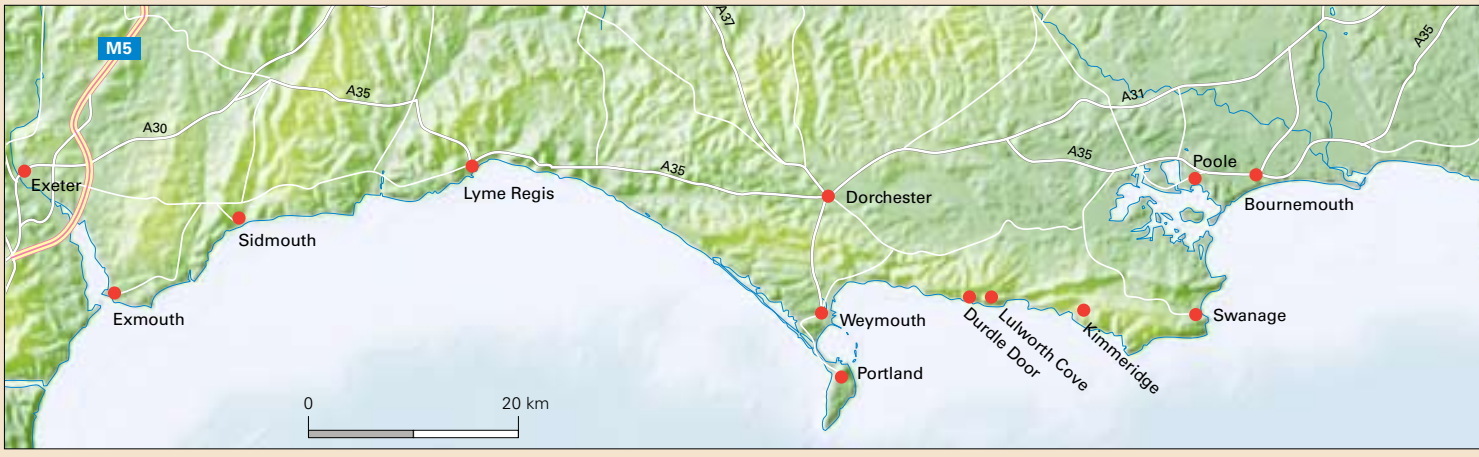
"The Jurassic Coast is an outdoor classroom for the study of geology, geomorphology, geography and biology."

Photo: Halfdan Carstens

The rocks at Kimmeridge Bay were once the floor of a fairly deep, subtropical sea rich in life. Within the bay, we find the type section for the Upper Jurassic Kimmeridge Clay Formation, which is the dominant source rock of the North Sea. It is also noteworthy that Kimmeridge is an international name; all around the world rocks of this age are known as Kimmeridgian. Blocks of stone from dolomite beds occur at intervals in the grey Kimmeridge Clay. They have formed during the generation of hydrocarbons in the organic-rich muds.



The Jurassic Coast

A few days of holiday can be well spent by walking leisurely through an almost complete Mesozoic succession along the south coast of England. Outcrops of colourful shales, sandstones and carbonates can be studied without the need for detailed prior knowledge. The rest of the family will also enjoy abundant fossils, beautiful beaches, lagoons and numerous bays, as well as small, picturesque towns next to the cliffs.

Located on the south coast of Britain, the Jurassic Coast comprises a segment of undeveloped coast and countryside between East Devon in the west and Dorset in the east. More than 80% of this is cliffed coastline. This unique area has a combination of internationally renowned geological features considered by both palaeontologists and geomorphologists to be one of the most significant research sites for their respective fields of study.A World Heritage Site, it includes a near-continuous sequence of Triassic, Jurassic and Cretaceous rock exposures, representing almost the entire Mesozoic Era. The sequence of Jurassic strata exposed between Lyme Regis and Swanage is said to be among the best sections of marine Jurassic-age rocks to be found anywhere in the world.

