

Jaguar's E-type : refining the sports car : April 3-August 20, 1996 : the Museum of Modern Art, New York

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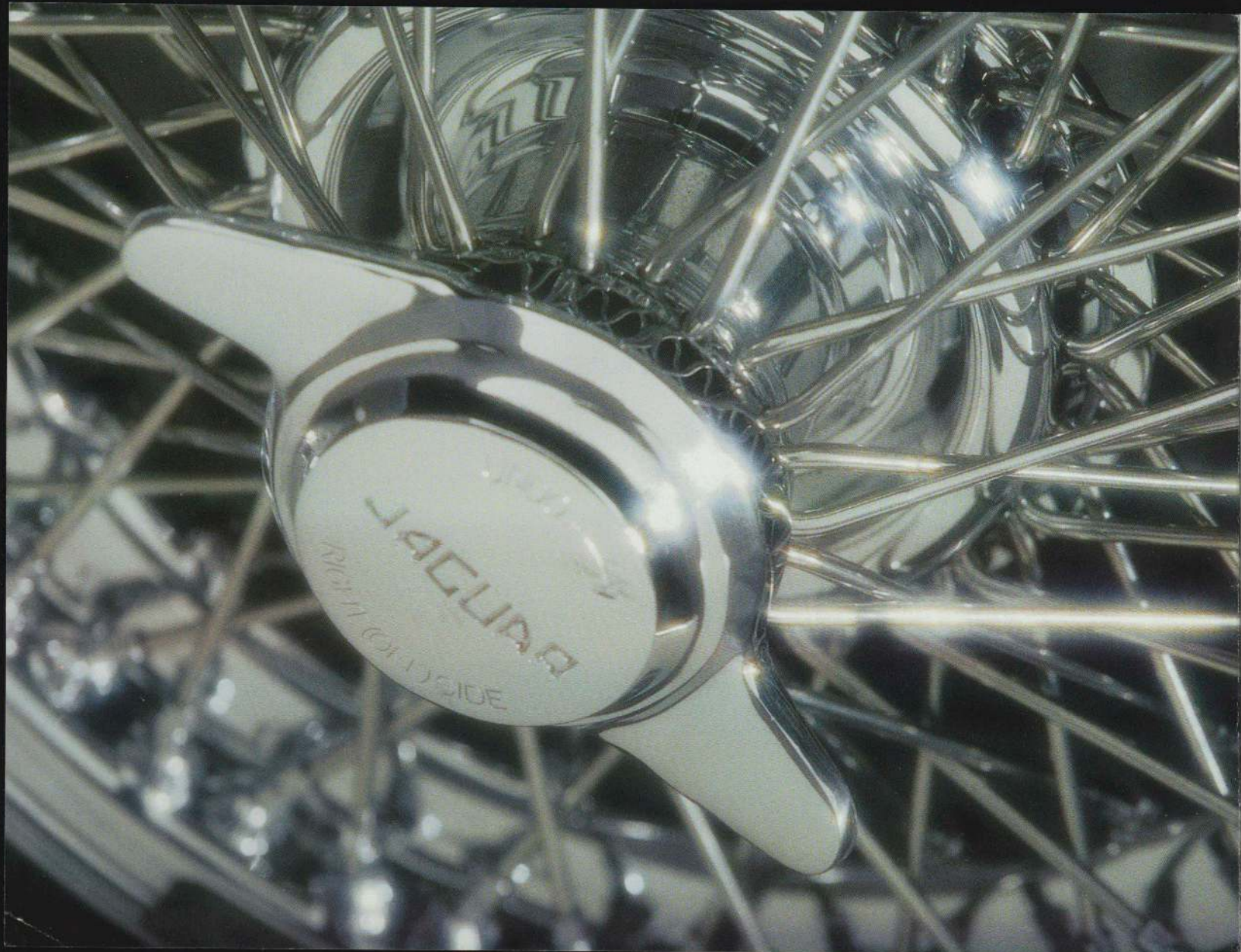
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Refining the Sports Car

Jaguar's E-Type



April 3–August 20, 1996
The Museum of Modern Art, New York



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Refining the Sports Car: Jaguar's E-Type

If it looks right, it will be right.

