New Edition

Easier Scientific English Practice

G. C. THORNLEY

a first collection of writing of scientific interest

Easier Scientific English Practice

G. C. THORNLEY
M.A., Ph.D.

LONGMAN GROUP LIMITED
London

Associated companies, branches and representatives throughout the world

First published 1964
New edition 1972
Reprinted 1976
ISBN 0 582 55222 2

Also by G. C. Thornley

EASIER ENGLISH PRACTICE

PRACTISE YOUR ENGLISH

FURTHER PRACTICE IN ENGLISH

KEY TO FURTHER PRACTICE IN ENGLISH

SCIENTIFIC ENGLISH PRACTICE

PRINTED IN GREAT BRITAIN BY
HAZELL WATSON AND VINEY LTD, AYLESBURY, BUCKS

Foreword

THIS book has been written to provide those who are interested in science with material for fairly easy practice in the English language. An attempt has been made to arrange simple pieces in order of increasing language difficulty. A few slight simplifications have been made here and there in the vocabulary, but this has not been done to any great extent. The aim has been to find originals which are not too difficult in themselves.

G.C.T.

Acknowledgements

We are grateful to the following for permission to adapt copyright material:

George Allen & Unwin Ltd. for material from *Early Ideas about Atoms* by Laura Fermi; Arco Publications for material from *Astronomy Explained* by A. E. Fanning; Edward Arnold (Publishers) Ltd. for material from *Everyday Heat, Light and Sound* by A. C. Penney; Blackie & Son Limited for material from *The Scientist and You* by Patrick Moore; Cambridge University Press for material from *Stars in Their Courses* by Sir James Jeans, from *Hydrostatics and Mechanics* by A. E. E. McKenzie and from *Stories from Science I* by A. Sutcliffe and A. P. D. Sutcliffe; Collins Publishers and Harper & Row, Publishers Inc. for material from *The Scientific Renaissance* by Marie Boas; The John Day Company, Inc. for material adapted from *Space Monkey* by Olive Burt, © 1960 by Olive Burt; E. P. Dutton & Co., Inc. and Hutchinson & Co. (Publishers) Ltd. for

material from *Dinosaurs* by Edwin H. Colbert, copyright © 1961 by Edwin H. Colbert; the author and Penguin Books Ltd. for material from *Men of America* by Lionel Elvin; Faber and Faber Ltd. for material from *Your Book of Space Travel* by D. M. Desoutter; the author and Longmans, Green & Co. Ltd. for material from *The Air Around Us, Fire and Heat* and *Treasures from the Earth* by W. E. Flood; George G. Harrap & Company Ltd. and Barnes & Noble, Inc. for material from *Chemistry for the Modern World* by George Porter; the author and Longmans, Green & Co. Ltd. for 'Albert Schweitzer' and 'Madame Curie and Radium' from *Great Men and Women* by Leslie W. Leavitt; Longmans, Green & Co. Ltd. for material from *Mankind Against the Killers* by James Hemming and from *Makers of Civilization, Book 2* by M. I. Potts; the executors of the late C. K. Ogden and the Orthological Institute of which they are the proprietors for material from *Inventions To-day* written in 'Basic English' by Dr. H. Stafford Hatfield and published on behalf of the Orthological Institute by Sir Isaac Pitman & Sons Limited and Penguin Books Ltd.; Penguin Books Ltd. for material from *The Personality of Animals* by H. Munro Fox; the author and Granada TV Network Ltd. for material from 'Using the Land Wisely' by L. Dudley Stamp, originally broadcast in a Granada TV Network Ltd. programme and published by Granada TV Network Ltd.; and Ward Lock & Co. Ltd. for material from *The Airline Crew* by T. E. Scott-Chard.

We are unable to trace the copyright owner in *The Romance of a Modern Airway* by Harry Harper and would welcome any information which would enable us to obtain formal permission to reproduce this material.

We are grateful to the following for permission to reproduce the photographs:

Barnaby's Picture Library for pages 2, 12; The Trustees of the British Museum (Natural History) for page 114; British Overseas Airways Corporation for pages 23 below, 119; British Oxygen for page 124; Collection Viollet, Paris for page 104; The Mansell Collection for pages 38, 43, 83; Paul Popper for page 48; Radio Times Hulton Picture Library for pages 78, 108; Science Museum for pages 22, 23 above, 54, 99; Twentieth Century Electronics Limited for page 88; Vickers Limited for page 28.

