Canon

Single Lens Reflex Cameras 1959-1991

PETER DECHERT

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This Monograph is dedicated to:

SANDY, ROBIN, CAROLINE, and ANDY

With Love

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Introduction to this Facsimile edition

My Canon SLR camera monograph was published in 1992, and covers the early EOS cameras as well as the SLRs that came from Canon before them. Taken in conjunction with my Canon RF camera book, the two volumes together include all the high-quality exchangeable-lens 35mm cameras made by Canon (and Seiki Kogaku) between 1933 and 1991.

John Baird's printer had difficulties when it came to making good reproductions of many of the photographic illustrations: this deficiency is the reason for the uneven quality of these scanned images that replicate each page of the originals. Unhappily, the same situation affected my Olympus Pen F monograph as well. I hope you'll bear with those that didn't fare too well.

Happy reading!

Peter

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I. HISTORY

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Canon did not invent the 35mm Single Lens Reflex Camera. It existed for more than two decades before they added their first Canonflex to what had already become to many observers the most significant camera type of the second half of the twentieth century.

Nor, when they finally did introduce the Canonflex, a novel and original design to be sure, was it by any means an overwhelming success. Canon, a major established photographic manufacturing concern, had to struggle to hold even a comparatively minor share of the SLR camera market for the first sixteen years that they were in it; in the meantime, the company almost went under entirely. Then came the AE-1, and the rest is history.

The goal of this monograph is to trace the developmental history of Canon's SLR designs from the Canonflex to the 1991 EOS models, a thirty-two year history which in some ways encapsulates the larger industrial development of design concepts for this type of camera. At various times during the more than three decades between 1959 and 1992 one manufacturer or another has attained a clear lead in the effort to make the SLR camera model that was perceived by the public to be dominant in its field -- Nikon with the F in 1959, Topcon briefly with the RE Super in the mid-1960s, and Minolta with the Maxxum in 1985, for instance -- but during much of this period Canon have been either pressing the perceived technical leaders or actually, especially during the ascendence of the AE-1, the A-1, and the T90, been the perceived leader themselves.

Taken together with my earlier book CANON RANGEFINDER CAMERAS: 1933-1968, the present Canon SLR study more or less charts the development of Canon's major achievements in advanced camera design, from their beginnings as a small research organization devoted to the goal of producing Japan's first high-quality 35mm camera, through the few years of their being little more than a wing of the Nippon Kogaku establishment, then finding a measure of independence through the investment of Dr. Takeshi Mitarai, who later led them through the early postwar years into a period of growth and success that few could have foreseen.

In the late fifties and the sixties they became sidetracked for a while, albeit profitably, in exploiting the then-current rage for 8mm and Super-8 cine cameras, a developmental phase which ultimately had no lasting impact and the recounting of which I have no intention ever of pursuing. But since the advent of the FTb and the F-1, Canon have been among the industry leaders in applied camera design; as this study may suggest, they had earlier worked hard to reach this objective.

Nowadays Canon's photographic manufacturing accounts for only a minority of their total business. Heavily into office equipment and other applications of electronic technology, they probably would not feel any bad economic effects if the photographic end of things were to be totally stripped from the scene. It is quite possible, indeed, that their photo business is run at, or near to, a loss.

But if Canon were to withdraw from this phase of activity, they would lose even more: tremendous face, if nothing else, since camera -- and later lens -- design and manufacture is the

foundation upon which all the rest was based. Canon are still perceived as camera-makers by multitudes of people around the world; thus they must, and do, retain a commitment not just to excellence but to absolute leadership in this now comparatively minor aspect of their total industrial output.

This monograph, therefore, really is designed to update and to complete the story begun in my earlier book. Together, they chronicle the major elements in the history of Canon's photographic story.

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Before we turn our attention specifically to the story of Canon's SLR camera achievement from Canonflex to EOS, however, we need a little background. First, we should understand something of how 35mm SLR design in general had progressed between the invention of this camera type and the time that Canon joined in developing it. This is the subject of the section that immediately follows this one.

Second, we should take some note of the specific photographic design context into which the Canonflex was introduced. The fourth section of this chapter is designed to help us with that topic.

Ideally, we should also know something about Canon themselves. Who were they? Whence did they come? What, if anything, had they already learned by the year 1959 about making cameras? How did they fit into the contemporary scene? As I noted above, that topic has been covered in my earlier book, CANON RANGEFINDER CAMERAS: 1933-1968. Some further insight might be found in my monograph THE CONTAX CONNECTION. I shall not go farther into the topic here. But please try to remember that by 1959, when the Canonflex appeared, Canon and their ancestral company had been designing and making high-quality 35mm cameras for about twenty-five years, longer than any other 35mm camera manufacturer in Japan.

In fact, it turned out that Canon cameras were important assets in the early postwar history of Japan's industrial resurgence; they have historical importance, as I pointed out in that earlier book, that transcends their simply photographic worth. For one reason or another, a good many Canons over the years have been "important" cameras.

And as we meet here together, too, many of us are likely to have been Canon camera owners. Possibly we still are. Many of our Canons have been, and today remain, fun to work with.

So, on these notes, let's begin.

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The history of the 35mm Single Lens Reflex Camera starts in 1936, when the first two models of this type became available. One, the Kine Exakta, was widely influential and became the standard against which all other 35mm SLRs were judged; this position was unchallenged as late as the mid-1950s. The other, the Sport, was made in Russia and, perhaps fortunately, had no apparent influence on SLR configuration anywhere, not even in the Soviet Union. That is another story.

The Exakta design included a focal plane shutter with a fastest speed of 1/1000 second and an array of slow speeds that no SLR matched until the advent of electronic shutter timing four

decades later. It had a waist level finder which because it reversed the image field from left to right was nearly impossible to use for vertically composed photography; to compensate, a part of the Exakta's finder cover could be opened up when the cover was raised in order to provide a non-optical frame viewfinder. This became standard practice for all major SLR designs until well after the 1939-45 war had ended.

There had been earlier Exaktas, slightly larger SLR cameras that used 127 rollfilm, but the Kine Exakta was a class act from the beginning, especially among naturalists and other scientifically inclined users who needed a small, precise camera for field work: one that was also usable in the laboratory. Because of its defective vertical view, and because it flew directly in the face of Leica and more lately Contax tradition, it was not accepted so quickly by generalist photographers, despite the fact that it was made with superb precision from the start.

The first breakthrough toward wider SLR acceptance came with the East German Contax S camera design, previewed at the end of 1948 but not generally distributed until late in the following year. This camera, quite nicely designed but often badly assembled, featured a permanently installed pentaprism in its viewfinder path. The five-sided roof prism (five major sides, anyway: a photographic pentaprism always has more than five faces) served to correct the field of view for the photographer so that right was right and left was left. Both vertical and eyelevel use of the SLR design were now suddenly possible. Almost at once a removable adaptation of the same prism was made available for a new Exakta, known as the Exakta V or Varex model.

Other problems with SLR design remained to be overcome. The mirror in an SLR, which had to be raised out of the way before the film could be exposed, remained in that raised position after exposure. In the most usually encountered 35mm SLR design, the one pioneered by Exakta, this condition lasted until the film and shutter were wound on, an action which was linked to winding the mirror back down into place again. Another design, first adapted for 35mm by the 1938 Praktiflex and rare on other examples (but widely used, especially before the war, on larger SLRs) only retained the mirror-up position until pressure on the shutter release button was relaxed. The defect of the second design, however, was that pressure on the shutter release was also used to raise the mirror, making this a stately process during which the subject was likely to change appearance before the exposure could be made. This system was an early and outstanding example of what we now call "time parallax," a problem that has been reintroduced to our thinking by the improper use of new autofocus SLR designs.

But several years later a relatively little-known Japanese camera maker, the Asahi Optical Company, introduced the Asahiflex IIB, which incorporated a mechanically controlled automatic instant-return mirror. For the first time, the photographer could see what changes, if any, his subject had undergone while the exposure was being made. The Asahiflex was a rather primitive waist-level design, but in 1955 it was superseded by the Asahi Pentax, which featured a pentaprism to accompany the new mirror mechanism.

Early SLRs had had no linkage between mirror and lens; the lens had to be set to its taking aperture before the exposure was made. And focusing screens were primitive. At small f-stops, the image on the camera screen became very dark. Attempts to improve this drawback were made using condenser lenses above the screen in order to direct more of the scattered light from the image directly to the photographer's eye; later, fresnel lenses were adapted for this purpose. Shortly after the Contax S, which used a condenser lens in order to improve its brightness, had been marketed, so-called "preset" lenses were introduced by East German Zeiss and later by other makers. These allowed the f-stop for exposure to be selected while the lens itself remained at its full aperture; at the last moment the photographer manually rotated a second aperture control ring adjacent to the setting ring, and the lens accurately closed down to the stop he had selected earlier.

A year or two later the branch of Zeiss that had remained in East Germany after the war, again quickly followed by others, developed external camera to lens coupling, which was first applied to the Exakta. In this design, an external linkage was a part of the lens shell; when the lens had been mounted the protrusion housing the linkage came to rest just in front of the camera's shutter release button. The linkage incorporated an auxiliary release plunger; when partially depressed, this plunger released a spring that caused the lens diaphragm to close down to its taking aperture, which had been preset by the photographer. Later in its path the plunger's stroke extended far enough backward to activate the on-camera shutter release button. The aperture close-down spring, however, had to be rearmed manually for the next photograph by stroking a recocking lever.

This system worked well enough so long as the close-down spring's pressure remained strong; when the spring became lazy, one's photographs became evilly exposed. The same general arrangement was even adapted, by means of a very chancy long extension plate, to the Contax S camera family, whose angled shutter release buttons precluded the simple form of Exakta-style juxtaposition. But the East German designers soon improved upon this almost emergency expedient by arriving at the original form of internal camera to lens coupling, using a plate within the bottom of the camera's throat to push a diaphragm release pin that extended out from the back of the lens mount; again, the lenses had to be manually rearmed.

Lenses of this type, either external or internal, are called "semi-automatic," and Asahi among others adopted the East German internal system for several of their Pentax models that followed the original one, which had still depended on preset lenses. Eventually the Zeiss-Pentax design, with improvements, developed into the so-called 42mm or "Universal Thread Mount." Internal lens-camera linkage quite soon became the favorite of almost all designers; Topcon and Alpa were two of the relatively few major SLR makers who chose to follow the external lens automation route for a while longer; indeed, Alpa still use it.

When the instant-return mirror came into general use, a few years after Pentax had pioneered it, the semi-automatic lensmount was no longer adequate, since it required manual rearming in order to produce a bright image on the now immediately repositioned mirror and its screen. Solutions to this problem were still being worked out in 1959; many very early and short-lived ones involved double-spring systems in which one spring was stronger than the other, and this led to predictable lack of accuracy after a certain usually minimal amount of wear.

A neater solution was to have one spring in the lens and another in the camera body. There were two cases to this solution. In the first, the lens could be sprung open, and a pin, set into the back face of the lens and controlling its diaphragm action, made to interface with a lever in the camera throat. This lever could either be controlled by a much stronger spring than the one in the lens or, preferably, by a totally mechanical link between it and the shutter release mechanism. Action of the camera lever would then force the lens pin to overcome pressure from the lens spring in order to close the diaphragm. The pin in the lens could move either fore-and-aft, as in the Pentax system, or side-to-side, the method finally chosen by the majority among those manufacturers who did not adopt the Universal Thread Mount.

Or the lens could be sprung closed, in which case the camera lever would force it into an open position and the release of pressure on the lever would allow the lens's own internal spring to close the diaphragm to whatever aperture had been chosen by the photographer. In either case, the camera lever returned to its original position as soon as exposure had been completed, allowing the lens diaphragm to reopen to its maximum aperture by the time that the "instant-return" mirror had in fact come back to rest.

Both solutions had merits; both had drawbacks; neither finally prevailed over the other. In developing their SLR system, Nikon chose the second method, with the lens sprung so as to be closed when not mounted on the camera. Originally, Canon somewhat typically chose neither, as we shall see; when they changed from the Canomatic R lens design to the FL design, their lenses were sprung to remain open, exactly the opposite of the Nikon system. In the more recent "new" FD lens system, however, Canon reverted to their iconoclastic practice of going their own way once more; here the lens diaphragms come to rest at an intermediate location. Both companies, for what it may be worth, have nonetheless settled on side-to-side lever movement rather than fore-and-aft.

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In order to understand the context into which Canon introduced their original Canonflex, we should look at a few of the more importantly typical SLR cameras that could be bought in early 1959, just before the Canonflex, and the Nikon F as well, were introduced.

Perhaps the best-made small SLR with a focal plane shutter then available was the Topcon R, which had appeared in 1958. In the United States it was sold as the Beseler Topcon Super B. Certainly the most widely popular SLRs were the various late 1950s models of the Pentax, though "popularity" was not at all then what it is today. The Exakta was still generally thought of as the premiere camera of this type for scientific use; the Miranda probably was the most versatile system SLR from Japan, though few foreigners had heard of it.

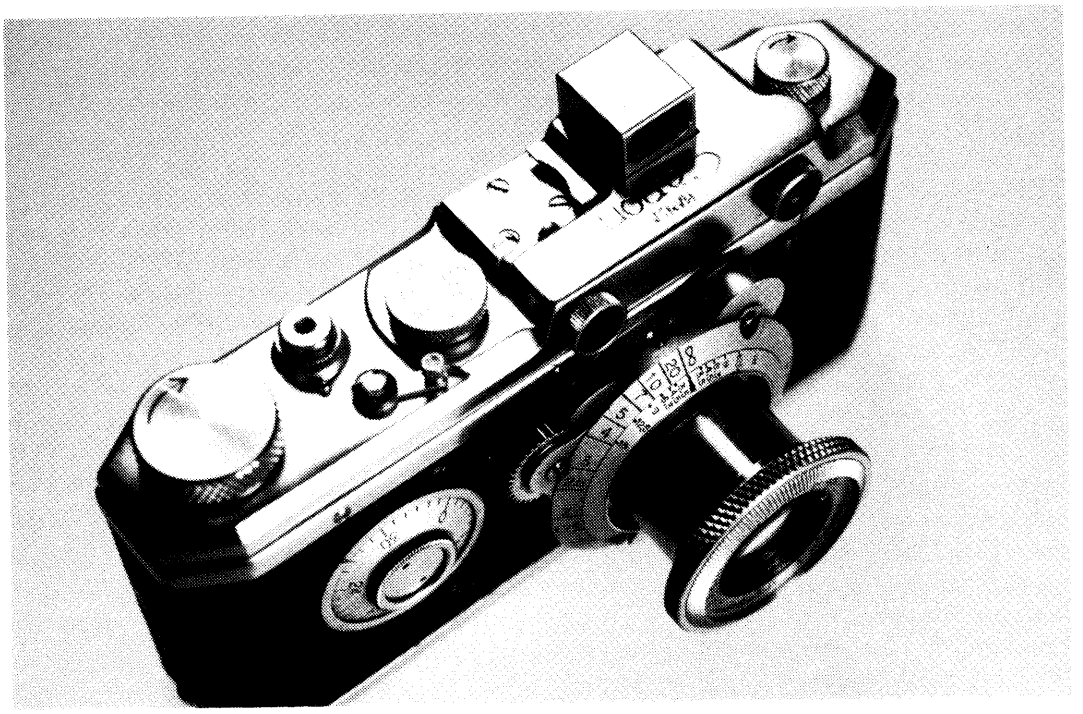
Among amateur users West German Zeiss Contaflexes and Kodak Retina Reflexes and Voigtlander Bessamatics held sway. While these were useful and generally well-made cameras, their leaf shutters limited their utility both in the consistency of their shutter speeds at differing apertures and in the matter of extensive lens arrays. The Bessamatic, nevertheless, was the first 35mm SLR for which a zoom lens was successfully designed.