—Common aphorism in the British motor industry

The fundamental appeal of the sports car is a consequence of its exterior form being the direct expression of its function. The sleek sculptural lines of a well-designed sports car suggest movement, speed, and the unimpeded flow of air over the chassis. These machines engender emotions unique to their class of automobile and aroused by few man-made objects. Rarely has one motorcar inspired such passions and combined the elements of beauty, performance, and even affordability as comprehensively as the Jaguar E-type.

Although it was first introduced over thirty years ago, its rounded projectile-like shape continues to be one of the most influential and often imitated styling forms. Ironically, this popular and seductive design was determined not with the aide of marketing surveys, but with the use of arcane and complicated mathematical equations. The E-type (better known in the United States as the

XK-E) was principally a domesticated racing car for everyday use. It was beautifully finished and extremely fast, handled well, and cost much less than other cars with similar features and performance. An authentically modern sports car, it quickly became an icon of England's swinging sixties and the paradigm of the British sports car.

Jaguar Cars, founded by Sir William Lyons in Coventry, England, in 1922, began as a small producer of motorcycle sidecars. Swallow Side Car Co. quickly evolved into Swallow Coachbuilding, and in 1931 Sir William produced his first automobile, the S.S.1. By 1935, Sir William had bought out his partner, and a year later he changed the company name to S.S. Jaguar Cars. Soon after the Second World War, he abandoned the nomenclature S.S. for its negative connotations.

Cover:
Jaguar E-type Roadster
1963

The Museum of Modern
Art, New York
Gift of Jaguar Cars
Photo: Greg Jarem

Opposite:
Wheel knock-off hub
Jaguar E-type Roadster
1963

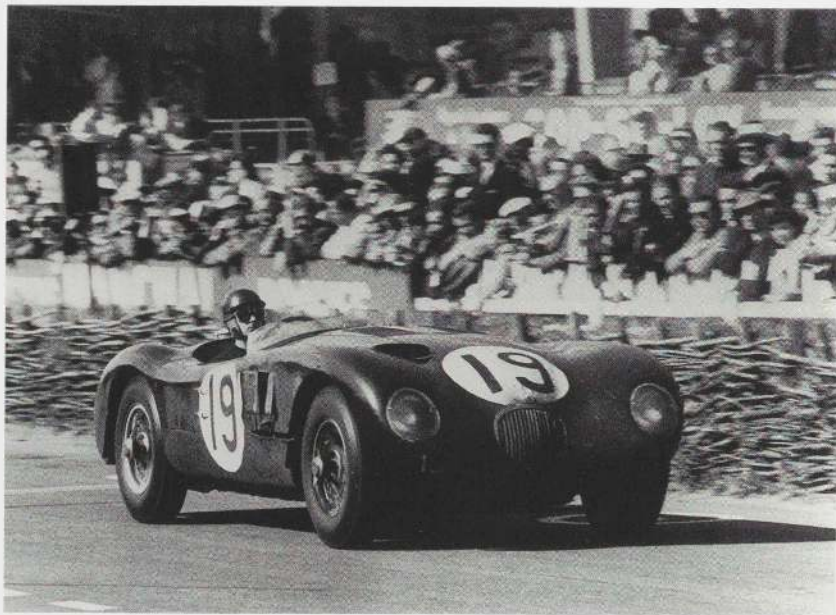
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Gift of Jaguar Cars
Photo: Greg Jarem

Below:
Jaguar C-type

Photo: Jaguar Daimler
Heritage Trust

Opposite:
Jaguar D-type

Photo: Jaguar Daimler
Heritage Trust



From the beginning Sir William understood the prestige associated with racing and high-performance sports cars. The E-type was the direct descendent of a number of previous models, most conspicuously the C- and D-type racers. Both the C- and D-types were conceived exclusively as racing machines and intended to compete primarily at Le Mans, one of the most important racing events in the world. The C-type won the race in 1951 and 1953, as did the D-type in 1955, 1956, and 1957. Although the D-type was relatively underpowered in comparison with its competition, its slippery, extremely aerodynamic shell compensated for the disadvantage in horsepower. The engine for both of these cars was a modified version of the one installed in the XK series, a group of two-seat roadsters which were the production predecessors of the E-type and particularly popular in the United States. It is from this series that the E-type obtained its American designation of XK-E.

