Shipbourne School Science – using Cornerstones Curriculum Maestro

Purpose of Study

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. It teaches pupils to work scientifically to stimulate creative thought and understand the nature, processes and methods of science. Through studying science, pupils learn to ask scientific questions and begin to appreciate the way in which science will affect the future on a personal, national, and global level. Science has changed our lives and is vital to the world's future prosperity, and therefore it is important that all pupils are taught the essential knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils will recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena.

Aims and Intent

Our science curriculum allows all pupils to progress through a carefully planned sequence of knowledge, concepts and associated key vocabulary. We want all pupils to develop a practical understanding of the world around them, to appreciate how science impacts their everyday lives and to acquire the necessary skills required for accurate investigation and enquiry, including making predictions and drawing sound conclusions. At all time, pupils will be supported to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes**.** We want to inspire all pupils to be curious and further their learning in science as they move into secondary school and the world that awaits them.

Our curriculum for science aims to ensure that all pupils develop:

- a positive attitude towards science and a greater curiosity;
- understanding of the nature, processes and methods of science through different types of science enquiries and investigation
- the ability to use science to answer questions about the world around them
- an understanding of science through a process of enquiry and investigation;
- confidence and competence in scientific knowledge, concepts and skills;
- an ability to reason, predict, think logically and to work systematically and accurately;
- an ability to communicate scientifically, asking and answering questions about the world around them;
- the initiative to work both independently and in co-operation with others;
- the ability and understanding to use and apply science across the curriculum and in real life, today and for the future;
- higher aspirations for the future;
- scientific knowledge and conceptual understanding in the following areas:

    - Biology: including plants, animals, habitats, evolution and inheritance.

    - Chemistry: including everyday materials and their uses, rocks, states of matter and the properties and changes of materials.

    - Physics: including seasonal changes, light, forces, magnets, sound, electricity and Earth and space.

Programmes of Study and Implementation

All pupils access the Science curriculum at Shipbourne School, starting with children in EYFS who learn about the world around them through play, practical exploration and conversation. Specific Science lessons occur weekly and are planned using Curriculum Maestro knowledge rich projects. Coverage is carefully considered and organised on a two/three year rolling programme in each mixed-age class, with progression statements used to ensure that there is age-related learning and progression during any one unit. Each lesson begins with a key question and scientific knowledge, concepts and skills are revisited each lesson based on prior learning, using Knowledge Organisers and key vocabulary visuals. Practical work, focused enquiry and exploration are key to all Science lessons as is exploring the work of key Scientists who have shaped our current and ever evolving understanding of the world.

<u>Scientific knowledge and conceptual understanding</u>

While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Insecure, superficial understanding will not allow genuine progression and will lead to misconceptions which will impact learning at a later stage.

Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data in line with the maths curriculum. The social and economic implications of science are important but, generally, they are taught most appropriately within the wider school curriculum: teachers will wish to use different contexts to maximise their pupils' engagement with and motivation to study science.

<u>The nature, processes and methods of science</u>

'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. The notes and guidance in the national curriculum give examples of how 'working scientifically' might be embedded within the content of biology, chemistry and physics, focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Pupils should seek answers to questions through collecting, analysing and presenting data. 'Working scientifically' will be developed further at key stages 3 and 4, once pupils have built up sufficient understanding of science to engage meaningfully in more sophisticated discussion of experimental design and control.

Spoken language

The national curriculum for science reflects the importance of spoken language in pupils' development across the whole curriculum – cognitively, socially and linguistically. The quality and variety of language that pupils hear and speak are key factors in developing their scientific vocabulary and articulating scientific concepts clearly and precisely. They must be assisted in making their thinking clear, both to themselves and others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

Working scientifically

Key Stage 1

During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking simple questions and recognising that they can be answered in different ways
- observing closely, using simple equipment
- performing simple tests
- identifying and classifying
- using their observations and ideas to suggest answers to questions
- gathering and recording data to help in answering questions

Key Stage 2

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

The detail associated with the programmes of study from the national curriculum are shown in the coverage map below alongside the relevant unit. A number of objectives are also covered in other subjects providing cross-curricular links to strengthen learning.

The Year 3 unit Rocks is covered solely in the Geography unit 'Rocks, Relics and Rumbles' and supported by a day long workshop led by the Outdoor Education Unit.

Other objectives covered solely in other subject units:

Year 4 Living things and their habitats: recognise that environments can change and that this can sometimes pose dangers to living things – Misty Mountain, Winding River (Geography)

Year 4 States of matter: identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature - Misty Mountain, Winding River (Geography)

Year 6 Living things and their habitats: give reasons for classifying plants and animals based on specific characteristics – Frozen Kingdoms (Geography)

Enrichment, Visits and Visitors

It is vital that pupils are given practical, hands on, real life experiences to learn well in Science. When planning units, teachers ensure that visitors and local visits form an important part of provision, as well as ensuring learning is rooted in practical and active tasks, thus ensuring that pupils remain engaged, enthused and challenged.

