pulled up into the nose.

   Learning to hold the breath is the third step. Hold the pool gutter and take a breath. Hold it for five seconds, then ten seconds. (Our goal is to be able to hold it for thirty seconds under the water. Next, submerge in the water to shoulder level, put your face in the water, and hold your breath five, ten, fifteen, and finally thirty seconds. Remember to bring your face out of the water slowly when finishing this exercise. Notice the buoyancy of the water will give you a tendency to float.

   Now take a deep breath and submerge the whole body, head and all. Slowly bend the knees until the water is over your head, then slowly stand back up. When this can be done comfortably, count to five while under the water, then come back up slowly. Next time count to ten before coming up. Eventually it will be possible to count to thirty before coming up. At that point one can be considered to be comfortable in the water. Some people can do
this easily the first day, while others take several days; but however long it takes, this very important skill must be accomplished.

Adapting to the water. Holding the side of the pool, submerge the face.

3. The next goal is to be able to open your eyes when under the water.

When you try this, first look at the pool bottom and the sides. Then look at other swimmers. Drop a coin or other weighted object, and with the head underwater and the eyes open, find and retrieve it from the pool bottom.

4. Rhythmic breathing is a skill necessary for swimming the crawl stroke. To practice rhythmic breathing, take a breath through the mouth, then submerge and blow bubbles through the nose or the nose and mouth. Repeat this by "bobbing" up and inhaling through the nose and mouth. When you are swimming the crawl, your breath will be taken in for one count and exhaled for five counts, so practice this rhythm-in, 2, 3, 4, 5, 6.

**Standing Up in the Water**

It is important that you learn to stand up after floating or swimming. If the feet are not on the bottom of the pool, such as when floating or swimming, put them on the bottom before lifting the head to stand up and breathe. If the head is lifted before the feet are on the bottom, the feet may miss the bottom when the legs are extended to stand up. This can cause a loss of balance and a difficulty in standing. Beginning students often lift the head and extend the legs at the same time. This action does not allow the feet time to find the pool bottom. But if the face is in the water, there will be no problem in finding the bottom with the feet.

A second way to stand is to press down on the water with the hands and arms, tuck the legs, then lift the head slowly as the feet find the pool bottom.

**Lifting the Head Out of the Water**

You should learn to bring your head out of the water without pulling water into your nose. Lift your head slowly from the water. If the head is lifted very rapidly, a vacuum will be created and water can be pulled into the nose. Lifting it slowly allows the water to drop from the face and nose so that no problem is created for breathing.
Also, exhale slowly as the head is raised from the water. Some people like to make a humming sound as they bring the head up. This gives just enough outward air pressure to keep the water out of the nose.

Floating

Nearly everyone can float because water is more dense than the human body.

Jellyfish (Turtle or Tuck) Float

The jellyfish float is the simplest type of float. The first step is to hold the pool gutter with the right hand. Put your face in the water, bend the left knee slightly, and grasp the left knee with the left hand. Feel the water support the body. Then release the hand and slowly lower the left foot to the pool bottom and slowly raise the head.

Now, with the right hand still grasping the pool gutter, take a deep breath and put your face in the water. Bend up both knees slowly just a little, and grasp the left knee with the left hand. Slowly take the right hand from the pool gutter and grasp the right knee. Feel your body floating! As you float, your body will rotate forward slightly so that your back is nearly out of the water. When you are ready to stand up, slowly lower your feet to the pool bottom and slowly raise your head out of the water. Remember, exhaling slowly will keep the water out of the nose as you lift the head.

Jellyfish float— Holding wall       Free floating

Prone Float

The prone float gives more of a feeling of swimming. Take a deep breath. The prone position is easily entered by starting with the jellyfish float, then extending your arms out in front of your head and extending your legs behind, so that you are lying flat on the water. Your head should be between your arms, and your eyes should be looking down at the bottom of the pool. Looking ahead will cause your head to rise out of the water and your feet to lower. To stand up, bring your legs back under you, as in the jellyfish float. Push down with your hands. Put your feet on the pool bottom, then slowly raise your head.