Though these drawbacks were somewhat offset by the ability of the leaf-shuttered cameras to support electronic flash synchronization at short shutter speeds, those were still the days when electronic units had not been very fully developed: outfits were large and eccentric. The flash advantage, then, could not offset the leaf-shuttered SLRs' disadvantages among professional users; few of us carried them in our working kits. Nevertheless, their proliferation proved their inherent worth, even to many proficient users.

In general, active photographers who worked with the 35mm format used Leica M3 and M2 or Nikon SP and S3 rangefinder cameras. A few preferred Contaxes or Canons, and some had a Pentax or Exakta tucked away with a long lens or two, but the Nikons and Leicas suited a very comfortable majority. Because they accepted lenses in the Exakta mount, which were numerous and amazingly various, a handful of workers including myself were giving Topcons a try, but the R lacked internal lens automation as well as an instant return mirror. Most of us were wary, waiting because we had heard very reliable rumors that Nikon and Canon both planned advanced SLRs in the not very distant future.

When it arrived, the Nikon F, as we all know now, was a huge success. The Canonflex was not. In considerable part this situation mirrored the relative acceptance of their then current rangefinder camera models. In 1959 Canon were marketing the VI-type cameras as well as trying to sell off what V and L models remained in inventory; the model P, destined to be the best-selling Canon in their pre-1961 history, was released concurrently with the Canonflex.

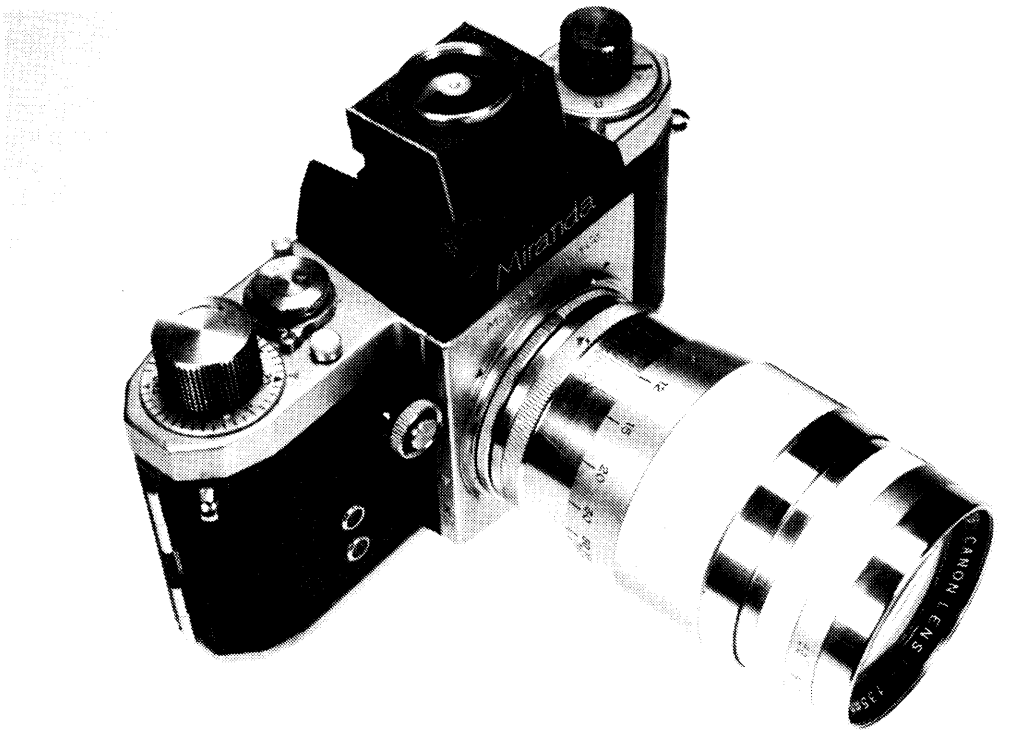
By many observers, Canon and Nikon were perceived then as being very much in combat with each other. There was more than a grain of truth behind that perception. Although they had once been close allies in what was essentially a Nikon-dominated partnership, the two had alternately drifted and been wrenched apart many years earlier.



An early 1936 Canon/NK Hansa camera, Number 127, shows the original source from which, much later, the Canon SLR cameras came.

Preceding Page *The Praktina FX was among the world's first production SLRs with internal diaphragm semi-automation, and was also the first that allowed a motor drive to be attached.*

The Asahi Pentax was the first SLR with a instant-return mirror.



Canon's first foray into SLR-land, about 1955, was a set of two lenses in Exakta mount. These were marked "EX" in red on the nameplate ring; the 135mm f/3.5 shown here is mounted on a Miranda T, of roughly the same vintage, by means of Miranda's Exakta lens adapter.

II. THE CANONFLEXES

CANONFLEX

Work on prototype Canon single lens reflex cameras began soon after the revolutionary model V series of Canon rangefinder cameras was marketed. The V-cameras used a baseplate lever winding device as standard, and from the start of SLR experimentation this attribute was incorporated into the prototypes.

Indeed, remaining examples of design exercises for the Canonflex suggest that its outlines were clear to the design team from early on. Placement of some of the controls, such as the shutter speed dial, varied; but the general layout of the camera as it evolved was clearly that of the final production model.

The production version of the Canonflex was the first Canon SLR camera to be marketed, introduced in May 1959 although manufacture had started earlier, near the beginning of that year. It ended in May 1960. Slightly more than 16,000 Canonflexes were produced. Nowadays the first Canonflex is often called the Canonflex R to distinguish it from the three Canonflex models that followed, but its original name was simply Canonflex.

It had shutter speeds from 1 to 1/1000 second on a single serrated knob at its top right end. The serrations coupled with an external light meter that could be clipped onto a rail on the upper right front face of the body, allowing the meter to respond automatically to changes in the shutter speed setting as they were made by the photographer. But this happened only if the meter had been properly coupled upon installation. There was no provision, then or later, to couple Canonflex lenses to the meter.

Two finders were available: the normal pentaprism and an upright direct viewer with adjustable diopter correction. Finder housings were unlocked for exchange by a small sliding switch on the left side of the lensmount bulge. The finders slid into and out of position on a very smooth rail-and-key arrangement. Focusing screens were not user-exchangeable; although the configuration looks at first glance like a split-image rangefinder within a microprism doughnut surrounded by groundglass with faint fresnel circles, in fact there was no microprism focusing aid.

The direct viewing finder did not fold up; it was intended for scientific and copystand use. The pentaprism had no provision for simple attachment of correction lenses or eyecup, though the finder lens could with difficulty be unscrewed and a substitute mounted.

In addition to its 1 to 1/1000 speed range, the shutter had two other settings: X for electronic flash, which equated to a speed near 1/60, and a singularly marked B-T which stood for Bulb and Time. The shutter release was at the top front between the speed dial and the finder; a comma-shaped arm around it looks like a lock against accidental release, but in fact acted to secure the plunger after it had been depressed on the B-T setting, providing the Time exposure facility. Turning the arm back to its normal fore-and-aft configuration allowed the shutter curtains to close. The exposure counter was just left of the arm.

When the rewind crank at the left top was pulled up, two small serrated levers could be found beneath it. These tiny protrusions allowed adjustment of the film load reminder dial that

surrounded the base of the crank assembly. It was calibrated for ASA and DIN speeds as well as showing symbolically the type of film loaded, but of course did not couple to any of the camera's controls.

At the left edge of the Canonflex was a bayonet plus PC connection onto which contemporary Canon flash units such as the model V could be attached. The camera had no standard accessory shoe. Its front face was unadorned except for a circular device below the exposure meter attaching plate. This housed a D-ring key that when unfolded wound the delayed action mechanism, which in turn was activated by the camera's shutter release. Once set, the delayed action could not be overridden.

The Canonflex's hinged back unlocked by folding out a small key at the left end of the baseplate and turning it 180 degrees counterclockwise, the last bit of this arc against moderate spring pressure. The key also allowed use of Canon's model V locking bulk-film cassettes in the Canonflex. The tripod socket was at the far right end of the baseplate, just beyond the very comfortably shaped rewind button depression.

The reason for the socket's not being centered was, of course, the baseplate winding trigger. Where such triggers on the Canon rangefinder cameras had been long folding stems that moved in a straight right-to-left slot, the one on the Canonflex was much better designed. A small tab at the front of the baseplate, when pulled down on its spring-secured hinge, became the trigger, and in turn allowed the arm to which it was attached to be swung clockwise in an arc of about 140 degrees, winding the shutter and advancing the film in a single stroke.

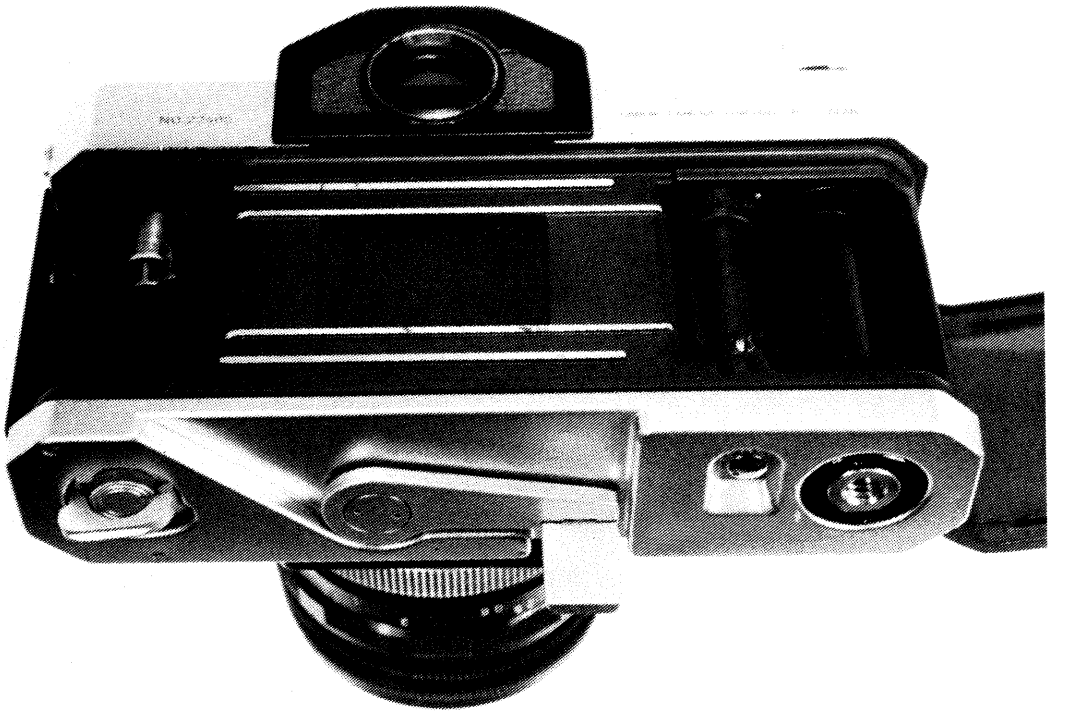
The arm pivoted around a central shaft. This gave the Canonflex a more comfortable winding action than that found in any other bottom-wound camera, but as I suggested earlier it also made the camera very cumbersome to handle when a long lens was attached and continuous focusing was necessary in order to follow whatever subject matter was being photographed. Thus the winding mechanism of the Canonflex was at once the best of its sort ever made, and yet a non-conclusive answer to the problem (whatever it may have been) that bottom-winding was supposed to solve.

The Canonflex backdoor was hinged at the right end of the body. This fact made it much easier to load film into the Canon than was the case with such cameras as the Nikon, whose entire back and baseplate unit came off in your hand and had to be put down carefully before you could load the camera. One could not lose or easily damage the Canonflex backdoor while changing film in a hurry on the job.

Lenses were attached to the Canonflex by a breechlock mount that was very little different from the one pioneered on the Seiki-Kogaku X-Ray camera first designed about 1939 by Canon's predecessor company. The lens flange was pushed flat against the front face of the camera flange and a small protruding screw-head on the lens mount socketed into a depression at the top of the body flange; then a ring that surrounded the lens flange was tightened clockwise in order to lock the lens to the camera. Essentially the same mount was used by Canon until 1988, though it underwent a number of transformations, until it was supplemented by an entirely new and different one developed for the EOS/EF series of cameras.

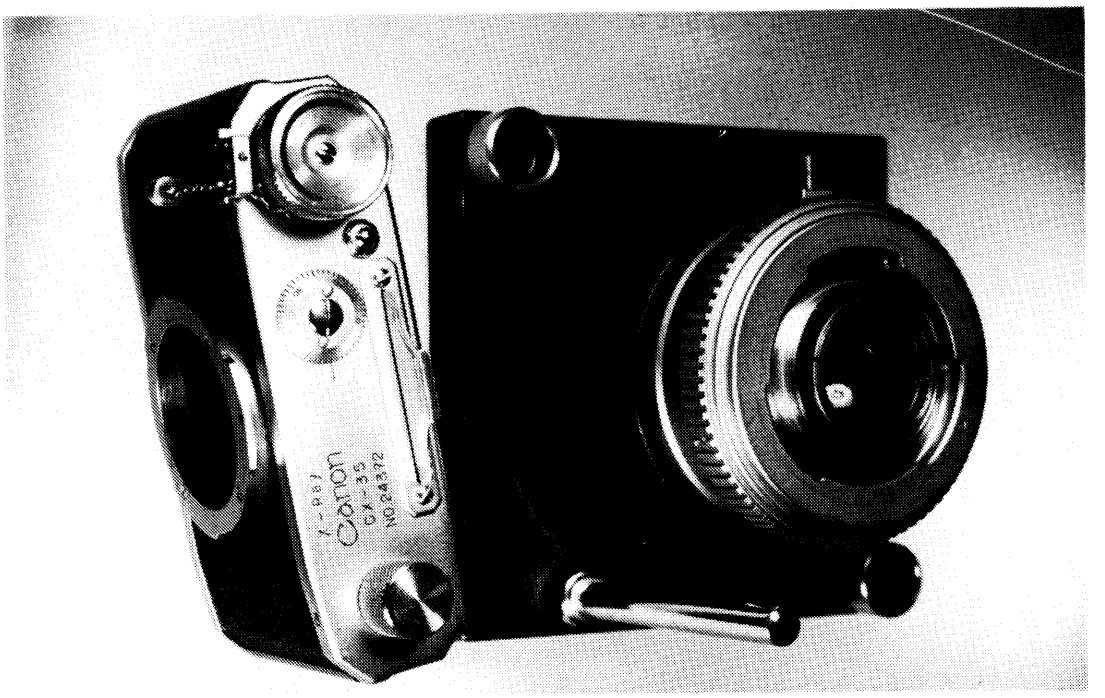
The Canonflex was a ruggedly built, very nicely finished camera. In one's hands it felt much better than the Nikon F that arrived simultaneously on the photographic scene. Until the Contarex became available, in fact, the Canonflex was certainly the best-built 35mm SLR on the market. But because of the drawbacks induced by a few of its alleged advantages it was not very successful commercially.

The Canonflex, Canon's first production SLR, now sometimes incorrectly called the R1000.



Bottom rear view of the Canonflex, showing the open backdoor and the bottom winding lever with its tip extended, ready for use.

The original Canonflex lensmount was derived from the one that first was used in 1939 on the Seiki Kogaku Seiki X-Ray camera, shown here with its 50mm f/1.5 Seiki Kogaku R-Serenar lens and cassettes, but without the bulky lens cone that normally hides the lens itself.



A 1950s vintage X-Ray Canon CX-35, still almost identical to the 1939 Seiki version, with its lens cone, showing the bayonet fixture at the rear of the cone which is very similar to that of the Canonflex lenses, as well as the camera flange which closely resembles that found on all Canon SLRs before the EOS models.

THE CANONMATIC AND R-TYPE LENSES

There have in fact been three distinct series of Canon SLR lenses within the same basic mount: the R lenses, the FL lenses, and the FD lenses. The FDs can further be subdivided into those that were secured by rear rings and the more recent ones, which are secured by turning the whole outer shell of the lens. The Canonflex models all used the R lenses and will not work properly with either later series; some of the R lenses may be mounted on later bodies without harm (others may not), but they will not work together automatically.