Contents

1 The Development of Rubber

H. STAFFORD HATFIELD, Ph.D., F.Inst.P.

The piece given here describes the part of the work of Goodyear and Hayward in the development of rubber for the modern world. It comes from Dr. Hatfield's book *Inventions To-day* (1939). This book is based on some radio talks which the author gave. He has also written *The Inventor and his World*, *European Science*, and other books.

HERE is the story of rubber. From the earliest time it was common knowledge to the Peruvians that when a cut was made in the outside skin of a rubber tree, a white liquid like milk came out, and that from this a sticky mass of rubber might be made. This rubber is soft and wax-like when warm, so that it is possible to give it any form. The Peruvians made the discovery that it was very good for keeping out the wet. Then in the early part of the eighteen-hundreds, the Americans made use of it for the first time. First they made overshoes to keep their feet dry. Then came a certain Mr. Mackintosh, who made coats of cloth covered with natural rubber. From that day to this we have been coating cloth with rubber as Mr. Mackintosh did, and our raincoats are still named after him.

But these first rubber overshoes and raincoats were all soft and sticky in summer, and hard and unelastic[1] in the winter when it was cold. In fact, they might almost have been made of wax, only they were a bit stronger. But the rubber we have today is not sticky, but soft and elastic, though very strong—even in the warmest summer and the coldest winter. There would be no automobiles such as we

[1] Unelastic: Refusing to stretch.

The white liquid is collected from a rubber tree

have today without it. Long before the start of history, man made the discovery of how to make skins into good leather. But every attempt to make rubber hard and strong came to nothing. The early overshoes and raincoats were simply not good enough, and their makers went out of business.

Goodyear was living near some of these poor men and he got to work on this question of making rubber or "gum" as the Americans say, hard and strong. Once started on this work, he was the sort of man who simply had to go on till he had overcome the trouble. First came the discovery that nitric acid (HNO_3)[1] made the rubber much better, and in a short time he was doing a small business in rubber shoes produced in this way.

But when things were starting to go well with him, there

[1] This is read as: HNO three.

came a time when business was bad[1]. Even a hundred years back they had such times. After a little, Goodyear was without money or even food.

But then a strange thing took place. A friend of his, Nicholas Hayward, had the idea in his sleep that rubber might be made hard and strong if mixed with sulphur (S) and put in the sun. Goodyear put this idea to the test, and saw that it did have more or less the desired effect—though somewhat less than more. The only effect it had was on the outside of the rubber. It is common knowledge now that the way to make rubber hard and strong—to "vulcanise" it, as we say—is by heating it with sulphur. If only Nicholas had had the idea of a simple oven, in place of the sun, how much less time it would have taken! Goodyear was another four years, in which things went very badly with him, before he made the discovery how to vulcanise rubber completely. When at last he did it, he had nothing at all. Everything of the smallest value had been used to get money, even his sons' school-books.

He did well in America, but chance had one more dirty trick in store for him. He went to Paris to put his new vulcanised rubber on view at the Exhibition, and took with him thousands of pounds for the purpose. But the money was not enough and he was put into prison for debt—not for the first time.

Almost everything we make use of in our complex existence has the same sort of story at the back of it. Though they are not all quite such unhappy stories, they are generally about someone who went on working night and day to do something which no other person so far had been able to do.

[1] This means that people had not much money, and he did not sell many shoes.

EXERCISES

COMPREHENSION

1. What used to happen when a Peruvian cut the outside part of a rubber tree?
2. What did the Peruvians discover about the usefulness of rubber?
3. What two sorts of things were made from rubber in the early days?
4. Why is a raincoat often called a mackintosh?
5. What is leather made from?
6. Which acid was useful in improving rubber?
7. What did Hayward think of in his sleep?
8. How is rubber vulcanised?
9. Why had Goodyear nothing left when he at last discovered how to vulcanise rubber?
10. Why was Goodyear imprisoned in France?

LANGUAGE

1. Fill each space with one of the words from the list:

liquids; sticky; wax; mackintosh; acid; sulphur; test; oven; exhibition; debts.

(*a*) Glue is very — when it is warm and it is used for sticking furniture together.
(*b*) Rubber is vulcanised by being heated with —.
(*c*) We use — to seal a letter and make the envelope difficult to open.
(*d*) Peter put on his — and went out into the rain.
(*e*) There is to be a big — of postage stamps in London tomorrow.
(*f*) Sulphuric — (H_2SO_4) is made up of sulphur, hydrogen and oxygen.
(*g*) Most — can be changed into gases by being heated.
(*h*) His uncle paid all Tom's — when he left college.
(*i*) Please — the insulation of the wire so that we may be sure it is safe to use.
(*j*) The smell of something cooking in the — made him expect to have a good dinner that day.