Halfdan Carstens

The Jurassic Coast, a narrow coastal strip of land lying between the top of the cliffs and the low water mark, was in 2001 awarded World Heritage Site status and became recognised as a place of "outstanding universal value". The Jurassic Coast includes 155 km of unspoiled cliffs and beaches along the East Devon and Dorset coast.

The main reason for its inscription as England's first natural World Heritage Site is the unique insight it gives to the Earth Sciences. Sedimentary rocks of Triassic, Jurassic and Cretaceous age record 185 million years of the Earth's history, and this rare geological display enables both the study of coastal geological processes that are changing the landscape, as well as the evolution of life through fossils that are easily found along almost the entire coast.

Impressive web-site

Dr. Ian West has spent most of his life as a geologist amongst the coastal cliffs and has an intimate knowledge of the beaches, bays and lagoons of the Wessex Coast. After many years as a lecturer at Southampton University, he is now retired and working from home.

"The Dorset and East Devon World Heritage Coast provides classic and well-known exposures of the Triassic, Jurassic and Cretaceous strata of southern England. It is important because they are varied, easily accessible, described in detail and in many cases, type sections or reference sections for understanding the Mesozoic geology of Europe," Ian explains.

"Because of rapid variation in rock type within a short distance, there is a wide variety of geomorphological features clearly visible. The coast is active and moving northwards rapidly as the English Channel continues its post-glacial expansion. The "Jurassic Coast" is not a static feature but is moving inland at a rate in places of a metre per annum. Remarkable geomorphological features such as Chesil Beach are the result of this," says Ian.

Ian is now heavily involved in building and updating a web-site concerning the Jurassic Coast: http://www.soton.ac.uk/~imw/. It is run in cooperation with the School of Ocean and Earth Science at the National Oceanographic Centre in Southampton and has an impressive content with both text and numerous photos. Nevertheless, he has some clear ambitions with respect to the web-site: "My plan is to substantially expand this website over the coming years," he says.

Named by quarrymen

As often as he can, he takes his car and drives down from Southampton to one of the many spectacular localities for another visit. With hammer and lens in hand, there are always new things to discover for the curious geologist.

"The large area of coastal cliffs provides a good opportunity to study the geological details which provide important information on the ancient environments. Because the cliffs of this classic area are within easy reach of London and Oxford, they have been studied in detail since 1814. In addition, geologists have given names and numbers to the strata of these cliffs. Names have also been applied to the strata by quarrymen in the past. Thus, individual beds of rocks have their own names: Glass Bottle, Cinder, Under Picking Cap, Skull Cap, Top Copper, Saurian Shales, Feather Bed, Spangle, Shrimp Bed, etc., etc. If you know a bed of rock by name you have a more personal interest in it and this increases one's enthusiasm to understand its history," Ian says.

"In addition to the Mesozoic strata, there are major features of geomorphological interest, including the famous Chesil Beach. The landslides involving the Lias in West Dorset and the Kimmeridge Clay in East Dorset are of great importance. The area is of special interest to petroleum geologists, partly because it lies close to the Wytch Farm Oil Field. It has the best Kimmeridge Clay exposures in the world and these include various bituminous shale source rocks and in particular, the Blackstone - the Kimmeridge oil shale. It has been worked since Iron Age times and was important to the Romans."

Photo: Halfdan Carstens

Dr. Ian West acquired an intimate knowledge of England's south coast by working the area throughout his entire career. He has made the geology of the Kimmeridge Bay and the Wessex Coast of southern England, available to the whole world through his comprehensive website http://www.soton.ac.uk/~imw/.

Photo: Halfdan Carstens

The area's important fossil sites and classic coastal geomorphologic features have contributed to the study of earth sciences for over 300 years.

The world famous section

"The Triassic rocks of East Devon are desert fluvial and sand dune sediments that were originally brown. They include the Sherwood Sandstone that constitutes the lower reservoir of the Wytch Farm oil field. The strata are red now because of water loss from ferric hydroxides during the heat of a long period of burial. The latitude was about 20 °N and conditions were like those of the Sahara Desert. Gypsum and salt deposits are common. The halite is being used for gas storage on the Isle of Portland where these Triassic strata are deep underground," Ian explains.