The Canomatic R lens coupling design was one of the Canonflex's weak points. It required two mechanical pin connections with the camera body. The first connection armed the stop-down spring; the second activated it. The lenses themselves were designed to have open diaphragms at all times when at rest; a second aperture ring immediately behind the forward-mounted primary ring served to provide a preview at shooting aperture, and unusually could be set at its smallest aperture even if the primary ring was set at the largest.

The arming linkage of the lens was controlled by the camera's own winding mechanism. What this meant was that if a lens was removed from the camera immediately after firing, before it had been rearmed, and later was remounted to a fully wound camera, the lens would not close down to shooting aperture on the first subsequent exposure because it had not been armed. Later exposures, of course, would not be affected, but the first would. While the lens could be armed manually by pushing the arming pin, this procedure was a nuisance and often apt to be overlooked in the heat of actual photography. I remember that error very well indeed, even so many years later!

Originally announced in Japan with the Canonflex was a series of four fully automatic R lenses: 35mm f/2, 50mm f/1.8, 100mm f/2, and 135mm f/3.5. The 35mm lens when finally marketed turned out to have a speed of f/2.5; it was a pretty poor retrofocus design about which the less said the better. The 50mm was a new design of rather good quality, while the 100mm and 135mm lenses were remounts of the excellent existing lenses in Canon's rangefinder camera series. Focusing adapters were also made available that permitted the heads of such RF camera lenses as the two above as well as the 85mm f/1.9, 100mm f/3.5, and others to be used with the Canonflex. A fixed adapter with a socketed filter retainer was marketed to allow use of screw-mount Visoflex I lenses (a specification then shared by Leitz and Canon) and Canon's own 200mm and 400mm reflex housing optics. With a bellows attachment Canon's 600mm, 800mm, and 1000mm lenses could also be fitted.

At first only the 50mm and 135mm fully automatic lenses were actually made available; others that followed were the 35mm and 100mm, and a 200mm f/3.5 that had a tendency to lose its diaphragm leaves; it had to be closed down by pressing a very small button and then rearmed manually if a preview at shooting aperture was required. Others followed later, after the next two Canonflexes had been introduced. The 200mm was known as a Canomatic R lens; the 35mm, 50mm, and other fully automatic ones were called Super Canomatic R, and the manual ones in Canonflex adapters were simply Canon lenses R.

CANONFLEX RP

Production of the Canonflex RP began in June 1960, following the end of the Canonflex manufacturing run. It was first marketed in September of the same year. Production lasted until January 1962, and somewhat more than 30,000 examples of the RP were made, almost twice as many as of the original Canonflexes. Nevertheless, because the Canonflex sold slowly in the United States and was superseded before the end of its marketing span by the Bell & Howell version of

the Canonflex RM, comparatively few of the RPs apart from those that were sold to customers at Post Exchanges and similar outlets abroad are to be found between these shores.

The RP was almost exactly like the original Canonflex. Its most obvious difference was in the finder construction: the RP had a fixed pentaprism which, except on the few black RPs to be made, was chrome instead of the black exchangeable one on the Canonflex.

Other differences were minor indeed. The delayed action on the front of the RP was activated by a wide vertical lever rather than the circular key arrangement of the Canonflex. No time exposure lock was fitted to the shutter release; thus the speed dial carried only a "B" setting instead of the earlier "B-T." The eyepiece of the pentaprism was designed from the start for convenient removal and replacement, allowing facile use of eyepiece correction lenses, and it was sufficiently flanged to permit mounting an eyecup.

All the other Canonflex RP mechanisms were located identically to those of the Canonflex and worked in the same way, including the attachable exposure meter. The camera was marked "Canonflex RP" behind its shutter release, making it easy for collectors to identify and distinguish. It was a slightly less expensive model to produce, but for all usual purposes worked just as well. People may tend to think of it as an amateur-oriented version of the Canonflex, but in fact it should properly be considered an equally professional camera, designed for the user who did not need exchangeable finders.

The Canonflex RP was a basic camera with non-removable prism housing.

The Canonflex RP was also apparently the first Canon SLR to be supplied optionally in black paint finish; shown here is a black version with 100mm f/2 lens and black attachable exposure meter (also suited to the following R2000) that is linked to the shutter dial but not the lens diaphragm.

The Canonflex R2000 with correct accessory meter, reading to 1/2000, attached.

The Canonflex RM, last of the Canonflexes, had an integral selenium exposure meter that was still not coupled to the diaphragm.

CANONFLEX R2000

The R2000 also had a production run between June 1960 and January 1962. It too was marketed in September 1960. As with the RP, comparatively few of the R2000s reached the United States; but then, only about eighty-eight hundred of them were ever made, so that this is the scarcest Canonflex of them all.

The R2000 was even closer to the first Canonflex than was the RP. Its primary distinction was a top shutter speed of 1/2000 second, making it the first 35mm SLR with a shutter as fast as this. If I am correct, the later Rectaflex models had previously held the speed record at 1/1300. Like the Rectaflex shutter, that of the R2000 had a tendency to slow down after a little hard use. Oddly, the shutter curtains of all the Canonflexes were made of rubberized cloth despite Canon's previous experience with light metal curtains that dated back to the VL and later VT-Deluxe rangefinder cameras. The cloth curtains, being heavier, theoretically produced more drag than the metal ones; but in fact Canon's metal curtains were designed to prevent shutter burnout from direct sunlight, not to improve shutter efficiency. Because of their mirrors, burnout is not a problem with SLRs.

Other differences between the Canonflex and the Canonflex R2000 were so minor as to be virtually unnoticeable. Because of the need to indicate the extra 1/2000 speed, the "X" speed was dropped from the shutter dial and the "60" setting was used for both purposes, becoming "60-X." "R2000" appeared on the front face below the shutter release, and the latter incorporated the same lock as had the Canonflex. Even the prism housing of the R2000 retained the old annoying eyepiece configuration of the Canonflex, despite the fact that it had been greatly improved on the RP. The attachable exposure meter for the R2000 differed from that for the other two Canonflexes by incorporating the 1/2000 speed on its dial. Finding an appropriate meter may indeed be the most difficult task to face the Canon SLR collector as he wends his way through his chosen field.

CANONFLEX RM

The Canonflex RM was a very different-seeming camera from the three models that preceded it. Production probably began in February 1962; it was first marketed in April of that year. More than 71,000 RMs were made before manufacture ended in March 1964, and it thus significantly outnumbered the other three Canonflex models lumped together.

Toward the end of 1961 Canon entered into an arrangement with Bell & Howell to be their United States distributor; this agreement determined to a very considerable extent the shape of Canon SLRs for ten years to come. Quite clearly, the RM was at least in part designed to satisfy the new US dealership arrangement. It retained the Canonflex lens mount and the RP delayed action device; little else external remained to remind the buyer of the cameras that had gone before. Most immediately apparent, the RM incorporated a selenium exposure meter (none of the Canonflexes nor their meters required batteries in order to work) that was coupled to the shutter speed and to the ASA and DIN film speed indices.

The waffled meter window perched on the camera's front face above the delayed action lever. It read out onto a scale at the left top end, and the F-stop scale surrounded the right edge of the rewind crank mechanism, which had been redesigned so as to be a little less convenient than that of the previous Canon SLRs. Readings from this scale had to be transferred manually to the lens on the camera; lenses remained in the R mount. Although still slightly serrated, the shutter speed dial had no need nor ability to couple with an external meter; for whatever reason, it also lacked an "X" index, though X synchronization still operated at speeds of 1/60 or longer. The top shutter speed was 1/1000, and the coupled film speed scales were incorporated in the shutter dial. The height of the top cover plate was raised in order to incorporate the meter, and the pentaprism was not exchangeable: it retained the split image rangefinder in a groundglass surrounding, with no microprism.

The other big news was that the bottom winding trigger had at last been replaced by a right thumb wind something like that of the Yashica/Nicca YF: a plastic tip on the end of a lever that was contained within a slot below the top deck cover of the camera. This arrangement was neat and stylish, but prone to trap dust; Canon have never repeated it. The eyepiece was now rectangular and grooved along its edges in order to accept externally mounted correction lenses and eyecups of the sort that still fitted cameras as late as the A and T Canons. Although not centered, the tripod socket was much closer to a central position than it had been before. The backdoor was essentially the same as that of earlier Canonflexes, and opened in the same way.

This camera was in many ways felt by casual observers to be an improvement on its forebears; I did not then agree, and still do not. To me it is a commercial compromise, fancy without any remarkable improvement over the R2000 or RP. Although easier to use, the lever wind had as many drawbacks as the trigger, and the internal meter was no more accurate nor convenient than the external one had been. If the meter needed repair, the whole camera had to sent home for service.

In the United States a good many of the RMs that were sold appeared with the "Bell & Howell/Canon" insignia, although some did not. R-mounted lenses were not so marked. A small circular plate at the top of the left rear cover, not openable by the owner without a special tool, allowed access to the zeroing mechanism of the exposure meter; it is typical of the attitudes of both Bell & Howell and Canon in those days that this adjustment was not trusted to the user. The RM was a camera aimed at amateur photographers.

IMPACT OF THE CANONFLEXES

Although their design, especially in the first three models, was absolutely redolent with promise, the Canonflexes never mounted a serious challenge to the Nikon F. They were better built and had better finders, but the bottom trigger wind by itself was enough to doom them. A barely broad enough selection of lenses in the R mount eventually appeared, but failed to match Nikon's equipment. The Canonflex backdoor was greatly superior, but its R lens coupling design was equally poorer. Focusing screens in the Canonflexes were not exchangeable even where they were accessible.

Most importantly, perhaps, Canon's designers did not anticipate the need to couple their lenses to an accessory, much less an integral, exposure meter. Nikon's did. Taken all together, this drawback in conjunction with the lens design and the bottom wind doomed the early Canon SLRs for professional use. So did Canon's rapid change in models; the Nikon F lasted for more than a decade, quietly improved from time to time but not apparently superseded.

And Nikon took advantage of the chance to establish their camera in the public eye as the choice among professional photographers. This was good public relations, all the better for being true. The Nikon system, from the start, was expanded with the needs of professionals in mind. Canon SLRs became by default an amateur user's recourse.

In the end, of course, this marketing setback was good news for Canon although it nearly did them in at the time. Forced to diversify as they entered the late 1960s and early 1970s, they learned more, and sooner, about the interfaces between electronics and photographics than did any other camera manufacturer, and they entered the 1980s with a lead that even enabled them to withstand, though not without difficulty, the challenge posed by Minolta's quantum jump into quality autofocusing SLRs. But this is a topic for later on.

The Mamiya Prismat was sometimes sold with a Canon 50mm f/1.9 lens marked "OM" long before Olympus adopted this nomenclature. Notice the backward Exakta automatic diaphragm control: a pin jumps out from the camera body into the lens linkage arm in order to close down the diaphragm.

III. THREE BUDDIES : Canon, Mamiya, and Osawa

About now occurred one of those amusing interludes that so endear the study of oriental ways to occidental minds: the Canon/Osawa/Mamiya triangle.

Some of us will surely recall the rather spectacular failure of the Osawa trading company in the early 1980s. Osawa had been handling the distribution of Mamiya in Japan and in overseas markets including the United States; their demise brought Mamiya to the verge of insolvency, which fortunately for those among us who use rollfilm formats was averted at the very final moment.

At the beginning of the 1960s Osawa was doing Canon's wholesaling in Japan, as well as Mamiya's. It seems likely that someone at Osawa decided a jointure of interests between Canon and Mamiya would be a good thing: not a merger, but engagement in a few mutual product development programs. However it came about, this uneasy triumvirate engaged in some SLR activity that, while a sideline to the main story of Canon SLR development, nevertheless resulted in a few products that must be mentioned, if only for laughs.

MAMIYA PRISMAT WITH CANON OM LENS

This seems to have been the first fruit of the collaboration. Mamiya about 1960 introduced the first in a string of cameras which they named Prismat; the one in which we are interested appears to have happened in 1961. It was the second version of the Prismat, and its official title, despite the fact that apart from "Mamiya" it carries no model number or designation, was the Prismat NP. Hardly high-tech even for those days, it was nonetheless robust and decently constructed, featuring shutter speeds of T, B, and one second to 1/1000. It had a delayed action lever on front, a film load reminder on the backdoor, and dual outlets on the back for FP and electronic flash. The pentaprism was permanently installed and gave a view of a plain groundglass screen with obvious fresnel rings.

For whatever reason, though the shutter release of their camera was top-mounted, the Mamiya engineers opted for an Exakta lensmount, the only one ever to appear on any Mamiya model. The lens had to recocked between exposures if you wanted a full aperture view of your subject matter: this system of operation, all the rage some years earlier in the mid-1950s, was called "semi-automatic" by the marketing folk. In order to couple the lens to the camera for automatic aperture close-down Mamiya chose the exact opposite of the existing Exakta/Alpa/Topcon technology. On the Mamiya, a shaft moved forward out of the camera body when the top-mounted shutter release was depressed, making contact with a pin that protruded back from an arm on the lens. Pushing the pin forward released the shut-down spring in the lens, which promptly (at least when new, that is) closed the diaphragm to its preset value.

Mamiya made several lenses for their NP in this configuration: a 35mm, a 50mm f/1.7, and a 135mm, at least. But for a bit more money, the Japanese buyer could equip his Prismat with a Canon OM 50mm f/1.9 normal optic. "OM," unexplained at the time, apparently stands for "Osawa/Mamiya" and of course has no connection with Olympus' later use of this initial group. So far as one can tell, the construction of the f/1.9 Canon lens was identical to the f/1.8 used on the Canonflexes. The f/1.9s may have been "seconds."

The Mamiya/Canon combination was never officially exported to the United States, but Olden Camera in New York City acquired a batch of them through a special deal with Osawa and advertised them full-page in such magazines as POPULAR PHOTOGRAPHY. They did not sell very well. A friend who then worked for Olden has told me that several years later, in the mid-60s, salesmen were being offered extra commissions of $15 to $25 for each of these items that they were able to dispose of. A few years ago I called Olden to see if by chance any might be left in a back room; apparently the bonus system eventually worked, because they were all gone. Now, I would say, this camera-lens combination is a very desirable one for the collector. I should add, too, that the three Mamiya Prismat-type lenses were also provided in semi-automatic mounts for the Nikon F, and Nikon collectors ought to find them interesting bits of curiosa.

MAMIYA FAMILY

This camera, also called the Mamiya Junior, was introduced in 1962. It was a leaf-shuttered 35mm SLR with built-in but uncoupled exposure meter whose window was centered above the lens; it read out just east of the rewind knob. Speeds of the simple Copal shutter were Bulb and 1/8 to 1/250; the lens was a 48mm f/2.8. Unusually for that time in a leaf-shuttered camera, the mirror incorporated an instant return mechanism. The accessory shoe was itself an accessory, and screwed into a socket on the left edge of the body.

The Family has a scarcity value of its own, I suppose, but no immediately apparent connection to the Canon family. I mention it here only in order to set the scene for the next two models that we shall discuss.

CANONEX

The Canonex, Canon's first autoexposure SLR, is a rare camera nowadays.