Sir William always intended the E-type to be a synthesis of a competition racer and an everyday sports car. In a lecture given in 1965, Jaguar's Chief Engineer William Heynes stated:

In designing the E-type we set out to make a car which would incorporate the experience we had learnt through the years on

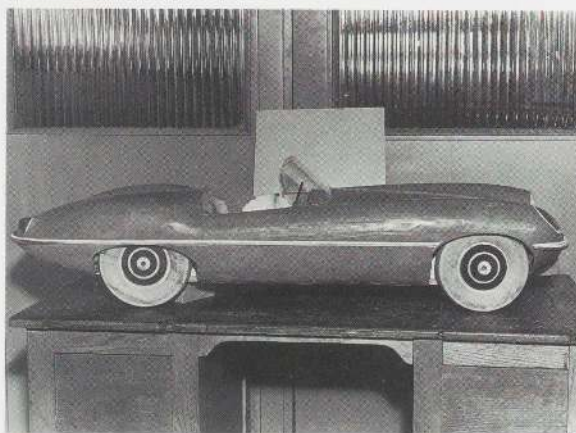
competition cars—a car to give a performance which would be acceptable as a competition car and yet could be sold at a price that was within the reach of a very large market. We decided at the commencement of development that this car was not to be a specialized racing car, and although the general approach to the design in both appearance and performance follows racing trends, the car has had to pass all the tests that we normally carry out on a production saloon before it's placed on the market.¹

The influence of racing cars lends the E-type its most striking feature, its styling. Both the C- and D-types were designed by Malcolm Sayer, who was trained as an aerodynamicist and worked for Bristol Aeroplane Company until Sir William hired him in 1950. When Sayer began designing the exterior shape of the E-type, he made the function of the silhouette paramount, as one would for an airplane. This was an atypical way to initiate work on a production car, particularly one that would prove extremely popular with consumers.

Sayer's technique was not only unusual but also prophetic in its similarity to the highly scientific method used to design Formula 1 and Indy Racing cars, today's most technologically sophisti-



XK 120 C BODY ORDINATES																			
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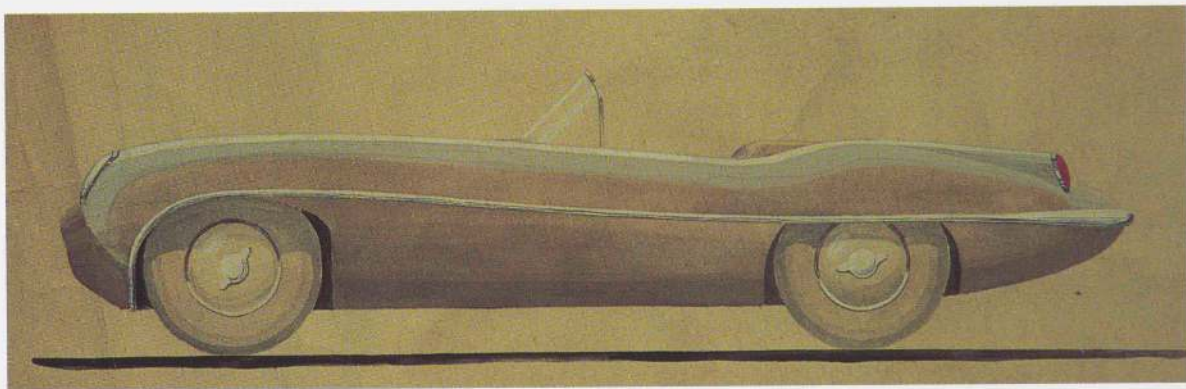