2022-2023

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Year R/1	**Everyday Materials** This project teaches children that objects are made from materials. They identify a range of everyday materials and their sources. Children investigate the properties of materials and begin to recognise that a material's properties define its use. Pupils should be taught to: • distinguish between an object and the material from which it is made • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • describe the simple physical properties of a variety of everyday materials • compare and group together a variety of everyday materials on the basis of their simple physical properties	**Human Senses** This project teaches children that humans are a type of animal known as a mammal. They name and count body parts and identify similarities and differences. They learn about the senses, the body parts associated with each sense and their role in keeping us safe. Pupils should be taught to: • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	**Seasonal Changes** This project teaches children about the seasons, seasonal changes and typical seasonal weather and events. They learn about measuring the weather and the role of a meteorologist. Children begin to learn about the science of day and night and recognise that the seasons have varying day lengths in the UK. Pupils should be taught to: • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. • Observe and describe weather associated with the seasons and how day length varies. • Observe changes across the four seasons.		**Plant Parts** This project teaches children about wild and garden plants by exploring the local environment. They identify and describe the basic parts of plants and observe how they change over time. Pupils should be taught to: • Identify and describe the basic structure of a variety of common flowering plants, including trees. • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.	**Animal Parts** This project teaches children about animals, including fish, amphibians, reptiles, birds, mammals and invertebrates. They identify and describe their common structures, diets, and how animals should be cared for. Pupils should be taught to: • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. • Identify and name a variety of common animals that are carnivores, herbivores and omnivores.
Year 2/3	**Human Survival** This project teaches children about the basic needs of humans for survival, including the importance of exercise, nutrition and good hygiene. They learn how human offspring grow and change over time into adulthood. Pupils should be taught to: • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Notice that animals, including humans, have offspring that grow into adults.	**Habitats** Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Pupils should be taught to: • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. • Explore and compare the differences between things that are living, dead, and things that have never been alive. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.	**Uses of Materials** This project teaches children about the uses of everyday materials and how materials' properties make them suitable or unsuitable for specific purposes. They begin to explore how materials can be changed. Pupils should be taught to: • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.	**Plant Survival** This project teaches children about the growth of plants from seeds and bulbs. They observe the growth of plants first hand, recording changes over time and identifying what plants need to grow and stay healthy. Pupils should be taught to: • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • Observe and describe how seeds and bulbs grow into mature plants.	**Animal Survival** This project teaches children about growth in animals by exploring the life cycles of some familiar animals. They build on learning about the survival of humans by identifying the basic needs of animals for survival, including food, water, air and shelter. Pupils should be taught to: • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • Notice that animals, including humans, have off spring that grow into adults.	

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Year 4/5/6	**Food and the Digestive System** This project teaches children about the human digestive system. They explore the main parts, starting with the mouth and teeth, identifying teeth types and their functions. They link this learning to animals' diets and construct food chains to show the flow of energy. Pupils should be taught to: • Construct and interpret a variety of food chains, identifying producers, predators and prey. • Describe the simple functions of the basic parts of the digestive system in humans. • Identify the different types of teeth in humans and their simple functions. • Recognise that environments can change and that this can sometimes pose dangers to living things.	**Sound** This project teaches children about sound, how sound is made and how sound travels as vibrations through a medium to the ear. They learn about pitch and volume and find out how both can be changed. Pupils should be taught to: • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Identify how sounds are made, associating some of them with something vibrating. • Recognise that sounds get fainter as the distance from the sound source increases. • Recognise that vibrations from sounds travel through a medium to the ear.	**States of Matter** This project teaches children about solids, liquids and gases and their characteristic properties. They observe how materials change state as they are heated and cooled, and learn key terminology associated with these processes. Pupils should be taught to: • Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C).	**Grouping and Classifying** This project teaches children about grouping living things, known as classification. They study the animal and plant kingdoms and use and create classification keys to identify living things. Pupils should be taught to: • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. • Recognise that living things can be grouped in a variety of ways.	**Electrical Circuits and Conductors** This project teaches children about electrical appliances and safety. They construct simple series circuits and name their parts and functions, including switches, wires and cells. They investigate electrical conductors and insulators and identify common features of conductors. It also teaches children about programmable devices. They combine their learning to design and make a nightlight. Pupils should be taught to: • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify common appliances that run on electricity. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise some common conductors and insulators, and associate metals with being good conductors. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.	