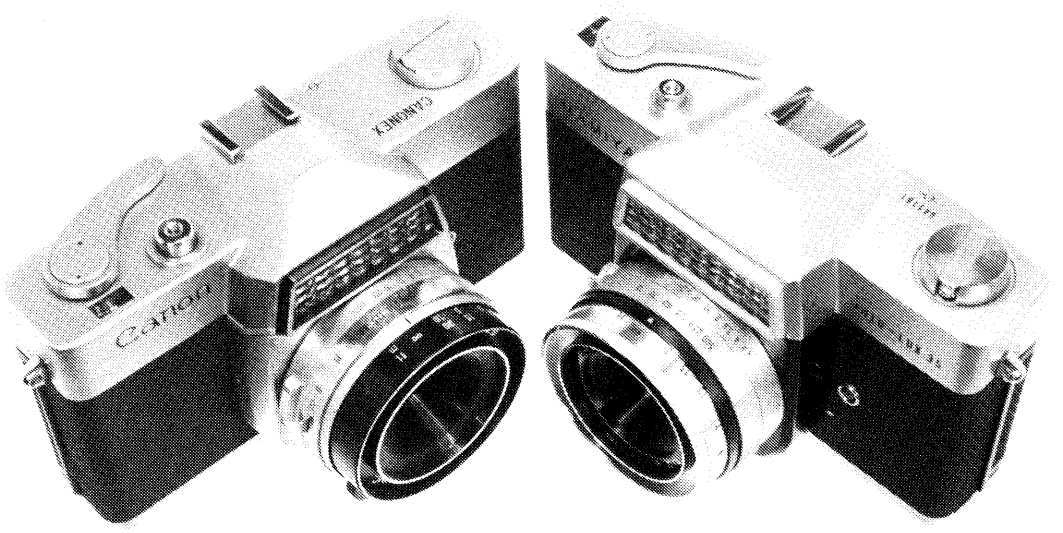
If we can trust several somewhat obscure Canon records, this leaf-shuttered SLR, the only one ever built by them, was first produced in November 1963 and shut down only six months later, in May 1964. It had an external exposure meter that read out onto the groundglass finder screen; a split-image rangefinder was incorporated into the center of the screen. Its shutter was a Copal-X speeded from 1/15 toward 1/500, plus Bulb, and the lens was a Canon Lens S 48mm 1:2.8 according to its escutcheon ring. The body covering was a pebbled leather substitute.

Their RF Canonet cameras having already proved successful, Canon clearly decided that an SLR version of that line would be even more so. They did not take into account the fact that the Canonex worked gingerly when it worked at all. Because the meter was cross-coupled to the shutter and aperture mechanisms, however, the Canonex could, when it did work, be operated in a shutter speed preferred automatic exposure mode. It was therefore the first Canon SLR to have an automatic exposure facility, even if it did not turn out to be very trustworthy once it got into the hands of a private owner. Thus it is a very desirable item for Canon collectors, when it can be found.

There are some indications that about 20,000 Canonexes were made before Canon's powers that be realized that it was too untrustworthy to guarantee at a profit. Nowadays it is a very rare model outside Japan, though, and not too plentiful there either. I suspect that many examples were junked at the factory.

MAMIYA AUTO-LUX 35

But at least some may have been sold to Mamiya. Indeed, Mamiya may have built the Canonex, though I tend to doubt it. However it happened, and surely the fine hand of Osawa is suspiciously lurking, the Mamiya Auto-Lux 35 was a clone of the Canonex, or vice versa.



The Canonex, at left, compared with its Mamiya Auto-Lux 35 clone.

First of all, despite some minor differences, they obviously look alike. The controls and even the assembly bolts of each are placed identically to those of the other, right down to their X synchronization outlets at 3 o'clock relative to the lens. The Auto-Lux is finished in a plastic fabric whose little "M" protrusions make it look like knurled rubber, and there are very minor differences in the levers and trim pieces of the two models; but one's first and also final impression is that here is one camera dressed in two sets of clothing. Shutters are the same; so are the finder readouts, though the Auto-Lux has a microprism instead of the Canonex's split-image focusing aid.

The Mamiya-Sekor 1:2.8 f=48mm lens appears to be identical to the one on the Canon. Both are a little larger than the similarly specified lens of the Mamiya Family, but not appreciably so.

Who built the Canonex and the Auto-Lux, and why do two versions of the same model exist at all, much less under two different manufacturers' names? At this remove in time and space I cannot say, but as I suggested it seems hardly possible not to see the influence of Osawa in this odd pairing. There are several alternatives that we can consider. One is that one maker did the camera body, the other the lens, and they then collaborated on putting them together. This I doubt. Another is that Mamiya made the whole batch, and passed some on to Canon for their own purposes. I doubt this also.

Look at the exceptionally clean external design of both cameras, and compare it to that of the Mamiya Family. To me it seems a great deal easier to believe that Canon designed the camera: it is much more in the Canonet style despite being an SLR than it is in the Family style. And, as I mentioned a moment back, the lenses in both Canonex and Auto-Lux are slightly different from that of the Family.

I have concluded on the little remaining evidence that Canon designed and made the whole batch, and that when the model proved less than successful Osawa said something to the effect of, "Look! We can't waste what's left. Let's turn them over to Mamiya and let those guys remainder them out!"

Do not, by the way, look for the Auto-Lux in the standard Japanese camera reference guides. Even Mr. Sugihama does not list it. Collectors, here's another challenge for you!

IV. THE BELL & HOWELL ERA

THE EARLY BELL & HOWELL CONNECTION

Canon entered their marketing agreement with Bell & Howell at the start of 1962, and for the first time in their history of dealing on the foreign market this pact allied them with a company whose primary interest was major sales successes.

During the first 25 years of their official history, through 1962 if you accept Canon's present incorrect reckoning, the company's major thrust was toward improving their products either by innovation or by tailoring models to specific small segments of a broader market. The latter approach, in fact, is still very evident today in the variations of basic models that they tailor toward specific segments of the camera-buying public (look at the A-series of SLRs, for example, not to mention the profusion of EOSes); but in the 1950s it was carried to such extremes as cataloguing and advertising a model like the IIA, of which fewer than 150 examples were made, and producing the IIAF as well as the putative IIAX in quantities of 15 or fewer examples.

Bell & Howell were not interested in such shenanigans. They wanted to sell cameras, not to admire them. And the best-selling Canon of all time by a wide margin, up to the end of the 1960s, was the Canon 7 rangefinder camera that was first introduced in June 1961, just before the Bell & Howell jointure. More model 7 cameras were sold than all four of the Canonflex models put together during the manufacturing period that ended, for both Canonflex and Canon 7, in 1964. It is thus hardly surprising that Canon as well as Bell & Howell probably misread the future of the 35mm SLR. From the evidence, it seems likely that they saw this type as largely an weekend photographer's fad, with the rangefinder 35mm still the mainstay of the serious cameraman. After all, 137,000 Canon 7 buyers couldn't be all that wrong, could they?

Nevertheless, there were obvious flaws in the Canonflex lensmount design, flaws that had to be addressed if any SLRs at all were to be sent to what even these two companies saw as an increasingly active market. Canon's answer was to drop the R-mount in favor of a new series of FL lenses that retained the breechlock bayonet fitting but abandoned the two-pin arming and firing mechanism.

THE CANON FL LENSMOUNT

The only linkage fitting on the new mount was a single sliding pin at its bottom for aperture close-down; the pin linked with a lever in the camera's throat below the mirror well. The lenses still incorporated a stop-down ring immediately behind their aperture rings; this feature originally, on the FX, allowed for a depth of field preview facility. When Canon finally added through the lens metering, the stop-down ring also provided one means of obtaining exposure measurement at shooting aperture. Its design was simplified from the similar ring on the R-mount lenses.

R-mount lenses could be used on Canons designed to accept FL lenses, but because there was no provision for arming them before exposure they would not operate automatically. Likewise the FL lenses could be fitted to the Canonflex cameras (apart from the special 38mm lens for the Pellix, which came later), but would not operate automatically. The Canonflexes, then, were obsoleted at a single stroke.

Astonishingly, despite the clear example given the industry by Nikon and Topcon, Canon had still failed to incorporate a provision in the new mounting style for communicating the value of changes in lens aperture from the lens to the camera body; stop-down exposure metering through the lens was the best that the new mount was capable of producing. This fact, as well as Canon's apparently inaccurate perception of the future for the SLR, was one cause of their near economic disaster during the six years that followed.

The FL lens and camera flanges, in which a single operating pin replaced the double set found on the original R-mount Canonflex lenses.

CANON FX

The FX was the first of the FL-lens Canon SLRs; its production run lasted from March 1964, when the Canonflex RM stopped, until December 1969. The principal feature of the FX was a CdS exposure meter whose external window was located just below the front of the rewind knob.

It was thus not a through-the-lens exposure metering system. Indeed, there was no meter readout in the finder; the metering scale was located on the back edge of the top cover plate just right of the rewind knob; its high and low sensitivity ranges were controlled by a lever concentric with the same knob, and its on, off, and battery check switch was on the back face behind the knob. The meter was coupled to the shutter speed dial, and its film speed index was incorporated into the dial, but the user had to transfer the f-stop reading from the meter read-out to the lens by hand.

Apart from this system, which was far from state of the art even in early 1964, the FX was a nicely conceived camera. It offered delayed action and a mirror lock-up lever, included shutter speeds from 1 to 1/1000 second plus X and B settings, and had a top-mounted winding lever that was a great improvement over the cosmetically slotted one on the RM. The back cover

still opened by operating what appeared to be a bulk load magazine key on the baseplate; but bulk film cassettes could no longer be used. The internal parts to open them had been left out. This was also the first Canon SLR to incorporate an accessory shoe, located in what has since become the normal site on top of the permanently fixed prism housing.

One might have expected that Canon's rangefinder camera models 7 and 7s would share a number of parts with the FX and the other SLR models that soon followed. Oddly, they did not. Even simple items like the rewind knob and the meter control switch were different, and the only obviously identical external parts were the delayed action lever on the right front of the body and the accessory shoe on top. The rangefinder cameras used metal shutter curtains while the FX continued to have cloth ones similar to those of the Canonflexes. The backdoor design of the Canon 7s was also notably more complex in its film flatness precautions. These differences make very clear just which of the two cameras had been designed for the discerning user.

Nevertheless, the FX was a good, solid SLR. Despite a metering system better suited to emergency than to regular use, it produced good photographs and was easy to regulate. It included a very bright finder screen with a split-image focusing aid, and I would be glad to wager that if any examples are still being used today, their owners are making good photographs with them.

CANON FP

In 1964, if you wanted a Canon FX without the metering assembly, you chose a Canon FP. This model was first made in September, six months after the FX began, and it stayed in production only until March 1966.

The Canon FP was an almost exact clone of the FX, apart from its exclusion of the CdS meter eye below the rewind knob and the accompanying read-out and switching facilities. To replace that assembly it included an unnecessarily complicated film speed and load reminder dial concentric with the rewind shaft. All its other parts and features (aside from a shutter speed dial without film speed setting provision) were identical to those of the FX, with one fascinating exception.

The FX, you remember, had no provision for using Canon's bulk-load film cassettes, the type then known as Canon V, which once installed in a Canon rangefinder camera were opened for use by rotating a key in the camera baseplate. This key also locked and unlocked the camera's backdoor in a design that went back to the Canon V of 1956, and was used only for that purpose in the FX. For some reason, however, the design team responsible for the FP decided that the vestigial key was not appropriate for the new model's intended audience; the simple baseplate key arrangement was replaced by a combination of sliding switch and release button.

This assembly was arguably more expensive to make than the key had been, and required a new baseplate design as well. It was also harder to operate, especially if you had been a bulk film addict, and of Canon it demanded new assembly facilities. Despite this odd readjustment, the Canon FP is just as nice a camera to use as is the FX, and I am sure that some are in fact still out there making photographs for their happy owners.

CANON PELLIX

I know a Canon regional sales rep whose standard line is, "Every now and then Canon will make a camera that knocks your eyes out, just to show you that they can do it!" The Pellix

was quite likely the first example in this line of thinking.

Manufacture of the Canon Pellix began in February 1965 and continued for exactly a year, at which time the Pellix-QL replaced it. The non-QL Pellix is therefore something of a collector's item, since the later version had a four-year run. Nowadays no one but a collector, however, would want to have anything at all to do with either variety.

The Pellix was the first production 35mm SLR to use a non-moving reflector instead of a flapping mirror in order to direct the subject's image onto the view screen. A thin semi-reflective plastic sheet formed a pellicle (from which word the "Pellix" name was derived) to perform the reflective function. An earlier application of this principle for photographic purposes can be found in the odd three-image instantaneous color cameras, such as Curtis and Devlin, made during the 1930s, in which it was necessary to expose images on three film surfaces through three different filtrations at the same instant.

The Pellix was also the first Canon to incorporate through the lens exposure metering. It used a metering cell located at the end of a swinging arm in the manner later seen in Leica's M5 and CL cameras; unlike the ones in the Leicas, however, the Pellix's arm swung up from the bottom of the mirror well behind the pellicle when the nicely curved delayed action release was pushed leftward toward the lens housing, the anti-normal direction of movement. Thus the metering cell, which was rectangular and covered a semi-spot area also delineated in the camera's finder, was normally at rest in a location which did not intrude on the light path between lens and film. The lever that popped the meter arm upward also closed the lens to its preset aperture; therefore the meter was in effect coupled both to shutter speed and lens opening. Proper exposure was determined by altering either setting until a needle in the finder bisected a small circle.

Still basically a Canon FX in all its other important mechanical aspects, the Pellix nevertheless differed from the earlier camera in several ways. One was the use of metal shutter curtains, which were necessary in order to prevent them from being burnt out by direct rays from the sun. There was no solid mirror to protect the curtains in this novel SLR design, and Canon compensated for this drawback by returning to the sort of curtains that had already been used for nine years in their rangefinder cameras.

Another difference was inclusion of an early example of the eyepiece shutter now found on many SLR cameras. Since metering had to be done through the eyepiece and was not active at the instant of exposure, present-day readers may wonder why the eyepiece shutter was necessary; it was needed because of the pellicle. In a normal SLR, the flopping mirror blanks off the underside of the view screen at the instant of exposure, but since the Pellix had no mirror, there was no way to keep any light that might enter the camera through its eyepiece from degrading the image-forming light path, thus fogging the film during exposure. If one used the Pellix on a tripod or other stand without having his eye at the eyepiece, the eyepiece shutter was necessary in order to block out this stray source of light. In fact, owners were warned that they should use an eyecup at all times when working the camera at eye level in order to avoid traces of the same problem.

The eyepiece shutter control ring was concentric with the rewind knob. Apart from the adjustments required by its metering and mirror innovations, and a slightly different shutter speed dial, the major parts of the Pellix were identical to those of the FX: it offered the same range of shutter speeds, used the baseplate opening key instead of the FP arrangement, and had the same interior layout in its film chambers and backdoor.

Because it had no moving mirror, the Pellix should have been a very quiet camera; it was not. It sounded just as loud as the FX when it was fired. This seems largely to have been due to the noise of the aperture shut-down arm and the shutter.

It also provided a very dim view of its surroundings, especially when used indoors. The pellicle reflected roughly a third of the light passed by the lens into the finder; this was all one had in order to focus and compose his photograph. By the same token, the film was exposed by appreciably less light than one would have expected from the f-stop in use because of the amount taken away by the viewing system. Therefore, if you used an accessory exposure meter instead of the inbuilt Pellix one you inevitably underexposed your pictures unless you knew just how much light your particular pellicle intercepted. They were not entirely uniform, and of course they tended to gather dust, both degrading the image and cutting down the transmitted light.

They also tended to sag and darken with the passage of time, and fingerprints were ruinous. Dirt of any sort was next to impossible to remove without damaging the thin plastic film. As of a few years ago, and probably even right now, I suppose, Canon could still replace the pellicles in a Pellix because the same arrangement is used in the EOS RT (with a much improved pellicle material) and the exotic high-speed versions of the Canon F-1, but no sensible photographer would use a Pellix today if he had another camera at hand.

Canon tried to obviate some of the disadvantages of the shared light system by introducing a new 58mm f/1.2 normal lens with the new camera; this was some sort of landmark in lens speed for an SLR, but no solution for the problems of the Pellix. It also proved less than fully satisfactory in use, and was soon redesigned as a 55mm f/1.2.

Another specially designed lens for the Pellix system was the 38mm f/2.8 FLP, which was a normally configured wideangle design rather than the retrofocus type needed by usual SLR cameras. Since the mirror in a Pellix did not rise, more space was available for the lens' rear element to obtrude into the mirror well. The 38mm lens is an absolute trap for unwary Canon owners; it will not work with any other Canon SLR, and can easily ruin their mirrors.

