

**Play-the-ball** is one of the things that makes Rugby League a fast-moving, exciting game to watch, with fewer stoppages than Rugby Union games. When a player is tackled, all opposing players but two must retreat ten meters from the tackled player. The two markers remain in front as he places the ball on the ground and rolls it backward with his foot to the player behind them. It is also acceptable for the player to roll the ball back, step over it, and pick it up himself.

The **six-tackle rule** further differentiates the two kinds of rugby. In League, there can only be five of these tackles where the ball is passed back into play. If a sixth tackle occurs, the ball is handed over to the opponents, so it's usually kicked high as it comes back into play after the fifth tackle, gaining ground in the process. Ideally, of course, the set of six would gain enough ground to go for a try or a drop goal.

Both kinds of rugby can be exciting to watch and the sport has not suffered from some of the crowd troubles that have affected soccer in recent years. A single chapter cannot cover every aspect of a complex game, unfortunately. For those who wish to go further, there are local clubs all over the country. A definitive collection of Union rules is published by the International Rugby Board: *The Laws of the Game of Rugby Union* (ISBN 0954093909). Alternatively, the Rugby Football League publishes a 52-page booklet: *Rugby Football League: Laws of the Game and Notes on the Laws* (ISBN 0902039032).

## SPIES—CODES AND CIPHERS



**T**HE PRACTICE OF SENDING secret messages is known as “steganography,” Greek for “concealed writing.” The problem with hiding a message in the lining of a coat or tattooed on the scalp is that anyone can read it. It makes a lot of sense to practice “cryptography,” as well, Greek for “hidden writing.” Cryptography is the art of writing or breaking codes and ciphers.

The words “code” and “cipher” are sometimes used as if they mean the same thing. They do not. A code is a substitution, such as the following sentence: “The Big Cheese lands at Happy tomorrow.” We do not know who the “Big Cheese” is, or where “Happy” is. Codes were commonly used between spies in World War II, when groups of numbers could only be translated with the correct codebook. Codes are impossible to break without a key or detailed knowledge of the people involved. If you spied on a group for some months, however, noticing the president of France landed at Heathrow Airport the day after such a message, a pattern might begin to emerge.

“Ciphers,” on the other hand, are scrambled messages, not a secret language. In a cipher, a plain-text message is concealed by replacing the letters according to a pattern. Even Morse code is, in fact, a cipher. They are fascinating and even dangerous. More than one person has gone to his grave without giving up the secret of a particular cipher. Treasures have been lost, along with lives spent searching for them. In time of war, thousands of lives can depend on ciphers being kept—or “*deciphered*.”

Edgar Allan Poe left behind a cipher that was only broken in the year 2000. The composer Elgar left a message for a young lady that has not yet been fully understood. Treasure codes exist that point the way to huge sums in gold—if only the sequence of symbols can be broken.

At the time of writing, the state-of-the-art cipher is a computer sequence with 2048 figures, each of which can be a number, letter or symbol. The combinations are in trillions of trillions and it is estimated that even the fastest computers in the world couldn't break it in less than thirty billion years. Oddly enough, it was created by a seventeen-year-old boy in Kent, named Peter Parkinson. He is quite pleased with it. To put it in perspective, it is illegal in America to export an encryption program with more than *forty* digits without providing a key. It takes three days to break a 56-bit encryption.

Combinations to computer locks are one thing. This chapter contains some classic ciphers—starting with the one used by Julius Caesar to send messages to his generals.

1. **The Caesar Shift Cipher.** This is a simple alphabet cipher—but tricky to break without the key. Each letter is moved along by a number—say four. A becomes E, J becomes N, Z becomes D and so on. The number is the key to the cipher here. Caesar could agree the number with his generals in private and then send encrypted messages knowing they could not be read without that crucial extra piece of information.

“The dog is sick” becomes “WKH GRJ LV VLFN,” with the number three as the key.

As a first cipher it works well, but the problem is that there are only twenty-five possible number choices (twenty-six would take you back to the letter you started with). As a result, someone who really wanted to break the code could simply plod their way through all twenty-five combinations. Admittedly, they would first have to recognize the code as a Caesar cipher, but this one only gets one star for difficulty—it is more than two thousand years old, after all.

2. **Numbers.** A = 1, B = 2, C = 3 etc, all the way to Z = 26. Messages can be written using those numbers. This cipher is probably too simple to use on its own; however, if you combine it with a Caesar code number, it can suddenly become very tricky indeed.

In the basic method, “The dog is better” would be “20 8 5—4 15 7—9 19—2 5 20 20 5 18,” which looks difficult but isn't. Add a Caesar cipher of 3, however, and the message becomes “3 23 11 8—7 18 10—12 22—5 8 23 23 8 21,” which should overheat the brain of younger brothers or sisters trying to break the encryption. Note that we have included the key number at the beginning. It could be agreed beforehand in private to make this even harder to break. (With the Caesar combination, a difficulty of two stars.)

3. **Alphabet ciphers.** There are any number of these. Most of them depend on the way the alphabet is written out—agreed beforehand between the spies.

A B C D E F G H I J K L M  
N O P Q R S T U V W X Y Z

With this sequence, “How are you?” would become “UBJ NER LBH?”