The prone float position must be mastered because all prone-position swimming strokes (front crawl, breaststroke, and butterfly) start and finish in this position—with the arms extended forward of the head and the hands nearly
touching, the legs together, and the toes pointing backwards. This is the streamlined position that gives the body the least amount of drag in the water.

Now that you've mastered the position for the prone float, walk away from the pool wall about two body lengths. Put your face in the water, extend your hands over your head, and push off the bottom toward the wall. Glide through the water toward the wall. If the feet tend to drag, a slight kick will keep them up. When close to the wall, bring your knees near to your chest and put your feet on the pool bottom. Then raise the head slowly. This is called the prone float.

![Prone float—Correct and Incorrect](image)

**Checklist for the Prone Float**

While standing in waist-deep water, place one foot against the side of the pool. Put your face in the water, push off the side, and glide.

**IMPORTANT:** To stand up, bring your knees up under the chest, then put them on the bottom of the pool. Once the feet are on the bottom, stand up slowly to avoid water being pulled into the nose.

Return to the side by pushing off the bottom and gliding to the side.

**Back Float**

Learning to float on the back (*supine float*) is one of the most important skills a person can learn in the water. If you are ever in trouble in deep water, miles from the shore, the back float is your key to survival. It is also an important step to learning the back crawl stroke and the elementary back stroke.

To learn the back float, stand next to the edge of the pool with the water about mid-chest level. Facing the pool wall, put your toes and hips against the wall and grasp the pool gutter with both hands. Arch your back until your head is lying in the water. Remember to keep your toes and hips against the wall. Take a deep breath and relax your grip on the wall, keeping the head back and pushing the stomach and hips up. You will easily float on your back. This exercise can also be done with a partner instead of using the pool gutter.

Since the weight of water is only slightly heavier than the weight of the average body, only a small area of the body will be above the water. It is wise, obviously, to have that be the part of the body that breathes.

If your feet are too low in the water, slowly bring your arms to your side, then above your head—keeping them completely *under water* the whole time. This
will balance the body and bring the legs up. Many floaters can adjust the depth of their legs simply by moving their arms from above their heads toward the sides of their bodies. To bring the feet up even higher, point the fingertips up and out of the water.

When you are ready to stand up, just pretend that you are going to sit in a chair. Lift your chin forward, and your feet will find the bottom.

(CAUTION: Beginners often try to keep the top of their heads out of the water. Doing this will force the hips to drop deeper into the water and the mouth will go under the water.)

Some people float higher than others. Since fat weighs less per cubic inch than bone or muscle, people with more body fat float higher. Most women, because of a higher body fat composition, float higher than most men. Some very heavily muscled men may not float at all. They have what is called negative buoyancy.

The type of water is also a factor in floating. Ocean water weighs about 64 pounds per cubic foot, while pool water is about 62 1/2 pounds per cubic foot. So because of the greater density of the ocean water one will be able to float better in the ocean than in a pool.

Back float.

**Checklist for the Back Float**

1. Lie back on the water.
2. Arch your back enough to get your forehead in the water so that
your mouth will stay above the water.

3. Keep the hips high.

4. If you have trouble floating, flutter kick your feet a bit. The movement of the body through the water will help you float higher.

5. If your feet sink, just extend your arms over your head but keep them underwater. This will move the center of buoyancy of the body a bit closer to your head.

6. If necessary, kick softly, as if kicking a butterfly off your toes, or use a skulling action to give your body movement and more flotation ability.

**Summary**

- If the water temperature feels chilly, get used to it gradually by splashing your face and body, then submerging slowly.
- When you are able to submerge your body to shoulder level in waist-deep water, put your face into the water and hold your breath for five, ten, fifteen, and finally thirty seconds.
- Learn the proper way to breathe while swimming (rhythmic breathing) by taking in air through the mouth then exhaling through the nose and mouth. Do this out of the water first. Then take a breath, submerge the face, and blow bubbles under the water, exhaling through your nose and mouth.
- It is important that you learn (1) how to stand up after floating or swimming and (2) how to bring your head out of the water without pulling water into your nose.
- Floating is an important survival skill. Four types of float are the: jellyfish float, turtle float, prone float, and back float.