Top:
Malcolm Sayer
XK 120 C Body Ordinates
Laser print
Courtesy Philip Porter

Bottom:
Design Model
Photo courtesy Philip
Porter

cated automobiles. The complicated technique is thought to have resembled a longhand version of the CAD (Computer Aided Design) program used currently throughout the racing industry. Sayer claimed he learned this elaborate formula from a German professor while teaching at an Iraqi University. According to Tom Jones, who worked in the Styling Department at Jaguar during this period, "Sayer kept his mathematical formula for design a secret and in fact died before anyone else learned it. Sayer would disappear and return with sheets of numbers which represented the coordinates of the car."² Unlike most car designers, Sayer did not draw first, but instead used paper only to record long lists of numbers.

Sayer began with the four fixed dimensions of the car previously determined by the engineering requirements for height, length, width, and ground clearance. To arrive at the body's basic form he used a complex numerical formula for calculating ellipses, refining the shape of the exterior skin of the car until it was mathematically precise. Once the outline of the car was correct, he applied this formula to specific areas of the car: the bumpers, lights, and various exterior elements whose aerodynamic lines were essential to the car's performance. According to those who worked with Sayer, he could calculate any point on the body of the car to



Left:
Malcolm Sayer
Study for E-type
Watercolor on print paper
Courtesy Jonathan
Heynes/Jaguar World
Magazine

Next Page:
E-type Roadster
Photo: Steven Salmieri

within a thousandth of an inch. He would then pass these coordinates to the sheet metal workers, who would fashion a facsimile of the design.

Scale models of Sayer's shape were tested and retested in a wind tunnel to assess how the car would respond to air resistance. Because a car performs differently in various types of crosswinds, the aerodynamics were tested from multiple directions. In particular situations, such as crossing a bridge, too much resistance from one angle could make the car extremely unstable. Attention to this aspect of the design produced the E-type's graceful uninterrupted lines from side to side, in contrast with the large, finned American sedans of the fifties, which only address aerodynamics from front to back. The body panels of the E-type are tapered from virtually all angles. Bumpers are as small as possible, and

the door handles and gas filler cap are designed with an emphasis on a basic teardrop form. To produce less disturbance, early E-types even have glass-covered headlights as well as wheels noticeably inset on the chassis.

The ellipse is the principal recurring geometric element of the E-type. The car's universal appeal stems from the use of mathematical proportions which are by definition not subjective, but absolute. As Bob Knight, Deputy Director of Engineering during this period, states, "Proportions are the first necessity. If the proportions are wrong, you might as well go home."³ The relationship between the empirical laws of science and the beauty of art or design is apparent. As Le Corbusier wrote, "Not in pursuit of an architectural idea, but simply guided by the results of calcula-







tion (derived from the principles which govern our universe) . . . the engineers of to-day make use of the primary elements and, by co-ordinating them in accordance with the rules, provoke in us architectural emotions and thus make the work of man ring in unison with universal order."⁴

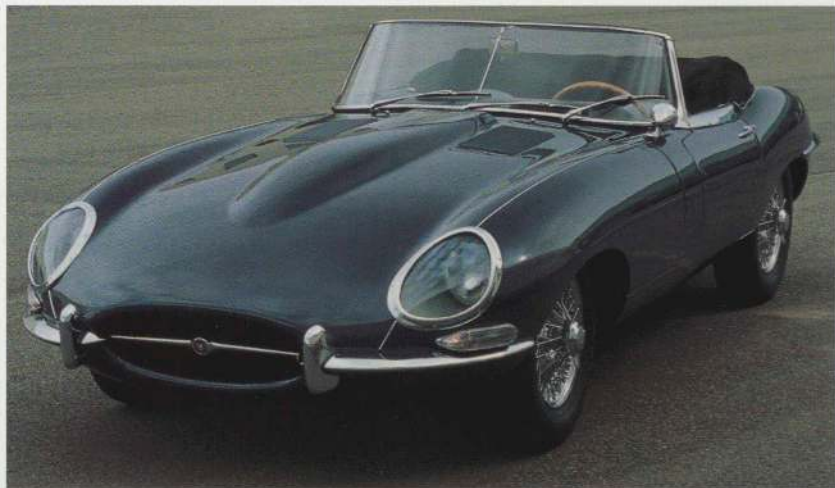
Departing from standard practices for an automobile company president, Sir William maintained for himself the title of Chief Stylist, which assured him final authority on all designs. Although the E-type's revolutionary appearance was based on functionalism and Sayer's desire to best minimize the amount of drag, its styling is not an anomaly among Jaguars. The cars are fluid, reflecting Sir William's preference for curvilinear forms. They imply movement and presuppose a relationship between the automobile and the elements of wind and ground. Characteristic features include a low roofline and a high waistline where the door frame and dashboard are in an elevated position relative to the passengers. The silhouette of a Jaguar is composed of a series of gently curved peaks and valleys, which ripple across its sides.