The Pellix was a "gee-whiz" camera, no mistake about that, but it was also a failure in terms of photographic prowess. It sold fairly well because of its novelties, and was abandoned fairly soon by its owners because of its drawbacks. I have never met an enthusiastic Pellix user once the first glow had begun to fade.

THE CANON QL SYSTEM

"QL" stands for "Quick Load," and this is what the QL system was designed to achieve. Beginning with the two February 1966 models that we shall examine next, it was incorporated into most of the Canon SLR cameras produced during the next decade; it also appeared in many of the simpler, snapshooters' cameras.

In concept the QL system is very like the facility for self-loading that has been incorporated into the recent Canon T and EOS designs. The original version of the QL feature, however, included an extra intermediate metal leaf between the film channel and the backdoor, and was not easily adaptable to cameras whose design called for add-on motors or winders; it thus was dropped from Canon's A-type SLR designs as well as the earlier "professional" F-1 and EF types.

In use, QL was very simple and positive. The photographer inserted his film cassette in the well in the usual way after pulling up the camera's rewind knob, then placed the film leader across the shutter opening in accordance with a black and silver diagram attached to the backdoor, making sure that the end of the leader fell into place somewhere along a small red line embossed into the lower lip of the take-up end of the body. When the backdoor was slightly closed to a ninety degree stand-off from the body, the intermediate plate fell into place on top of the film; through a rectangular cut-out in the plate it was possible to verify that the film's sprocket holes had

engaged with the sprockets on the camera's film advance shaft. If they had not, the photographer adjusted the film so that sprocket and holes mated properly. Once all was correct, he closed the backdoor, locked it, and carried on.

In those days Kodak had not yet shortened the film tongue on their 35mm loads, and usually a small amount of film had to be rewound by hand into the cassette in order to keep the leader from extending beyond the red line on the camera. That was really the only drawback to the QL system, which in fact works even better with today's 35mm Kodak cassette loads than it did with those of twenty years ago.

QL was Canon's first major contribution to 35mm SLR design; other manufacturers soon began to develop similar systems to accomplish the same end. In the simpler 35mm cameras, such quick-loading arrangements were motivated as answers to the short-lived popularity of the Agfa Rapid Load cassette system, derived from their Karat loads of the 1930s, and the first Kodak Instamatic cartridge. In more complicated SLR designs, they were simply great conveniences, first and most expertly engineered by Canon.

CANON PELLIX - QL

Manufacture of the Pellix-QL began in February 1966 and continued until May 1970. Essentially the Pellix-QL was no more than a Pellix with the QL feature added; however, Canon took this opportunity to make another design improvement as well, adding a lock to the meter activation arm.

Located just beneath the arm itself, this lock was a swinging lever which was activated by being placed in the straight down position. Using it, the photographer could meter and adjust his exposure by changing the shutter speed dial setting without having to strain to keep the stop-down lever depressed at the same time. The new lock was a convenience; nevertheless, the basic Pellix design stayed the same.

The eyepiece shutter lock ring under the rewind knob was remarked in order to make its function and settings more apparent, but no further external changes were made to the new Pellix. All the observations made earlier about the original Pellix model apply equally to the QL version: very few remain in use today.

CANON FT - QL

Looked at in retrospect, it is quite easy to see that the FT-QL, first in what became the most successful line of Canon models produced in their earlier years as an SLR manufacturer, was largely a design exercise for the "professional" F-1 model introduced four years later. Design work on the F-1 had begun by the time that the first Pellix design was finalized, though the new professional camera itself did not appear until 1970.

Canon FT-QL production began concurrently with that of the Pellix-QL, February 1966, and continued until March 1972. This was Canon's first model with through the lens metering and a normal mirror movement; it incorporated shutter speeds from 1 to 1/1000 second, and unlike its successor versions used the FL-mount lens system. Metering was done at taking aperture; the lenses were closed down by the same arrangement used on the Pellixes, a reverse movement of the delayed action lever which, in turn, was shaped and locked identically to that of the Pellix-QL.

The FT-QL incorporated the same mirror lock-up control that was current on the FX, and

indeed used a number of the same parts as that earlier Canon, including the baseplate opening key. A small lever under the rewind knob, marked simply "C" with a short arrow, was the battery check for the through the lens CdS exposure meter, which was linked to the shutter speed dial and read out with the same finder display used in both Pellixes.

Why was the FT-QL a design exercise for the F-1? Two reasons: one internal, the other external. Internally, the exposure meter was designed to read a rectangular semi-spot area, darkened in the finder, by the same system later used in the F-1. Instead of being located above or at the back of the prism and looking through space at the finder screen, in the FT-QL the meter cell read off of a semi-silvered reflector incorporated within the condenser lens immediately above the screen. This, it turned out, was exactly the same system ultimately used in the F-1; the designers proved it out in this earlier Canon SLR.

The external reason was an accessory introduced for both the Pellix-QL and the FT-QL, the Canon Meter Booster, which allowed the FT-QL to read accurate exposures in light roughly thirty times dimmer than was possible with its inbuilt metering system alone. A similar booster later became one of the key accessories in the F-1 system. For the earlier cameras the booster, which fitted into the camera accessory shoe and was linked by cable to the body's battery housing at the left top end of the camera, needed to be switched in order to tell it which camera it was working with. The later F-1 unit was, of course, a fully dedicated unit that linked with the F-1 shutter control dial.

The FT-QL had two subsequent incarnations, which we shall discuss in their own historical order. One way or another FT-type cameras were in production for more than eleven years, during a considerable part of which time they formed the best-selling economic backbone of the Canon SLR line.

CANON TL - QL

We must remember, in discussing this period of Canon history, that in the later years of the 1960 decade Canon's primary focus of camera development interest seems not to have been SLRs (the Canon 7s ended the rangefinder camera line when its manufacture was stopped in 1968), nor even weekend cameras like the Canonets and Demis and Dials, but cine cameras, both Super 8 and the 16mm Scoopic. And almost exclusively, apart from the Scoopics, the market they were aiming at was the so-called "amateur" photographer. Before the F-1, Canon developed no SLR at all which was clearly dedicated first of all to the "professional" user; the first three Canonflexes were the closest that they came, and the FT-QL with its already obsolescent closed-down exposure metering system was merely a kindly nod in his direction.

The TL-QL, then, was a simplified version of the FT-QL made between December 1967 and July 1972. It lacked the FT's 1/1000 shutter speed, mirror lock-up facility, battery check button, and shutter release lock. Other than these deletions, it was exactly the same. It even used the same metering system. Clearly aimed at the amateur or entry-level SLR user, the TL-QL was a good basic picture-maker while it remained in production, and for many years thereafter.

CANON EX-EE

The first Canon SLR to combine fully automatic exposure with exchangeable lenses, the EX-EE was also aimed directly at the amateur market. Manufactured from August 1968 until March 1973, it for some reason is hard to find in decent shape two decades later; I guess that many examples were completely used up by their owners. In addition to its automatic exposure mode, it offered full manual operation.

The EX-EE has tended to be an under-rated camera among Canonphiles. In 1969, while I was Assistant Director of the School of American Research, a venerable and important archaeological and anthropological institute, we became concerned that our archaeological crew chiefs were not producing very good photographic documentation of our extensive field work project with prehistoric pueblo remains within and on the north rim of the Grand Canyon. The chiefs had not been hired as photographers, after all, but as highly skilled excavators, and the Yashica TLRs they had been issued several years earlier were beyond the capabilities of some of them, while still not exactly fitting the requirements of the work that they were doing.

At that time the EX-EE, newly available, was the only 35mm SLR with any aspirations toward quality that provided apparently dependable exposure automation. With some trepidation about its potential durability, I nevertheless suggested issuing this newly available camera to replace the Yashicas, pointing to its provision for a wideangle lens as a second asset in recording our excavation work. After considerable discussion, this was the course we followed, and I gave the crew chiefs a very short course in use of their new cameras.

My fears turned out to be groundless. Our documentation improved beyond all expectations; when I left the School in 1971 the EX-EEs were still in use, and in fact they remained so for a number of years thereafter until they finally, one by one, wore themselves out. Theirs may not have been a professionally oriented design, but it was a good one.

The EX-EE used the QL system and had a cloth focal-plane shutter speeded to 1/500. In most ways it resembled the TL-QL, but it had a lens system all its own based on exchanging the front lens cells while the rearmost ones remained fixed in the camera body, in the fashion, for example, of the early Contaflex SLRs. The aperture scale was not on the lens mount; apertures were adjusted by a ring under the rewind knob and read out on a scale visible only at the right edge of the finder screen, which also incorporated a microprism focusing aid. The manual aperture ring also served as a power "off" switch and, when set to "EE," activated the automatic exposure control.

Today, if you pick up an EX-EE without previous experience, it is hard to deduce how to proceed with lens exchange. The alternative front element assemblies were removed by unscrewing them from the focusing barrel, which remained affixed to the camera at all times and enclosed the diaphragm assembly and rearmost optical elements; but there is no indication on the camera itself that this is the way to go. The 50mm focusing scale, located on the fixed part of the mount, remains in place at all times, while a small white dot at the front of the focusing ring shows distances on the supplementary scales incorporated on each accessory lens. Similarly, the f-stop readout in the finder always begins at f/1.8, but if you set stops between this maximum and the actual largest opening, f/3.5, of the accessory lens you have mounted, you will simply be making exposures at that smaller maximum opening. A small dot on the stop scale marks the true f/3.5 position.

The normal EX-EE lens was a 50mm f/1.8 of good quality. The only accessory front lens assemblies ever made available were a 35mm f/3.5, a 95mm f/3.5, and a 125mm f/3.5, all of satisfactory quality for general use. Each of these units was marked "EX," but they were not the only lenses that Canon have made with this nomenclature. More than a decade earlier they issued a 135mm f/3.5 and a 100mm f/3.5, marked "EX" in red, in mounts for Exakta SLR cameras. Those two early "EX" lenses were almost certainly the first optics sold by Canon for use in any model of SLR.

If sometime you manage to acquire an EX-EE in operating condition, don't be afraid to make photographs with it. It's a sleeper.

CANON EX-AUTO

EX-Auto production spanned the period from March 1972 through March 1976. It was thus a companion and later a replacement for the EX-EE, which is the reason for considering it here, out of temporal order.

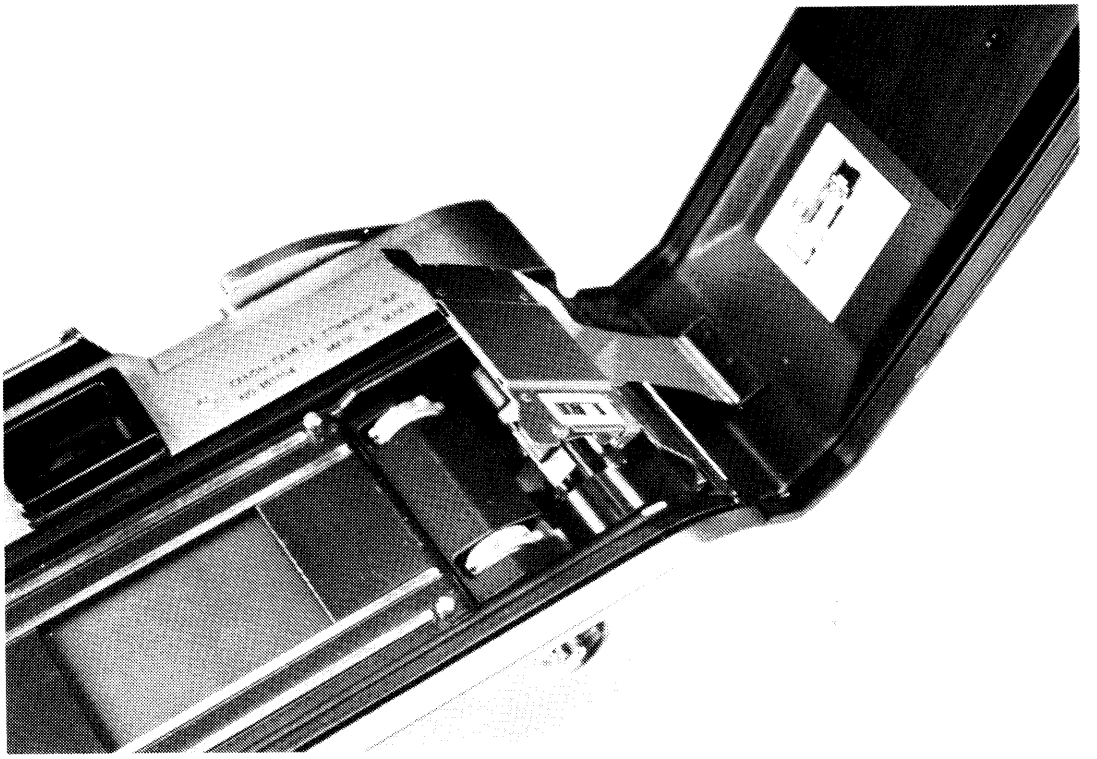
The principal difference between the two is that the EX-Auto has provision for use of Canon's CAT automatic electronic flash system, which was first employed in 1970 when Canon FD lenses appeared in conjunction with the F-1 SLR. In order to accommodate the new flash system, the EX-Auto had a new CAT lever on a ring concentric with the rear of the fixed portion of its lensmount; there was also a dedicated hot-shoe facility in its accessory shoe. Apart from these changes the EX-Auto is the same camera as the EX-EE and uses the same lenses in the same way; and since CAT automatic flash is nowadays an affair of the long-gone past, there is no reason why an EX-Auto should be preferred for use over the earlier model.

Canon made still one more variation on the EX-camera theme, but the tale behind that one will arise from our discussion of a different topic.

The Canon FX was probably the first of the really practical Canon SLRs.

The Canon FP was essentially an FX without an exposure meter.

The original model of the Canon Pellix had a pellicle mirror but no Quick-Load provision.



The Canon Quick-Load mechanism is shown here with its secondary door partly raised into the loading position. This system was a first for Canon, and is ancestral to that used in today's EOSes.

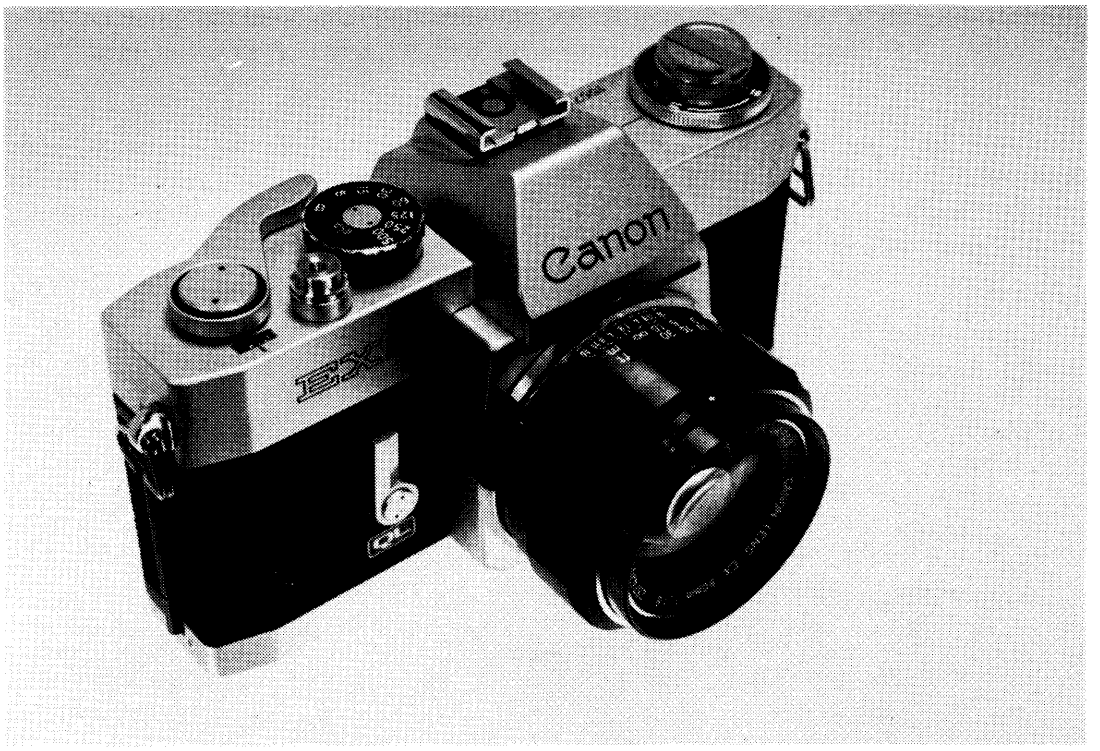
The Pellix QL is shown with its dedicated 38mm f/2.8 lens that will ruin any other Canon on which it is inadvertently mounted and operated.