**Drills for Learning Rhythmic Breathing**

1. Out of the water, take a fast gulp of air through the mouth, then exhale through the nose and mouth.

2. Next, bend over at the waist so that the chest is in the water. Take a gulp of air, put your face in the water, and blow bubbles, before expelling all of your air. Then slowly bring your face out of the water. Bringing your face up quickly may create a vacuum that will pull water into the nose.

3. While standing in the water, bend at the waist, put your face in the water, and turn your head to the side and breathe in through your mouth. Turn your head back into the water and exhale through the nose and mouth.

**CHAPTER 4**

**Front Crawl**

**Outline**

The Kick
The Stroke
The Pull-Push Arm Stroke
The Beginners' Arm Stroke
The Arm Stroke Using the Lift Theory

The Breathing

Checklist for Learning to Breathe Properly During the Crawl Stroke

Summary

Drills and Workouts for the Front Crawl

The front crawl is the fastest of the swimming strokes, and the one most people think of when they talk about swimming. The beginning swimmer may find that it requires mastery of a considerable amount of coordination and timing. The coordination required for breathing is the most difficult part. Body position in the water is also of great importance, and improper body position will make rhythmic breathing more difficult to learn.

Being streamlined is important in every swimming stroke. The less cross-sectional area that the body presents to the water, the less drag will be created. Allowing the hips to drop lower than the shoulders or forcing the legs to kick deeply will reduce the streamlined effect.

**The Kick**

One should be able to flutter kick in the prone float for at least ten yards before attempting to learn the arm stroke for the front crawl. The feet should be underwater while kicking. Swimmers with very powerful kicks may find that their heels break the water surface, but any kicking in the air will not propel the body forward.

*(CAUTION: Some beginners bend their knees too much and allow their legs and feet to come out of the water. Then they kick down at the water. Such a kick may force the upper body (head and torso) underwater because too much of the lower body will be out of the water. Try to kick without splashing.)*

The toes should not go deeper than 12 inches below the depth of the chest and abdomen. Kicking too deep will create an excessive drag and reduce the streamlined body position.

**The Stroke**

From the prone float position, learn to pull one arm at a time through the complete stroke. By using only one arm at a time the swimmer can concentrate on proper technique without trying to master too many skills at one time.

**The Pull-Push Arm Stroke**

The *entry* of the hand into the water should be about 12 inches in front of the shoulder. The hand and arm should then reach forward from that position. Some swimmers will reach across the plane of the body rather than straight ahead. Reaching across twists the body and slows one's speed.

**Streamlining**

The more streamlined the body is in the water, the less drag is created.
Hips up: good streamlining.

Hips down: poor streamlining. Head is out of water.

**Excess reach in the crawl**
slows one's speed by twisting the body.

Correct

Incorrect

**Front crawl sequence**
The Beginners' Arm Stroke

The **stretch** is the term used to describe the reaching of the hand forward from the point of entry until the pull is initiated. Some people use the stretch as a time to glide and relax. As one begins to swim faster, the glide is reduced and eventually eliminated.

The **catch** is the term used to describe the beginning of the pulling phase of the stroke. For beginners the catch is made with the hand directly in front of the head. The wrist will flex slightly downward as power is applied to the pull. The fingers should be slightly apart-about one-eighth to one-fourth inch for the maximum propulsive drag effect.

**Front crawl sequence photographs**
The arm pull for beginners need only be a simple pull and push of the water with the elbows slightly bent. When the arm passes the shoulders, the stroke becomes a push, which continues until the hand passes the upper thigh. The hand must stay below the elbow throughout the stroke.