During the thirteen years the E-type remained in production, it was gradually transformed, deviating increasingly from Sayer's original design. The various designations, Series 2 and 3 and the 2+2 Coupé, were the result of assorted engineering improvements and

a desire to meet consumer needs. The 1960s and early 1970s had also brought an array of new safety and pollution laws for automobiles, particularly in the United States. The required increase in bumper size, for example, only mutated Sayer's original design. The later versions illustrate how fragile his careful calculations were and how a slight departure could negatively affect the geometric harmony.

It was not only the appearance of the racing C- and D-types that inspired the E-type, but also their inner mechanics. As a modified racing car, the E-type offered many advanced technological features which otherwise were only available in much more expensive sports cars, if at all. These elements included front and rear independent suspension, rack and pinion steering, disc brakes, and an advanced semi-monocoque construction—borrowed from the airplane industry—which made the car lighter and thus much faster.

The early E-types were available with a 3.8 liter, six cylinder engine modified only slightly from the version used since 1948 in the XK series of roadsters. This engine allowed for performance comparable to that of a racing car. The E-type, introduced at the 1961 Geneva auto show, was faster than any other large-production auto available in the world. The test car for the show was capable of 150 miles per hour, a standard that the



Previous pages:
Jaguar E-type Roadster
1963

The Museum of Modern
Art, New York

Photos: Greg Jarem

Vehicle: E-type Roadster with 3.8 liter engine

Body Material: steel

Years produced: 1961–64

Number of cars produced: 7,827

Top speed: 149.1 mph

0–60 mph in 7.1 seconds

Engine:

Type: Inline 6 cylinder

Bore x stroke: 87 mm x 106 mm

Displacement: 3781 cc

Power: 265 bhp (gross) at 5500 rpm

Torque: 260 lbs ft @ 4000 rpm

Gearbox: four speed, nonsynchromesh
in first gear, synchromesh in second
through fourth gears

Dimensions:

wheelbase: 8'

length: 14' 7½"

width: 5' 4¼"

height: 3' 11"

Curb weight: 2,688 lbs.

Suspension:

front: independent, torsion bars,
anti-roll bar

rear: independent, lower wishbone,
upper driveshaft link, radius arms,
coil springs, anti-roll bar

Steering type: rack and pinion

Wheel size: Dunlop 6.40 x 15 RS5

average E-type straight from the factory could not quite match, peaking only in the high 140s. Remarkably, zero-to-one-hundred mph was possible in a quick 15.9 seconds.

Like a racing car, the E-type required careful and continuous maintenance. Nevertheless, unlike most high-performance sports cars of the period, which required substantial muscle, the E-type was easy to drive. Despite the lack of power steering in the early models, the car handled exceedingly well at slow speeds or in traffic. The gear ratio allowed for ample power and speed in low gears and large amounts of room in the top gear. This permitted deceleration without stalling, which meant the car required less precise shifting than most of its kind. A damper system in the form of rubber mounts throughout the chassis gave the automobile a smooth and even ride without excessive vibration.