2. Insert the correct prepositions in the spaces below. The passage may help you:

(*a*) A cut was made — the cloth.
(*b*) A mackintosh is good — keeping out the rain.
(*c*) Let us keep this copper wire; I can make use — it.
(*d*) The material was covered — rubber.
(*e*) Raincoats are named — Mr. Mackintosh.
(*f*) They were too soft — summer and too hard — winter.
(*g*) Peter then walked out — the house.
(*h*) When he had started — this work, things began to go well — him.
(*i*) The rubber was mixed — sulphur and the idea was put — the test.
(*j*) Goodyear put his vulcanised rubber — view — Paris.

3. *Every attempt came to nothing* = was unsuccessful.
Write original sentences containing the following:

(*a*) Came to nothing;
(*b*) Will come to nothing;
(*c*) If it comes to nothing;
(*d*) Because it may come to nothing;
(*e*) Will . . . come to nothing if . . .?

4. *The rubber we have today* = which we have today.

The relative pronouns (*which, whom, that*) may be left out when they are the objects of verbs.[1] They may not be left out if they are subjects.

Rewrite the following sentences, leaving out the relative pronouns if possible:

(*a*) The rubber that they got from the trees was a white liquid.
(*b*) The overshoes that they made were not very successful.
(*c*) The idea that Hayward got in his sleep was only partly successful.
(*d*) The rubber that goes into our tyres is vulcanised.
(*e*) The money that Goodyear took to Paris was not enough.

[1] This rule does not apply when the noun which is qualified by the clause is already defined or distinct from others. For example, it does not apply in; *Mr. Tomkinson, whom you know, has fallen ill.* (The relative clause does not pick out Mr. Tomkinson from others.)

5. Form nouns from (*a*) know; (*b*) discover; (*c*) exhibit. Form adjectives from (*d*) stick; (*e*) nature.

6. Notice *stronger*, which is the comparative degree of *strong*. Comparatives are used when we compare TWO things. *Warmest* is the superlative degree of *warm*.

Positive	*Comparative*	*Superlative*
strong	stronger	strongest
warm	warmer	warmest

Give the other two degrees of comparison of the following: (*a*) smallest; (*b*) coldest; (*c*) longer; (*d*) useful; (*e*) hot.

7. Explain the following in any way you like:
   (*a*) Once started on his work, he . . .
   (*b*) A strange thing took place.
   (*c*) Their makers went out of business.
   (*d*) Common knowledge.
   (*e*) From that day to this.

2 Weight On and Off the Earth

D. M. DESOUTTER

D. M. Desoutter is a writer on flying and space, and has the ability to explain difficult matters clearly enough for young people to understand them. Among his books are *Your Book of Flying* and *Your Book of Space-Travel* (1962). From the second of these the passage below is taken. It is a discussion of weight, and how the weight of an object changes in different places.

We are so used to our life on the surface of the earth that it can be quite an effort for our minds to break free of all the ideas that we take for granted.[1] We talk about "up" and

[1] Take for granted: Believe without proof.

"down", but we know that what is "down" for us is "up" for someone on the other side of the world.

Because we can feel that things are heavy, we think of "weight" as being a fixed quality in an object, but it is not really fixed at all. If you could take a one-pound packet of butter 4,000 miles out from the earth, it would weigh only a quarter of a pound.

Why would things weigh only a quarter as much as they do at the surface of the earth if we took them 4,000 miles out into space? The reason is this: All objects have a natural attraction for all other objects; this is called gravitational attraction. But this power of attraction between two objects gets weaker as they get farther apart. When the butter was at the surface of the earth, it was 4,000 miles from the centre (in other words the radius[1] of the earth is 4,000 miles). When we took the butter 4,000 miles out, it was 8,000 from the centre, which is twice the distance.

If you double the distance between two objects, their gravitational attraction decreases "two times two". If you treble the distance, it gets nine times weaker (three times three). If you take it four times as far away, it gets sixteen times weaker (four times four) and so on.

So this is one of the first things we need to remember: that the weight of an object in space is not the same as its weight on the surface of the earth.