Pellixes were also supplied in a black paint finish. This one sports the early FL 55mm f/1.2 high-speed lens, the second version of this optic.

The Canon FT-QL was first in the long progression of very successful FT models.

The Canon TL-QL was the first of two TL models.

Here is the unusual Canon EX-EE with all its lenses: clockwise from top right they are the 125mm f/3.5, the 95mm f/3.5, the standard 50mm f/1.8, and the 35mm f/3.5. The camera is shown with naked lensmount into which each optic, which also fitted the later EX Auto, could be inserted. Each lens is marked "EX", just as was the Exakta lens shown in Chapter One, but obviously the two styles are not exchangeable.



The Canon EX-Auto cleaned up the earlier EX-EE design.

V. THE MODERN ERA BEGINS

THE CANON FD LENSMOUNT

The Canon F-1 was announced during the summer of 1970, and became generally available early in the following year. This model was designed to convince photographers that Canon were, at last, approaching SLR camera design seriously; also, that they were capable of conceiving, developing, and producing a truly first-class SLR camera for professional use. The F-1 was a statement for the future, because no one, and surely not Canon, believed that professional photographers who largely were already fully equipped with the often esoteric equipment made by Nikon would suddenly abandon their investment and re-equip with Canon kits. The F-1 was designed to exist as an alternative system for the upcoming photographer, who perhaps was right now cutting his professional eyeteeth on a Canon FX or FT; it would be ready for him when he was ready to make a decisive move into his future career.

We shall make a short study of the train of F-1 designs later, from a retrospective point of view. What is important to us here is to note the simultaneous arrival of a new Canon SLR lensmount, their third in eleven years; the FD series of lenses; and the cameras designed to use the enhanced capabilities of these optics.

The new FD lenses retained the same breech collar and bayonet fittings that had been used in the R-mount and FL-mount design. Although some more recent arrivals are no longer compatible, all the earliest FD lenses could be mounted on the older cameras. Their additional features were simply ignored. On FL-type cameras such as the FX the new FD lenses performed exactly as well as had the earlier FL lenses, except that there was no lock-down switch on the lenses. With the stop-down metering system of the FX, FP, Pellix, and FT-QL, metering could still be done with the new lenses, however, by using the camera's own controls.

FD lenses also fitted onto the older Canonflexes, but like the FL lenses they could not produce automatic lens stop-down and reopening during the exposure sequence.

With a few exceptions, the FD lens design of 1970 has been the basis of all the non-autofocusing lenses made by Canon since 1970-71. Although information exchange between lens and camera body is entirely mechanical, the design proved more than adequate to support even the extremely extensive electronic design functions of the Canon T90.

In the FD lens series, the linkages between camera and lens are of three sorts. You will recall that in the FL-series there was only one linkage: the stop-down lever on the bottom rear face of the lens, which was activated by an arm in the bottom of the camera throat. This assembly was retained essentially unchanged in the FD-series, and formed the first order of linkage, controlling the lens aperture at the moment of exposure.

The diaphragms of the early breech-lock style of FD lenses were sprung to remain fully open except when the lever at the back of the lens was shifted; thus some form of lock had to be provided for the FD series in order to close them down when used with non-automated accessories such as early bellows and extension tubes. Originally, therefore, many of the lenses had a simple detent on their close-down lever to lock them fully closed; later, some incorporated a switch on the back face of the mount to fulfill this function. (With more recent designs a small accessory

plug is inserted to lock the coupling lever in its closed position. This plug is a nuisance, easy to lose; but of course by now most close-up accessories have been automated.)

The second sort of linkages provided by the new mount design operate to signal basic facts to the camera body, facts such as the maximum aperture of the lens in use. Maximum aperture itself is signaled by a small pin that operates against a push-pull stud in the camera throat. The length of the pin varies with each lens; each possible maximum aperture has its own assigned pin length, with large apertures being the shortest. The farther backward the stud in the camera's throat is moved by the pin, the smaller is the maximum aperture of the lens.

A second stud, sometimes seen in later designs as a pair, is another facet of this static information exchange. It is called the "reserved pin" in Canon literature. Its purpose, now, is forever reserved. There have been various unofficial explanations for this pin or set of pins, including the possibility that it was designed to signal minimum apertures. It remains, an anachronistic example of the forethought of Canon's engineering staff, much like the appendix that we hope will never burst in our bellies.

The Canon FD lensmount for the first time in a Canon SLR allowed full information exchange from lens to camera.

The third set of linkages provides an active information exchange between camera and lens, varying with conditions of use. Primarily this set of geartrains provides information to the camera about the actual aperture set on the lens by the photographer; in later cameras, it also signals whether the lens is set for automatic diaphragm exposure operation, which covers the program and shutter speed preferred modes of camera control, or for manual control as seen in aperture preferred auto exposure and fully manual exposure modes.

In order to take full advantage of this last class of linkage, Canon FD lenses from the beginning have included a specially marked automatic exposure setting on their diaphragm rings. At first this mark was a green circle beyond the minimum aperture on the setting ring, and no lock was incorporated into the ring to make sure that it stayed in place at the automatic setting. Within a very few years, however, a push-button controlled lock was added, and the automatic setting marking was changed to what became, for Canon addicts, a very familiar "A".

In Canon's more recent automatic-exposure SLRs, this third linkage obviously took on an expanded role: it actually operated in the reverse mode of its original train movement in order to set the working lens aperture at the opening specified by the camera's internal metering system. In order to fulfill this function, all FD lenses had to have been, from their beginning, closely standardized insofar as the sweep area of the lug on the lens is concerned so that a similar position of the lug on every lens, no matter what its type, corresponds to an identical f-stop value. That a system designed in the later 1960s was still adequate to handle 1988's degree of exposure automation is a sign of the foresight exhibited by the Canon design team that developed the F-1 camera and its new system of lenses.

One further new detail of the FD lenses is a tiny pin at about the four o'clock position on the mount when viewed from the rear; it is just outboard of the rear lens protrusion, in the back mounting flange of the lens assembly. This pin extends when the diaphragm scale of the lens is set to its automatic position. On Canons designed to provide automatic exposure in a shutter-speed preferred mode, a tiny cut-out hole was incorporated into their lens flanges opposite the location of this pin in order to allow their lenses to be set for automatic diaphragm operation. On other Canons, the lack of this hole made it impossible for an FD lens to be set on automatic.

But while the new FD lensmount was immediately applicable to some of the features provided by the F-1 and its accessories, its expanded system of linkages was not initially useful to the owners of lesser Canon SLRs. This matter was quickly rectified at Christmastime of 1970, however, with the introduction of a refurbished version of what had already become a classic Canon favorite.

CANON FTb

FTb production began in December 1970, although sales did not start officially until March 1971. It was carried as a current model until December 1973.

Its principal specifications were identical to those of the already popular FT-QL, including retention of the Quick-Load film facility. Shutter speeds ranged from 1 to 1/1000. Internally coupled exposure metering was standard, using a CdS cell that was powered by a battery installed at the upper rewind end of the camera body. All the top deck hardware except the shutter speed dial was identical to that of the earlier camera, as was the lower front location of the synch terminal and the baseplate location of the rewind button.

Externally, the only immediately noticeable differences were minor, the most obvious being the absence of a mirror lock-up lever above the synch terminal. This function was transferred to the delayed action lever on the opposite side of the lensmount: the delayed action lever's small

auxiliary switch now incorporated three positions instead of two. The white dot indicated normal function when the lever was pressed toward the lens, standard depth-of-field preview. The red "L" position allowed the lens to be locked at its planned exposure aperture and was necessary for stopped-down metering of the sort supported by the previous FL lenses, which were of course still readily available at the time. Many were already owned by Canon users, and a new model of the camera obviously needed to allow for their use. The third position, an orange "M", was the relocated mirror lock-up.

The next most obvious external difference was probably the newly provided "Off" location on the meter switch which remained under the rewind knob. On the FT-QL this switch had simply allowed battery checking, with a small arrow and a "C" to show how the lever should be moved. On the FTb the same switch had three positions. "On" and "Off" incorporated detented locks; "C" for "Check" was located at the rear against spring-loaded pressure. The "Off" position included a "blitz" symbol indicating that it was the location for the switch during electronic flash use. Close observers would see that the "X" position of the FT-QL's shutter dial was no longer to be found; instead the FTb's "60" speed was marked in orange to indicate the strobe synch speed. On the FTb, the "DIN" exposure value scale of the FT-QL was also removed, making the shutter dial much more readable.

A flash contact was newly incorporated in the camera's accessory shoe to provide internal synch with cordless units. The maker's name, previously found on the back of the top cover plate, was relocated to the baseplate, and the serial number which had accompanied it was now found on the top cover just below the "C" marking of the battery switch. A lower-case "b" appeared on front of the camera following the "FT" model logo.

The Canon FTb was second in the line of FT-models, the first to accept FD-mount lenses.

Canon's TLb was their TL model for use with FD lenses.

The Canon FTbN had a new wind lever tip and other improvements: it was the last and best of the FTs.

Obviously the most important difference between the old and new FT cameras was the new metering facility allowed by the use of the FD lensmount. For the first time (apart from the recently introduced professional F-1 camera), Canon users had fully coupled exposure metering which did not require that the lens be closed to shooting aperture for measurement. The camera's lensmount included coupling arms to trace the maximum aperture pin and the preset aperture levers on all the new FD lenses, as well as the standard shut-down lever.

Readout in the finder was somewhat different, but still depended on centering a needle and a circular marking. The style was similar to that of the F-1. Neither shutter speed nor F-stop scales were included. A small rectangle in the readout area marked the battery "okay" position, and a decal on the back of the camera reminded the user that for a proper battery check the shutter speed should be set at "1000" and the ASA index in the speed dial at "100".

The FTb became an immensely popular camera for users whose requirements were intermediate between simple snapshooting and fully professional use. Probably much more than the more capable F-1 or even the EF which came along two and a half years later, the FTb was responsible for a shift in public attitude about Canon, from a producer of strictly "me-too" SLR cameras toward being a company that was seriously engaging itself in trying to improve the state of their design.

CANON TLb

After introducing the new FD lenses, the F-1 professionally oriented camera, and the revised FTb, Canon rested on their laurels for a year before starting to update the rest of their SLR camera line. The TLb, an update of the TL-QL, was the next model introduced; its manufacture began early in 1972, and the camera was introduced in March of that year.

Apart from using the new FD lenses, the TLb had only a few notable modifications from its predecessor model. Like the FTb, it incorporated metering at maximum aperture, but dropped the finder pattern of the earlier TL as well as the FTb. Instead of reading a central rectangular area, the TLb's meter read the entire viewscreen with, at most, only a very minor degree of center-weighting. Lenses could still be closed for preview at their taking aperture by pressing the delayed action lever toward the lens, so that metering was still possible with FL lenses, but no longer was there a lock on the lever to keep these lenses in their stopped-down position.

The TLb's shutter speed dial was also simplified in the same manner as that of the FTb. Speeds were still Bulb plus 1 to 1/500, as on the TL-QL, but the DIN window was removed and the "X" mark for strobe synch deleted in favor of an orange-marked "60" on the normal speed dial. The shape of the dial was also revised, and the maker's name and serial number were relocated as had been the case with the FTb.

The bevel below the rewind knob, chrome on the TL-QL, turned up as black on the TLb. Perhaps more importantly, the TL-QL's Quick-Load feature was removed on its replacement model, the second significant difference. The TLb was clearly intended by Canon to be a basic version of a through-the-lens metering SLR camera, the entry level Canon for beginning SLR users. This it continued to be until the end of its sales period in 1977.

CANON FTbN

This was the third and final version of the camera that had started life as the FT-QL back

in February 1966. FTbN series production began in June 1973; the camera was introduced a month later, in July, and continued to be readily available even after production stopped in December 1977, almost twelve years after the FT-QL had begun the sequence.

There were three external changes from the FTb on the new model, which was still marked simply "FTb" so that one has to know the differences in order to identify the two models correctly. Presumably this non-change made it easier for dealers to sell the older version FTbs that remained on their shelves.

The wind lever of the FTbN was reshaped and now incorporated a black plastic tip, changes which slightly improved its feel of operation. The large black-and-chrome delayed action lever was replaced by a smaller black-and-white one, since by 1973 Canon's old FL lenses were three years outdated and the lens stop-down facility of the lever was no longer important as an exposure metering function. Finally, a black plastic spring-loaded cover was added to the PC flash outlet on the front face of the camera body, a neat improvement that might still be wished for today on those cameras that retain PC outlets.

Internally the FTbN retained the Quick-Loading facility of its predecessors. It was the last Canon SLR with this feature. Newly added, however, was a plastic disc with the shutter speeds entered on it; this disc appeared in the lower left corner of the viewfinder, allowing the user to tell what speed he had set even when the camera was at eye level. There was still no F-stop indication in the finder, whose metering facility was identical to that of the FTb. The area covered by the meter, which you will remember was, on the original FT-QL model, a precursor of the method used by the F-1, was delineated by a slightly darker rectangle within the outer limits of the finder screen. The only focusing aid on the screen remained as it had been in the beginning: a microprism circle in the center.

These changes in the FTbN made it an even better camera for its devotees, and it continued to make new Canon enthusiasts for the next four or five years. Professionals, too, who had begun to embrace the Canon SLR system in the three years since introduction of the F-1, were ready to adopt the FTbN as a less expensive adjunct to their system for use when the features of the F-1 were not all necessary, or when conditions precluded use of the more expensive camera body. Even today there are many FTbN enthusiasts!

THE BELL & HOWELL SLRs: END OF THE OLD ERA

Earlier we mentioned the sales agreement entered into by Canon and Bell & Howell in the early 1960s. This lasted until 1972, when Canon decided that the time had come to reestablish a proprietary subsidiary in the United States that would handle all aspects of sales, service, and marketing. The first attempt at a Canon USA distributorship had failed almost fifteen years earlier.

In order to square matters with Bell & Howell, probably because the original agreement or its extension had not completely expired, Canon made two SLR cameras that were sold under the Bell & Howell name. "Canon" did not appear anywhere on the camera bodies, although the lens markings did include the maker's name. In a sense, the story of these two camera models was not unlike that of the Mamiya-Osawa-Canon Prismat and Canonex.

The first camera was the Bell & Howell Auto 35/Reflex, so marked on its chrome top plate. Over the Bell & Howell name it sported an embossed logo of two interlocking chrome and blue squares. Other than the differences in identification and a slightly different lettering style on its serial numbers, the Auto 35/Reflex is identical to the Canon EX-EE, whose manufacture was discontinued, as we saw earlier, in March 1973, somewhere between the time that the Bell &

Howell cameras first became available toward the end of 1972 and the time that they were sold out.

One assumes that the much of the final year of EX-EE manufacture was devoted to making the Auto 35/Reflex, because Canon's improved model, the EX-Auto, had been in production since March 1972. All three models used the same set of four lenses, and so far as I have been able to determine there were no special markings on the Auto 35/Reflex lenses sold by Bell & Howell that might differentiate them from the others. A collector who lacks the Bell & Howell version of this model is missing an interesting variation, but if he has the EX-EE he has a representative of the type itself.