The interior was small but relatively comfortable and lacked the bare-bones quality flaunted by most similar-performance sports cars of its day. It was not an imitation of a sparse racing car, but instead borrowed many of its appointments from Jaguar's luxury sedans. The fixed-head Coupé (hard top) even offered a reasonable amount of luggage space, making it a popular grand touring car, particularly in the United States.

Perhaps the most obvious example of Jaguar's

quest to make the E-type a more practical or family-oriented sports car was the introduction of the 2+2 in 1966. Like many later versions, it was also offered with an automatic gearbox, a feature intended primarily for the American market. This auto included more headroom and a backseat for two children or one adult. Unfortunately, the added interior dimensions made for an awkward, swollen final shape.

Not only could the E-type achieve close to 150 mph and be driven to the grocery store, but it was also surprisingly affordable. Since its production ceased in 1974, the E-type has gained acclaim and been much coveted by collectors, but this has obscured the fact that the car was not intended as a status symbol. Instead it was meant to be popular and, when compared with cars of the period with similar performance, was priced very reasonably. The first E-type Roadsters cost approximately \$5,500 in 1961, about half the price of similarly paced contemporary cars such as the 1963 Ferrari 250 GT (\$12,950), the 1961 Aston Martin DB4 (\$10,400), and the Mercedes 300 SL (\$10,950). Even the domestically manufactured Chevrolet Corvette's base sticker price was \$3,934.

Sir William's mission was to manufacture as stylish a car as possible for an affordable price. His frugal methods included promoting competition among employees, sometimes betting with engi-



Top:
Interior Jaguar E-type
Roadster
1963

The Museum of Modern
Art, New York
Photo: Greg Jarem

Bottom:
Fixed-Head Coupé
Photo: David Newhardt

Opposite:
Jaguar E-type Roadster
1963

The Museum of Modern
Art, New York

Photo: Greg Jarem

neers to encourage them to get more horsepower out of a given engine, and only producing cars that customers had ordered. Each model remained in production for a substantial period with only minor changes. Sir William even insisted that parts made by other companies be delivered only as needed, saving money on storage and overstock.

The E-type has had a significant legacy as the first popular and large-production car to evolve out of aerodynamic concepts previously used only on sophisticated racing machines. Recently the trend in automobile design has been toward a more aerodynamic shape. This type of styling—known as the “jellybean shape,” “the lozenge shape,” or even “the worn-bar-of-soap look”—has dominated new designs in the United States, Europe, and Japan. Prominent examples include the Ford Taurus, Buick Riviera, Chevrolet Caprice, Ford Contour, and Oldsmobile Aurora, as well as Mazda's recent redesign of its complete line. These curvilinear cars borrow heavily from the E-type, with their entirely rounded edges, bumpers intrinsic to the overall shape, and head and tail lights cast into the body. Many, particularly the Mazda Miata, even feature the Jaguar's curved, mouthlike front air-intake vent. These cars replicate the E-type's overall sense of wholeness and unity of shape. The emergence of this kind of design clearly illustrates the demand

for cars whose appearance in some manner acknowledges the laws of aerodynamics.

Although its revolutionary shape has had enormous influence as a styling model, the E-type's greatest legacy is as a well-conceived, refined, and affordable sports car. The combination of these qualities resulted in its enormous popularity and sales totaling 72,520 models. Despite its high performance and handsome appearance, it was not a specialized car produced in limited editions, but one that attempted to appeal to as large a segment of the population as possible. In an industry in which appearance and performance have so often reflected price—both high and low—the E-type provided an important alternative.

Christopher Mount
Assistant Curator
Department of Architecture and Design

Notes

¹ Lecture to the Institute of Mechanical Engineers, March 3, 1965.

² Telephone conversation with Tom Jones, January 11, 1996.

³ Telephone conversation with Bob Knight, January 11, 1996.

⁴ Le Corbusier, *Towards a New Architecture*, trans. Frederick Etchells (London: Rodker, 1927), p. 33.

This exhibition is made possible by Jaguar Cars.

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