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
 Z Y X W V U T S R Q P O N M L K J I H G F E D C B A

In this one, “How are you?” would become “SLD ZIV BLF?” It’s worth remembering that even simple ciphers are not obvious at first glance. Basic alphabet ciphers may be enough to protect a diary and they have the benefit of being easy to use and remember.

4. Most famous of the alphabet variations is a code stick—another one used by the Romans. Begin with a strip of paper and wind it around a stick. It is important that the sender and



the receiver both have the same type. Two bits from the same broom handle would be perfect, but most people end up trying this on a pencil. (See picture.) Here the word “Heathrow” is written down the length of the pencil, with a couple of letters per turn of the strip. (You’ll need to hold the paper steady with tape.) When the tape is unwound, the same pen is used to fill in the spaces between the letters. It should now look like gibberish. The idea is that when it is wound back on to a similar stick, the message will be clear. It is a cipher that requires a bit of forethought, but can be quite satisfying. For a matter of life and death, however, you may need the next method.

5. **Codeword alphabet substitution.** You might have noticed a pattern developing here. To make a decent cipher, it is a good idea to agree on the key beforehand. It could be a number, a date, the title of a book, a word or even a kind of stick. It’s the sort of added complexity that can make even a simple encryption quite fiendish.

Back to one of our earlier examples:

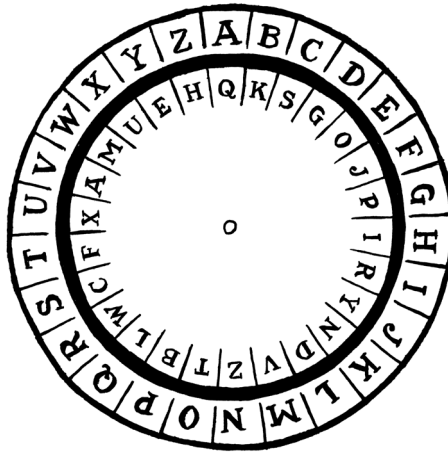
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
 Z Y X W V U T S R Q P O N M L K J I H G F E D C B A

If we added the word “WINDOW,” we would get the sequence below. Note that no letters are repeated, so there are still twenty-six in the bottom sequence and the second “W” of “WINDOW” is not used.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
~~W I N D O~~ A B C E F G H J K L M P Q R S T U V X Y Z

This is a whole new cipher—and without knowing the code word, a difficulty of three stars to crack.

6. **Cipher wheels.** Using a pair of compasses, cut four circles out of card, two large and two small—5 inch (12 cm) and 4 inch (10 cm) diameters work well. For both pairs, put one on top of the other and punch a hole through with a butterfly stud. They should rotate easily.



A circle = 360 degrees. There are twenty-six letters in the alphabet, so the spacing for the segments should be approximately 14 degrees. Mark off the segments as accurately as you can for all four circles. When they are ready, write the normal alphabet around the outside of the large circles in the usual way—A to Z. For the inner circles, mark the letters in random order. As long as the matching code wheel is done in the same way, it doesn't matter where the letters go. The code sequence will begin with the two-letter combination that shows the positions of the wheels—AM or AF, for example.

You should end up with a cipher-wheel encrypter that *only* be read by someone with the other wheel. Now *that* is a difficulty of four stars.

7. **Morse code** is the most famous substitution cipher ever invented. It was thought up by an American inventor, Samuel F. B. Morse, who patented a telegraph system and saw it explode in popularity. He realized that a pulse of electricity could act on an electromagnet to move a simple lever—transmitting a long or short signal. He arranged a moving strip of paper to pass underneath the metal point and a new method of communication was born. Using his cipher, he sent the first intercity message in 1844 from Washington to Baltimore. The marvelous thing about it is that the code can be sent using light if you have a flashlight, or sound, if you can reach a car horn, or even semaphore, though that is fairly tricky.

The first message Morse sent was “What hath God wrought?,” which gives an idea of just how impressive it was to pick up messages as they were written on the other side of America. In Morse's lifetime, he saw telegraph lines laid across the Atlantic.

The example *everyone* knows is SOS—the international distress call. (“May-day” is also well known. That one comes from the French for “Help me”—*M'aidez.*)

The SOS sequence in Morse is dit dit dit—dah dah dah—dit dit dit.

MORSE CODE					
A	• -	N	- •	1	• - - - -
B	- • • •	O	- - -	2	• • - - -
C	- • - •	P	• - - •	3	• • • - -
D	- • •	Q	- - • -	4	• • • • -
E	•	R	• - •	5	• • • • •
F	• • - •	S	• • •	6	- • • • •
G	- - •	T	-	7	- - • • •
H	• • • •	U	• • -	8	- - - • •
I	• •	V	• • • -	9	- - - - •
J	• - - -	W	• - -	0	- - - - -
K	- • -	X	- • • -		
L	• - • •	Y	- • - -		
M	- -	Z	- - • •		

This really is one worth learning. Rescuers have heard messages tapped out underneath fallen buildings, heard whistles or seen the flashes from a capsized dinghy. This cipher has saved a large number of lives over the years since its invention. It has also sent quite a few train timetables.

If you *do* have a flag handy, it's left for a dash, right for a dot. This is not so well known.