The Jurassic strata are from the shallow seas that flooded the rifted basins preceding the formation of the Atlantic Ocean. They originated in less arid conditions; the environment was warm Mediterranean and the palaeolatitude about 30 to 35 °N. Most of the deposits are limestone and sandstones of very shallow seas and the dark shales of rather deeper water. The latter were at times poorly oxygenated and the Kimmeridge Blackstone and the Black Ven Marls are black because of some similarities to the modern Black Sea environment. In the organic-rich shales the skeletons of marine animals, such as ichthyosaurs and plesiosaurs, have been well-preserved. The Dorset coast, and in particular, Lyme Regis, has received its fame from the creatures of the black waters.

"The Cretaceous is very varied because of large fluctuations in sea level, connected with the opening of the Atlantic and large variations in the rate of sea-floor spreading. The lower part is the product of paralic lagoons and of rivers and shallow deltas. This was followed by a change to marine sediments, and in the warm "greenhouse" environment the iron-rich clay mineral glauconite was developed on a large scale. As sea level rose because of the high spreading rate, the land around was flooded and the supply of clastics was greatly reduced. Thus came the pure white chalk sea of planktonic algal debris," says Ian.

The coastal landscape results from the way the power of the sea has acted on rocks of different resistance. At Lulworth, only twenty or so kilometres from Bournemouth, limestone forms a massive barrier against the sea. A small stream has caused a horseshoe bay by allowing the sea to enter the valley and remove the softer clays lying behind the limestone barrier.

The World Heritage Coast Scheme

The value of the Dorset and East Devon World Heritage Coast is obvious. Says Ian: "It is protecting from development or destruction some of the best, most important and classic coastal sections of Mesozoic strata in England. Many of these strata are richly fossiliferous and there is easy access in many places. Because the area has been studied for almost 200 years there are numerous publications on the strata and its fossils."

The Dorset and East Devon World Heritage Coast was opened in 2001 by Prince Charles, and is now well known and well accepted. It is surprisingly narrow, in many places it is only a few metres wide, and it does not include the cliff top coastal footpath or any land at all at the top of the cliffs.

"It would have been even better if a reasonable amount of cliff top land could have been included. However, in many places this deficiency is made up for by the fact that the National Trust and Country Parks

The Jurassic Coast is also renowned for the study of beach formation and evolution on a retreating coastline. Chesil Beach, famous for the volume, type and grading of pebbles, is one of the best-studied beaches in the world. It is an outstanding example of a barrier beach. The Isle of Portland is in the foreground.


Photo: Halfdan Carstens

The Jurassic Coast has a unique status in the history of geological science. Regarded for more than 200 years as among the best available research sites anywhere for geological inquiry, the output of research has fundamentally shaped the development of geological thinking.

own parts of the cliff top. The councils enforce strict planning regulations. Thus most of it consists of good cliff exposures with relatively unspoilt cliff-top land above. A good, long-distance, coastal footpath is present above it," explains Ian.

"All in all, the Dorset and East Devon World Heritage Coast protects what is quite probably the world's most well-known coastal sections of Mesozoic strata. Most of it has changed little since the 1940's and there has only been limited loss of sections near the main towns. However, if it had not been protected for the future, it could have become an ugly concrete and rock armoured coast, with expensive second homes littering the cliff top. It is now preserved for geology, research and education and as a general natural environment for the public. It is greatly valued and will continue as a national and international treasure," concludes Dr. Ian West, dedicated geologist and a frequent visitor to the "sacred" Jurassic Coast.

For more information: www.JurassicCoastline.com.


Photo: Halfdan Carstens

The Jurassic Coast can boast a range of internationally important fossil localities that have produced well-preserved and diverse evidence of life throughout the Mesozoic.

The "nodding donkey" on the cliff top has produced more than 3 million barrels of oil since 1959 (GEO ExPro no 5/6, 2005). The oil formed in rocks that were laid down on a stagnant sea floor in Early Jurassic times. In other places, oil seeps, where oil leaks to the surface from underground accumulations or mature source rocks, are evident.


Photo: Halfdan Carstens