2023-2024

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Year 2/3	**Animal Nutrition and the Skeletal System** This project teaches children about the importance of nutrition for humans and other animals. They learn about the role of a skeleton and muscles and identify animals with different types of skeleton. Pupils should be taught to: • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.		**Forces and Magnets** This project teaches children about contact and non-contact forces, including friction and magnetism. They investigate frictional and magnetic forces, and identify parts of a magnet and magnetic materials. Pupils should be taught to: • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Compare how things move on different surfaces. • Describe magnets as having two poles. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Predict whether two magnets will attract or repel each other, depending on which poles are facing.		**Plant Nutrition and Reproduction** This project teaches children about the requirements of plants for growth and survival. They describe the parts of flowering plants and relate structure to function, including the roots and stem for transporting water, leaves for making food and the flower for reproduction. Pupils should be taught to: • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. • Investigate the way in which water is transported within plants.	**Light and Shadows** This project teaches children about light and dark. They investigate the phenomena of reflections and shadows, looking for patterns in collected data. The risks associated with the Sun are also explored. Pupils should be taught to: • Find patterns in the way that the size of shadows change. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by a solid object. • Recognise that they need light in order to see things and that dark is the absence of light.

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Year 4/5/6	**Forces and Mechanisms** This project teaches children about the forces of gravity, air resistance, water resistance and friction, with children exploring their effects. They learn about mechanisms, their uses and how they allow a smaller effort to have a greater effect. Pupils should be taught to: • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • Identify the effects of air resistance, water resistance and friction that act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	**Earth and Space** This project teaches children about our Solar System and its spherical celestial bodies. They describe the movements of the Earth and the other planets relative to the Sun, the Moon relative to Earth, and the Earth's rotation to explain day and night. Pupils should be taught to: • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth. • Describe the Sun, Earth and Moon as approximately spherical bodies. • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	**Human Reproduction and Ageing** This project teaches children about animal life cycles, including the human life cycle. They explore human growth and development to old age, including the changes experienced during puberty and human reproduction. Pupils should be taught to: • Describe the changes as humans develop to old age. • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. • Describe the life process of reproduction in some plants and animals.		**Properties and Changes of Materials** This project teaches children about the wider properties of materials and their uses. They learn about mixtures and how they can be separated using sieving, filtration and evaporation. They study reversible and irreversible changes, and use common indicators to identify irreversible changes. Pupils should be taught to: • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.	

2024-2025

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Year 2/3	**Human Survival** This project teaches children about the basic needs of humans for survival, including the importance of exercise, nutrition and good hygiene. They learn how human offspring grow and change over time into adulthood. Pupils should be taught to: • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Notice that animals, including humans, have offspring that grow into adults.	**Habitats** Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Pupils should be taught to: • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. • Explore and compare the differences between things that are living, dead, and things that have never been alive. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. • Identify and name a variety of plants and animals in their habitats, including microhabitats. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.	**Uses of Materials** This project teaches children about the uses of everyday materials and how materials' properties make them suitable or unsuitable for specific purposes. They begin to explore how materials can be changed. Pupils should be taught to: • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.	**Plant Survival** This project teaches children about the growth of plants from seeds and bulbs. They observe the growth of plants first hand, recording changes over time and identifying what plants need to grow and stay healthy. Pupils should be taught to: • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Observe and describe how seeds and bulbs grow into mature plants.	**Animal Survival** This project teaches children about growth in animals by exploring the life cycles of some familiar animals. They build on learning about the survival of humans by identifying the basic needs of animals for survival, including food, water, air and shelter. Pupils should be taught to: • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Notice that animals, including humans, have offspring which grow into adults.	

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Year 4/5/6	**Circulatory System** This project teaches children about the transport role of the human circulatory system, its main parts and primary functions. They learn about healthy lifestyle choices and the effects of harmful substances on the body. Pupils should be taught to: • Describe the ways in which nutrients and water are transported within animals, including humans. • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.		**Electrical Circuits and Components** This project teaches children about electrical circuits, their components and how they function. They recognise how the voltage of cells affects the output of a circuit and record circuits using standard symbols. It also teaches children about programmable devices, sensors and monitoring. They combine their learning to design and make programmable home devices. Pupils should be taught to: • Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.	**Light Theory** This project teaches children about the way that light behaves, travelling in straight lines from a source or reflector, into the eye. They explore how we see light and colours, and phenomena associated with light, including shadows, reflections and refraction. Pupils should be taught to: • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. • Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	**Evolution and Inheritance** This project teaches children how living things on Earth have changed over time and how fossils provide evidence for this. They learn how characteristics are passed from parents to their offspring and how variation in offspring can affect their survival, with changes (adaptations) possibly leading to the evolution of a species. Pupils should be taught to: • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.