The hand should stay under the midline of the body. If it moves too far to the right or the left, it will push the body that way as well.

The recovery begins with the muscles in the back and top of the shoulder lifting the arm forward and upward. The little finger is the first part of the hand to exit the water. The elbow should be bent slightly, and the forearm and wrist should be relaxed. The hand should be below the elbow. The shoulder muscles should extend the arm forward to a point about a foot forward of the shoulder where the hand will drop into the water. This is called the entry. Beginners often have trouble relaxing the arm during the recovery. If the arm is too straight and stiff, just drag the fingers across the water. This will force the elbow to be bent and should keep it in advance of the hand until they are both even with the shoulder.

Another way to force the elbow to stay high is to touch the side of the body with the thumb as the arm is being recovered. This exercise should also keep the hand behind the elbow until it reaches the level of the shoulder.
**THE BREATHING**

Your breathing in the front crawl should be coordinated with the roll of your body. When breathing on the right side, your body should start to roll to the right as the left hand enters the water and as the right hand is finishing the stroke near the hip. The head should not be lifted out of the water but rather should roll to the side. As the head moves through the water, a wave will be created in front of it, and a trough will develop behind. The faster the swimmer is moving, the higher the wave will be and the deeper the trough. Since the swimmer will breathe in this trough, it is not necessary to bring the mouth above the water level to breathe.

The breath must be quickly taken through the mouth, then the head returns to the forward position before the right hand has completed the recovery of its arm stroke. The air exhaled while the left arm is in the pull-push cycle.

Note that the head works independently of the shoulders.

**Checklist for Learning to Breathe Properly During the Crawl Stroke**

1. Do not hold your breath—always be inhaling or exhaling.
2. Look at your right hand as it goes through the pulling cycle.
3. When taking the breath, imagine that your chin is attached to your right shoulder and rotates as the stroke is finishing.
4. Start to roll your head to the side when the arm on your breathing side is under you in the pull phase and the other arm is entering the water.
5. Breathe in just as you are finishing the stroke and starting your arm recovery.
6. Take a big gulp of air through your mouth, then exhale through your nose and mouth for the rest of the stroke.

**Summary**

- The progression for beginning swimmers learning the crawl is as follows:
  1. In prone-float position, kick.
  2. In prone-float position, practice front-crawl armstrokes.
  3. Kick with the kickboard.
  4. Pull with the kickboard.
  5. Breathe with one arm stroking, using the kickboard.
  6. Breathe with both arms stroking, using the kickboard.
  7. Swim the front crawl without kickboard.
- The swimmer should be able to kick ten yards before attempting to learn the arm stroke for beginners is a simple pull-push action.
- In proper breathing during the front crawl, the head turns to the side, the breath is taken in quickly, then the head is returned to the face-down position.
- The air is exhaled during the opposite arm pull-push sequence.

**Drills and Workouts for the Front Crawl**

1. Practice the arm stroke by starting in the prone-float streamlined position. Make one complete arm stroke and recovery. Do not start a second
stroke until the hand of the stroking arm touches the other hand. By stroking this way, one arm at a time, you can concentrate on the technique of just the one arm during a complete pull and recovery.

2. Push off the wall in a prone float. Without taking a breath, swim the front crawl as far as possible.

3. While holding a kickboard in both hands at arm's length over your head, take a stroke with the right arm. Toward the end of the push part of the stroke, turn your head and breathe. The right hand returns to the end of the kickboard, and you exhale the air through your nose and mouth. Don't hold your breath. The air should be passing in and out.

4. Push off the front wall, and swim the front crawl as far as possible while breathing once on every complete stroke.

5. With a kickboard, kick a length. As your body becomes better conditioned, kick additional lengths. If you need rest at the end of each length, take a rest. As your physical condition improves, the rest periods should become shorter and the number of lengths kicked should become greater.

For greater flotation you may want to hold a kickboard in the extended hand. When the stroking hand has made the complete stroke and grasped the kickboard, start the stroke with the other arm.