Despite what you may have read in the literature of more than one used camera dealer, the same is not true for the other Bell & Howell camera. The FD35 is not exactly a Canon TLb under another name; they have several cosmetic differences apart from the Bell & Howell name, the interlocking square symbol, and the new model identification. The FD35 also has at least one added feature.

Apart from markings, the most obvious cosmetic difference between the two is that the FD35's shutter speed dial is chrome rather than black. The bevel under its rewind knob is chrome, like that of the TL-QL, not the black of the TLb. Both cameras have the same shutter speed range, 1 to 1/500 plus Bulb, and the same metering mechanism and finder screens.

But the Bell & Howell FD35 has a hot shoe outlet in its accessory shoe, as well as the same PC outlet as the TLb on the front of the body. The TLb has no hot shoe, only the PC outlet. Thus, entirely apart from the cosmetic and printing differences, the Bell & Howell version is a somewhat different camera from the Canon version, and the conscientious collector will want to have examples of both on his shelves.

The FD35 was sold by Bell & Howell in conjunction with specially marked lenses in which the B&H initials were coupled with the Canon name, separated by a slash: "B&H/Canon." The lenses so marked, so far as I now recall, were the 24mm f/2.8, the 35mm f/2.0, the 50mm f/1.8 and f/1.4, the 135mm f/2.5, and the 200mm f/4.0: a total of six. Other than their markings and special Bell & Howell lenscaps, these were standard Canon FD lenses, but the devoted collector should have them on hand too.

CANON EF

The Canon EF, a black beauty, a classic, a strange model in Canon's history, used silicon technology in its metering system. In fact, however, much of the rest of its mechanical design apart from the shutter harked back to the F-1 and in some respects to the even older Canon FT.

Manufacture of the Canon EF actually began in July 1973, the same month that the similarly classic Canon FTbN was first marketed, although the EF's marketplace introduction was delayed until November of that year.

When it came out, the EF indeed looked like the first effort at a new design departure. As will become apparent, however, Canon never really followed it up. It is, actually, an historical orphan. And perhaps this is one reason that when an EF in superior condition is offered for sale today, the price is almost always well over $200 even without a lens. But there are more reasons, too, and that's why the EF is a classic.

Let's look at the EF itself. It was a larger camera than the contemporary Canon TLb and FTbN, and it felt in use like a clone of the F-1, introduced three years earlier, so far as size and weight were concerned. Its control layout was unusual for Canon: the shutter speed dial, concentric

with the shutter release and the hub of the wind lever, was nicely serrated and extended forward about three millimeters in front of the top deck so that shutter speeds could easily be adjusted with the camera at eye level.

An "On-Off" switch on the back of the camera below the wind lever unlocked both the shutter release and the wind lever, which then sprang backward a few degrees to a stand-off position that revealed a red dot to tell the user that the camera was ready to go. In the hub of the switch a small chrome button disengaged the film wind coupling, when depressed, so that the shutter could be wound independently in order to make multiple exposures on a single frame.

The delayed action lever on the front face of the camera was similar in appearance and function to that of the FTbN, but the complete assembly incorporated a small button above the lever in order to unlock it for setting the delayed action. The PC outlet, in this case at the upper rewind end of the camera, included a spring-loaded cover along the line of the larger one that had been used on the FTbN design.

Two chrome battery covers were set into the baseplate near the central tripod socket: two 1.3 volt batteries were required in order to power the metering system and the slow speeds. The fast speeds required no power.

In this respect, the EF scored an important debut for its makers: it was the first Canon SLR to incorporate electronic shutter timing. The electric timing was however applied only to the speeds between one and thirty seconds; speeds of 1/2 to 1/1000 were still mechanically governed.

The shutter itself was a metal-bladed vertical-travel focal plane unit, apparently an in-house design or at least modification, with a strobe synch speed of 1/125. This, too, was a "first" in the Canon arsenal. A valuable facility built into its advance mechanism was that the camera's shutter did not need to be released during loading; the wind lever ran uninterruptedly between the film counter's "S" and "1" settings.

A switch on the back with "Normal" and "blitz" positions provided for automatic flash exposures with the Canon CAT system, which worked awkwardly but perhaps well enough for some photographers. More helpfully, the EF's hot shoe included two dedicated contacts to facilitate auto flash exposure with Canon speedlights of the time. ASA film speeds were entered on a dial located below the rewind knob, and a small chrome button next to the knob served to lock an automatically determined exposure into the camera's memory, as might be necessary with back-lit or spot-lit subjects.

For the EF was Canon's first automatic exposure SLR with fully exchangeable lenses. (The Canonex, EX-EE, EX-Auto, and Bell & Howell Auto 35 had also had exposure automation, but with very limited optical felicity.) Using a recently developed silicon cell, the EF could read light levels as low as -2 EV with 100 ASA film and an f/1.4 normal lens.

Such a low level was an unheard-of facility before the EF appeared, and a very important "first" for Canon. But the silicon technology used by Canon in the EF metering system was radically new in 1973. The so-called "silicon blue" cells now almost universally seen in SLR metering systems had not yet been fully worked out, and the EF's system represented a relatively early phase of development. Nonetheless, it permitted this exceptionally low threshold of measurable illumination which, Canon said, also resulted from some sort of proprietary "amplification" circuitry.

Exposure automation was shutter-speed preferred; the FD lens was put at its automatic setting, and the automatic exposure system would then close it to a stop that was supposed to

match whatever shutter speed the user had chosen. Both the shutter speed and the F-stop in use could be read in the eyepiece. Shutter speeds were spread out along a scale across the bottom of the frame; the stops were in a scaled window along its right edge where the metering needle could intersect them. The scale included stops from f/1.2 to f/22, and the shutter speeds ran from 30 seconds to 1/1000. The battery check LED blinked when speeds slower than one second were running.

The EF had a somewhat centrally weighted metering system which was not similar to that of the F-1 and FTb; it in fact anticipated the lower-central area emphasis later incorporated into the A-series cameras. This works nicely for outdoor photographs made with the horizontal format, but is less happily coupled with the photographer's frequent need to expose vertically. I have always considered it an "ugly" solution to automatic exposure metering.

Such criticisms aside, though, the EF feels magnificent in the hands of the photographer, and for its time probably was a more user-friendly SLR design than had been produced elsewhere by anyone.

Avid collectors know that there are two versions of the EF. I prefer the earlier one, whose finder had a plain microprism circle in its center. The later version has a split-image ring within the microprism; its finder is busier than I like. Whichever your own preference may be, however, I would be very surprised to hear that you dislike the basic layout of the Canon EF.

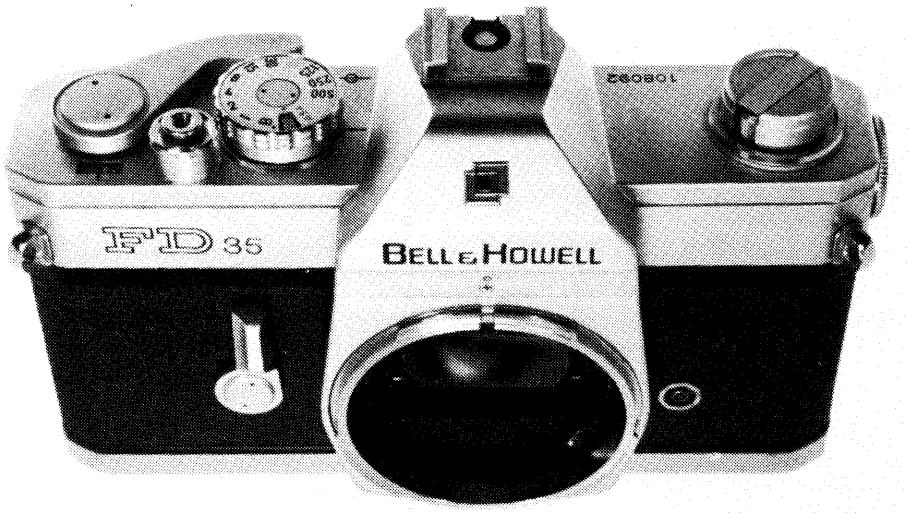
Its original impact, however, was effectively damped three years later by the advent of the AE-1. In the intervening period, Canon's designers had rethought the whole concept of camera electronics. In the EF, electronics had been applied on top of an older, conglomerate, basically mechanical design; but in the A-series cameras that followed the electronic technology was much more closely integrated into the complete camera concept from the very outset. Thus the EF, instead of being a new departure for Canon, actually turned out to be a sort of "summary with signposts" that suggested the future rather than leading into it.

Nevertheless, the EF remained in production for exactly four years, and is still highly prized by many photographer-users. It was an exceptionally comfortable and capable camera then, and it still is.

CANON TX

This was a supplement to the TLb, which for some reason remained in production for two years after the TX was introduced in early 1975. The TX featured a hot shoe, like the Bell & Howell FD35 that had been made two years earlier, and shutter speeds to 1/500; but it had the black dial and rewind trim ring of the TLb. The ideal entry-level camera according to most theories in the early 1970s was this sort of stripped-down SLR, and the TX managed to last for three years or so before it was discontinued.

The Bell & Howell Auto 35/Reflex was made by Canon in the spirit of the EX-Auto, but only its lenses said "Canon".



The Bell & Howell FD35 was the other Canon camera made for their US importer without a "Canon" identifying logo.

Canon's EF was their first truly "gee-whiz" model, the largely unsuccessful Pellix excepted, and has been much liked for many years by its band of enthusiastic owners.

The Canon TX was very similar to the Bell & Howell FD35.

VI. THE ELECTRONIC AGE

We have by now arrived at a point beyond which Canon's sequence of SLR cameras is recent enough so that the models are well known to most of us. Therefore, in discussing most of the cameras that follow, I shall simply point out a few major facts about each. References to them all are readily available in recent literature from the manufacturer, importers, guidebook publishers, and elsewhere.

CANON AE-1

Here is a truly landmark camera design of the 1970s, or indeed any era. A shutter-speed preferred automatic camera with an additional manual mode, it was introduced in April 1976 and remained available until 1984. In its first ten months of manufacture, several hundred thousand more AE-1s were sold than the entire total of Canon rangefinder cameras with exchangeable lenses that had been made between 1935, their inception, and 1968, their demise: a million AE-1 cameras.

Because the AE-1, and almost all the Canons we shall deal with from here on, are familiar to contemporary readers, let it simply be said of the AE-1 that it was the first fully electronically controlled 35mm SLR camera to have been made anywhere by anyone. It was also a pioneer in the unashamed use of plastic body parts. Both these firsts are greatly to Canon's credit.

Even more so, and much less often remarked, is the fact that with the AE-1 Canon finally hit upon how a real entry-level SLR camera should be configured. The TX, simple in features and demanding some skill in order to make good photographs, was in fact not at all what the beginning SLR user needed. He needed automation to carry him over the hump, and then the possibility of a considerably expanded scope after he got going. Canon realized this important distinction, and the AE-1 was their answer.

After all, it is the experienced photographer who knows all about the application of the rules of exposure to subject matter, not the beginner. The AE-1 did the whole job: it read the exposure and applied it to the camera's mechanism automatically, and at a price (unlike the EF and other auto exposure models from other makers) that scared away no neophytes. Availability of a nifty light-weight winder (another Canon first) did not hurt a bit. Plastic, electronic control, and high production volume combined to make the AE-1 a winner beyond any successes previously scored by any manufacturer.

CANON AT-1

This was the basic A-model camera, in concept a modernized TX with electronic control, plastic parts, and no exposure automation. Introduced at the end of 1976, it stayed in production until late 1982.

One assumes that the AT-1 was designed in order to cover the beginners' base in case Canon had guessed wrong about the AE-1's future. In fact, it became a very useful system back-up camera for more advanced photographers, featuring shutter speeds from two seconds to 1/1000, auto flash exposure with dedicated Canon units as its only automatic mode, through-the-lens

exposure metering, and the capability to mount an accessory winder. It was an honest, inexpensive, and very useful camera.

Canon's AE-1 was their first A-camera model, their second "gee-whiz" camera, and the model that really propelled Canon to the forefront among SLR camera manufacturers.

The Canon AT-1 was the no-frills A-camera.

CANON A-1

The next Canon to appear, the A-1, belongs on any highlight list of SLR camera designs. It set the design standards for 35mm SLR cameras for the next decade, and was arguably foremost among the three most influential designs of the 1970s: Canon's A-1 and earlier AE-1, and the Olympus OM-1.

The A-1 introduced the now all but universally used program exposure mode to 35mm SLR photography. Indeed, with its total of six different exposure modes in all, the A-1 blazed a path that practically every manufacturer has since followed: this Canon pathway has become a world highway. A-1 series production began about March 1978 and ended during the winter of 1986-87. Brand new examples were still available for several years thereafter; one belongs in any respectable collection devoted to miniature camera design.

The Canon A-1 had more "firsts" than can easily be counted, and is a classic by anyone's standards, as well as the finest possible example of "Canon Baroque" exterior design.

Thus the A-1 deserves a closer look, and even a brief examination of key elements among the system with which it was designed to operate. For, looking back at the 1970s decade, it seems unlikely given today's economic imperatives that we shall ever again see a time with such a proliferation of affordable, versatile SLR cameras from many makers. And most of them resulted from the impetus given the industry by Canon's two trend-setting A-model designs, and Olympus's remarkable miniaturizations in the OM-series.

The Canon A-1 appeared on the American scene at the PMA show in March 1978, touted as an incredible miracle by its makers and as a wonder by the photographic press. It provided six exposure modes (it was "hexaphotocybernetic," some of you will recall): shutter speed preferred auto, aperture preferred auto, flash auto (but not through the lens), manually preset aperture preferred auto, programmed auto, and -- fortunately -- full manual control too. In the finder the

shutter speed to be used was readable in real numbers instead of by following a magic, and often nearly invisible, wand; so was the aperture that the camera wanted you to use.

Indeed, the camera had so many firsts that enumeration becomes difficult. It may even be that the A-1 was first with an attachable handgrip as a standard part of the basic kit.

When you pick it up, the A-1 is likely to make an immediate impression because of its obviously quirky set of controls. They take a little time to adjust to. The shutter speed settings are combined with a secondary f-stop scale on a single dial; to operate it, you must first slide down a small door on the top front face of the body. Only one scale comes up at a time: selection is made by flipping a lever that surrounds the shutter release between "Tv", which displays the shutter speeds, and "Av", which gives you diaphragm control.

The "Av" scale is useful only for aperture preferred auto exposures, in which mode the lens diaphragm scale must be set at the locked "A" position and the chosen shooting aperture selected on the "Av" readout. The "Tv" scale is used in all other modes except flash automation with a dedicated unit, in which mode the 1/60 flash synch speed is selected automatically when the flash unit is fully recharged even if a faster speed has been set on the dial.

Basically, the "Tv" scale is a standard shutter speed dial with one additional index, "P" for the programmed automation mode, that appears immediately beyond the fastest 1/1000 setting. In program mode, the "Tv" dial is set at "P" and the scale on the lens is set at "A". The A-1 then does everything on its own.

Once the drill has been learned, the rest is easy. When the sliding door is open, the serrated tip of the main control knob extends slightly forward of the top cover plate; you can easily change shutter speeds at eye level, reading the new shutter speed value in the finder. If you are operating with fully manual exposures you may find that the finder readout is distracting, since, while it tells you the true shutter speed in use, the f-stop you see is the one that the camera's metering system suggests rather than the one you have chosen. If this idiosyncrasy annoys you, the entire readout can be turned off with the little lever just left of the front part of the prism housing; cover the white dot with the lever, and the readout disappears.