What about the weight of our pound of butter on the surface of the moon? At that distance the pull of the earth is about 4,000 times smaller than it is here on the surface, so we can forget all about the earth-pull on our butter.

On the other hand, on the moon there will be an attraction between the butter and the moon: but the butter will

[1] Radius: Distance from the centre to the surface.

weigh only about one-sixth as much as it does on the earth. This is because the moon is so much smaller than the earth. The amount of gravitational pull that a body produces depends on the amount of material in it. A packet of butter has a gravitational pull of its own; but this is very small in relation to the pull of something as large as the moon, or the earth, or the sun.

EXERCISES

COMPREHENSION

1. What makes it difficult for our minds to break free from ideas connected with living on the surface of the earth?
2. What would one pound of tea weigh if it was taken 4,000 miles out from the surface of the earth?
3. What is roughly the radius of the earth?
4. What is the attraction between objects called?
5. If an object is 4,000 miles from the surface of the earth, how far is it from the centre of the earth?
6. If we increase the distance between two objects, is their attraction weakened or strengthened?
7. If I have 6 pounds of sugar, and take it to the moon, how much will it weigh there?
8. Is the moon larger or smaller than the earth?
9. Why is the gravitational pull of the moon less than that of the earth?
10. Why is the gravitational pull of a pound of butter so small that we can forget it?

LANGUAGE

1. Fill each of the spaces with a word from the list:

   surface; weight; quarter; attraction; centre; radius; twice; produce; depends; material.

   (*a*) A — of 32 is 8.

   (*b*) The weight of an object — on its position in space.

(*c*) Most of us believe that — two are four.
(*d*) The amount of — in the moon is less than the amount in the earth.
(*e*) A large part of the — of the earth is covered by water.
(*f*) Fat men usually want to reduce their —.
(*g*) The diameter of the earth is about 8,000 miles, and the — is about 4,000 miles.
(*h*) Most points on the surface of the earth are roughly at the same distance from the —; but the tops of high mountains are further.
(*i*) The — between two bodies decreases as their distance apart increases.
(*j*) Can that battery — enough current to drive the motor?

2. Insert the proper prepositions in the spaces. The passage will help you:

(*a*) We spend nearly all our lives — the surface — the earth.
(*b*) It will be a good thing — you to take a holiday.
(*c*) The balloon went a long way up, away — the earth.
(*d*) Rockets often go up — space.
(*e*) When the distance — the bodies increases, the attraction decreases.
(*f*) The weight — a pound of sugar — space is not the same as its weight — the earth.
(*g*) The pull of the earth — that great distance is small.
(*h*) He forgot — the meeting he had arranged.
(*i*) His future depends — the result of the examination.
(*j*) The amount — sugar in the tin has gone down surprisingly.

3. The following are the answers to questions. Write suitable questions:

(*a*) A quarter of a pound.
(*b*) It gets weaker.
(*c*) 4,000 miles.
(*d*) About one-sixth of its weight on the earth.
(*e*) Much smaller.

4. Make the following sentences negative:
   (*a*) It will weigh more.
   (*b*) Will it weigh more?
   (*c*) The power of attraction between the two objects gets weaker.
   (*d*) They took the butter 4,000 miles into space.
   (*e*) We need to remember this.

5. *If you* double . . ., *their gravitational attraction* decreases.
   This kind of conditional (present tense + present tense) describes something that is always or usually true.
   Complete each of the following suitably, using the present tense:
   (*a*) If we take the butter four times as far away, . . .
   (*b*) If the engines of an aeroplane stop, . . .
   (*c*) If we drop an electric lamp on a concrete floor, . . .
   (*d*) A radio set does not work well if . . . no aerial.
   (*e*) Peter's car usually looks dirty if . . . clean it for a month.

6. Make adjectives from (*a*) gravitation; (*b*) nature.
   Make nouns from (*c*) attract; (*d*) distant; (*e*) weigh.

7. One-sixth = $\frac{1}{6}$.
   Write the following in figures:
   (*a*) A quarter. (*b*) A half. (*c*) One third. (*d*) One eighth. (*e*) Three eighths.

8. *Take for granted* = accept as true without thinking about it.
   A sentence may start with *We* (*etc.*) *take it for granted that.*
   Examples are:
   We take it for granted that the sun will rise tomorrow.
   They took it for granted that I would help them.
   Peter took it for granted that his father would pay for his holiday.
   Write five original sentences using this pattern.