To enter the ASA/ISO speed of your film, push in the tiny chrome tab at the edge of the film speed setting ring and move the index line on the rim until it indicates the proper speed. This tiny tab is a nuisance to operate, a design shortcoming. Exposure compensation can be applied, in one-third stop increments, through the range from two stops of underexposure (1/4 on the scale) to two stops of overexposure (4 on the scale), by pushing in the little button just forward of the film plane index (the circle bisected by a straight line) and turning the whole film speed setting ring until the necessary adjustment value lines up with the index just forward of the button.

Two tabs are set below and concentric with the axle of the wind lever. The front open-face one intersects any one of four settings. "A" is for "Active", the camera's operating position. The red "L" is for "Lock": at this setting the camera is turned off. The numbers "2" and "10" are the two delayed action settings, two and ten seconds respectively. The A-1 was the first camera after the Exakta to provide a short delayed action speed, but unfortunately neither speed is self-zeroing.

The second tab under the wind lever, facing rearward, allows you to make multiple exposures on a single frame. After the first exposure, move the lever leftward until it locks, exposing a small red dot. Then wind the lever as usual. The shutter will be recharged, but the film will not advance. This lever does self-zero; if you plan on several exposures on a single frame, the lever must be operated after each one except the last in the sequence.

The A-1 needs battery power to operate; there are no mechanical speeds. This was seen as a drawback when it first appeared, but now that we are all used to carrying spare batteries with us everywhere we go, it no longer really is. The battery is housed in a well on the front face under the main control wheel. To reach it you must first remove the small handgrip. The well is keyed for proper placement of the standard 6v battery; positive end goes up.

The small tab next to the finder window operates a viewing shutter that should be closed if you are making automatic exposures without looking through the finder, as for example when using the delayed action feature in order to get yourself into the photograph. Otherwise light entering the finder window will affect the exposure meter reading adversely. For the same reason, you should use an eyecup with the A-1, especially when working in bright light. An eyecup was provided as standard equipment with each new camera, but it does not fit over the correction lenses made by Canon for the A-1.

There are three controls on the right side of the lensmount housing as you look at it from the front. The lowest is a sliding preview key that allows you to examine the image at taking aperture; lift its hinged end and push it toward the lens until it locks in order to close the diaphragm to its preset opening. To cancel this action, press the little button that has been exposed under the end of the key's track by folding the hinged end of the lever back to its original flat configuration. The lever will then snap outward. This feature can only be used when a numerical aperture has been set on the lens; it will not work properly if the "A" position has been chosen. Lenses should never be mounted to the A-1 while its preview lever is engaged.

The center control on the housing is a button surrounded by a chrome ring. It activates an exposure preview reading in the finder, but its function is duplicated by slight pressure on the shutter release. The top control, another black button but without a surround, is an exposure lock. You can retain a specially selected meter reading while you recompose your photograph by keeping this button depressed.

A secondary PC outlet for non-dedicated flash use is on the upper front face of the camera below the rewind knob, covered by a pull-out plug unless this tiny item has been lost. But the main flash contact is in the accessory shoe; this is the only fitting that includes the two extra connections needed for use with dedicated units.

The A-1 was introduced while the older FD lenses with rotating breech locks were still current; the new FD lenses started to appear about six months later. It accepted all Canon lenses of either FD type, as well as all contemporary lensmount accessories: bellows units, extension tubes, microscope adapters, and so on. It also handled most FL lenses and even some of the R ones, but using these lenses seriously restricted one's ability to take advantage of the auto exposure modes.

Other accessories completed the A-1 camera system. The motor drive MA allowed up to four frames a second with its NiCad battery pack; thus configured the camera was still a small, light-weight unit. With the 12-battery AA cell pack it approached five frames a second at the expense of added weight and bulk. Two winders which work with the A-series in general also fitted the A-1: the original Power Winder A is a vertically configured unit, while the Power Winder A2 is flatter in shape, quieter, and includes a plug for remote release. Both operate at about two frames per second maximum speed.

At least eight dedicated flash units from Canon were available during the lifetime of the A-1, for automatic exposures in the synchronized mode. Independent makers like Vivitar and SunPack also chipped in with strobes that were, or could be, dedicated to the A-camera system. Independently supplied winders appeared, too, largely made in Hong Kong; one version allowed

automatic sequence photography with timed intervals of 5, 15, or 30 seconds between exposures.

So far as I can recall, the Pentax 6x7 was the first generally available production camera model to use electronic timing to control its shutter speeds. The first Canon to have this feature was the EF, but only its slow speed range was so operated. The AE-1 was the first Canon with a completely electronically timed shutter; the A-1 was the second. Unlike many competitors, however, Canon stuck with their own traditional cloth focal plane shutter design instead of adopting a new vertical-bladed metal one.

The Canon A-1 with motor drive and NiCad power pack mounted; below are the AA-battery power pack for the motor drive (left), and the smaller Canon winder for the A-1 and A-series cameras in general.

Why not switch? In 1988 I had occasion to check the shutter speeds of A-1 number 1266164. This is an example from the first two years' production; A-1 serials began near 100,001. (Judging from the highest serials that showed up on still unsold A-1s, about 3.5 million of them were built.) Every speed on this more than ten-year-old A-1 was still within a very few milli-milliseconds of its nominal value, none more than one percent off, and the repeatability at every

speed was within .0001 second. This result astounded me; it truly demonstrates just how well Canon had mastered the job of constructing the mechanically operated cloth focal plane shutter and merging it with their newly designed electronic timing controls.

All in all, the A-1 represented in 1978, and still did at the time that its production was discontinued, a very formidable base upon which to build a 35mm SLR outfit. It did have drawbacks, however. The two that most bothered me were the inconvenience of changing focusing screens, a process that must be carried out by a repairman or a very careful owner and cannot be accomplished with any reasonable quickness in the field; and the fact that the area covered by the exposure meter is essentially the full finder view with very little extra center-weighting. There is no "spot-reading" mode, no optionally available narrow-angle area of meter coverage.

Nevertheless, professional photographers using the Canon F-1 system soon found that the A-1 was an almost ideal back-up camera. Despite early doubts by some commentators, it proved able to withstand the rigors of punishing use even better than some widely-touted "professional" cameras from other renowned manufacturers. This fact led to some interesting attempts to modify the A-1 for special purposes; for example, one such alteration by Professional Camera Repair in New York made possible an automatically bracketed sequence of exposures by installing new circuitry in the area where the A-1's exposure preview button is normally located.

When it appeared nearly ten years later, the Canon T90 was the updated version of the A-1: a camera of immense capabilities which was still rugged enough to withstand most professional applications. But there were still some reasons for folk to prefer staying with the A-1. One was the fact that it could be operated without a motor for more silence on the job. Without its motor attached the A-1 is notably smaller and lighter than is the T90. Another was the fact that it did not overwhelm you with options: the A-1 had plenty of them, but none were frills. Nor did it depend on a semi-permanent lithium battery for some memory functions. Yet another attraction, which was specious but nevertheless compelling to a few die-hards, was the fact that the A-1 is essentially a metal rather than a plastic-bodied machine.

Add all its versatile working qualities to its landmark design and you cannot escape the conclusion that if you had to spend a decade on a deserted island and wanted to document your isolation, the Canon A-1 might well, even ten years later, still have been the first camera you would have chosen to have washed ashore with you.

CANON AV-1

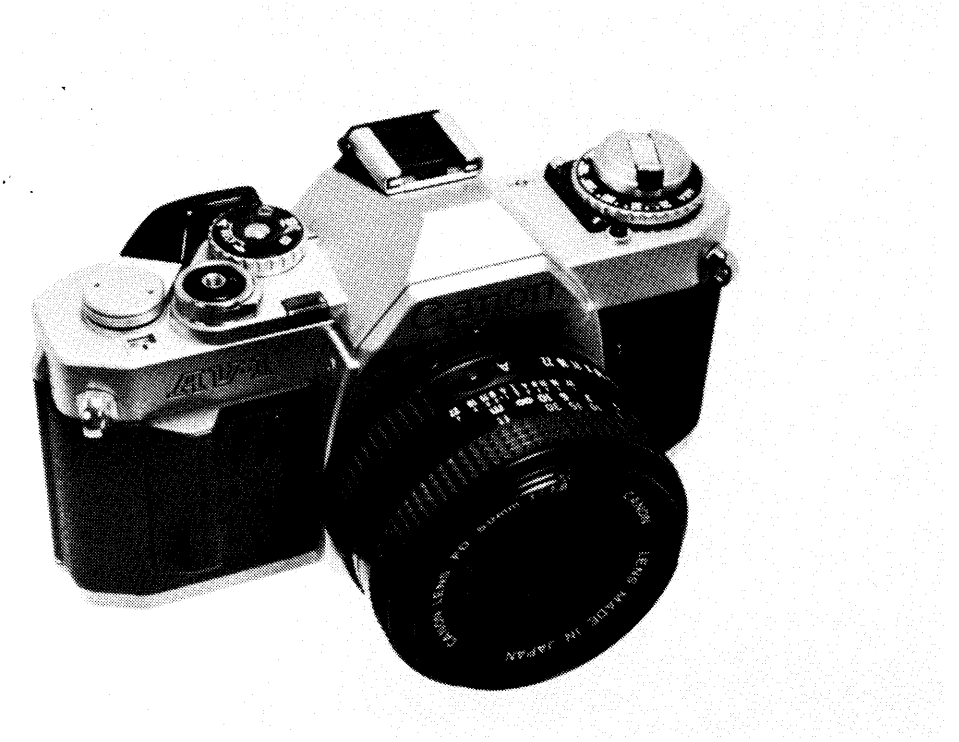
The Canon AV-1 was introduced in March 1979 and made until the autumn of 1983. It was a simple fully automatic SLR of the general A-type; its only manually settable speeds were 1/60 (for flash) and Bulb. It thus depended on aperture-preferred automation, an unusual method for Canon to adopt. The AV-1 was a fine early example of what today is being called a "bridge" camera, designed to introduce the unsophisticated user to somewhat broader photographic applications than he had yet encountered.

CANON AE-1 PROGRAM

The AE-1 Program added to the immensely successful AE-1 design the program capability of the later A-1. It also added the capability of user-exchanged focusing screens, just about the only major deficiency in the Canon A-1 design. The AE-1 Program was introduced in the spring of 1981 and made until the winter of 1986-87; during its first three years it complemented rather than replaced the AE-1 itself.

CANON AL-1

The last of the A-models was the AL-1, first generally marketed early in 1982 although manufacture began late the previous year. The AL-1 featured a new focus-assist system in which a signal in the finder indicated when the image on the viewing screen was judged by the system to be adequately sharp. This facility was in fact a close ancestor of the arrangement later used in the T-80 for full autofocus, but it was not accurate enough for dependable use with lenses of large aperture when they were set close to their maximum openings. Other features of the AL-1, whose production ended early in 1985, were very like those of the AT-1, and despite its not always sufficiently helpful focus confirmation system the AL-1 was a very useful camera.



The Canon AV-1 featured only fully automatic exposure control; manual control was essentially impossible.

The Canon AE-1 Program was available in black or chrome, and improved on the performance and flexibility of the earlier AE-1.

The Canon AL-1 featured a focus confirmation system that was displayed in the finder in much the same way as that later used on the EOSes. Here a black-bodied AL-1 is shown with Canon's first autofocus lens, the 35-70mm f/4 zoom that incorporated its own sensor to control the focusing process, and its own batteries and motor to carry it out. With the AL-1's focus confirmation, this combination was functionally somewhat ahead of its time.

VII. THE PROFESSIONAL CAMERAS

THE CANON F-1 CAMERAS

Both early versions of the Canon F-1, their first fully professional-oriented SLR model, looked the same from the outside.

Canon's sequence of F-1 cameras, apart from the earliest variation, has been well documented by Canon themselves in a series of pamphlets, brochures, and several very impressive full-length books that were offered for sale to the general public. Other authors have also covered the system in detail. I shall therefore simply review a few basic facts about them.

There have been four versions of the F-1 series. The first was marketed early in 1971 after having been in semi-series production for six months or more, and was superseded within a year. Its serial numbers all occur between 100,000 and 199,999, and the only important distinction between it and the later original F-1 is that the earliest type usually required modification or adjustment before a motor drive could be properly mounted. For a while, Canon offered this service free to early purchasers, and perhaps to make any distinction between the semifinal design and the real thing is simply splitting hairs. A nit-picking collector might want to locate an unmodified example (if he can tell the difference), but I have never tried to do so, though I owned one or two by accident through having bought into the F-1 system when it first appeared.

The second version is what we usually think of as the "original" F-1, and is the model that created the F-1 mystique. Fully complemented by an array of specialized accessories, it slowly

garnered an almost fanatical acceptance among a small but growing group of professional users. Its production began later in 1971 and lasted until late 1976. During this time only very minor running changes, such as increasing the range of settable film speeds, were made to the F-1 design.

The third version is what was called the F-1n when it was first marketed. It was made between July 1976 and May 1981. It accepted all the older F-1 accessories, and was little more than a cosmetic update of the original model, timed to coincide with introduction of the first of the new FDn lenses. You can tell an F-1n by its plastic winder tip and the film reminder shell on the backdoor. By the end of its production it had greatly expanded the group of accessories that its immediate predecessor started to assemble, and augmented the number of users, too.

The FDn lensmount, to which, apart from a few items like extension tubes, Canon had fully shifted by the early 1980s, is simply a locking bayonet adaptation of the earlier FD breechlock mount. All the functional connections between camera and lens remained the same. At first many "experts," including some technicians who should have known better, denigrated the new mount, saying it was too likely to come apart. Time has proved them wrong; as has often been the case, the folks at Canon knew better. There has absolutely never been any reason for any photographer to go out of his way to acquire old lenses in breechlock mounts.

The fourth F-1, introduced in the summer of 1981 and current into 1992, was first called the "New F-1." As had been the case with its predecessors, after the passage of some time this version also came simply to be denominated the F-1 by Canon. It is still a superb piece of equipment, widely used by professionals who valued rugged durability in combination with a large potential for flexibility.

Even in the 1980s, Nikon SLR cameras were still symbols of authority among photographers in their mid-forties and older; the Canon F-1 belonged to the younger generation. Canon seem to have planned events thus.

The Canon F-1n added a more comfortable wind lever tip and other refinements to what was still a fully mechanical SLR model, whose battery was used only to power the internal exposure meter.

The Canon New F-1, third and probably last in the F-1 sequence, used electronic controls for shutter timing and other internal functions, and was considerably more versatile than the F-1s that preceded it.

THE CANON HIGH-SPEED F-1 CAMERAS

There were two versions of the High-Speed F-1. The first, introduced in 1972, was a beefed-up original F-1 with a pellicle mirror that remains in place during the camera's sequencing operation. It will make about nine frames a second at full speed. These cameras are rare; most were rental units and were retired when they became uneconomical to keep going, or when they were replaced by the second High-Speed model.

The latter is loosely based on the New F-1, but has a multiple-blade shutter of unique design which allows sequence speeds of up to fourteen frames per second, the fastest rate in the world for this sort of camera. It also has a pellicle mirror, and incorporates a version of the New F-1 built-in exposure meter. It also is rare, at least in the hands of private owners; expense limits its use to those individuals or (in large part) organizations that really need to have it on hand, and most professionals who only occasionally need it are content to rent it from Canon's Professional Services division or some other professional source.

VIII. THE AUTOFOCUS ERA

While Canon's T-camera system did not incorporate autofocus except for the ill-fated T80, these cameras did definitely point the way toward the technology that made the EOS system practical. Of them all, the T90 is far and away the most important of the T-models, though the T70 was also a landmark camera when it first appeared.

Before turning to the EOS models, then, we shall briefly examine the five Canons in the T-series.

CANON T50

Canon's T-model cameras started with the T50, introduced early in 1983. It was essentially an AV-1 camera, with very little user control over its exposure settings, that had been mounted into Canon's new T-series body: a bridge camera both for the user and for Canon's designers, engineers, and assembly technicians. Its introduction brought disbelief as people gawked and giggled at the novel T-type configuration; five years later, it looked conservative. The T50, Canon's first SLR with an integral winder, seems to have gone out of production sometime during 1987, but the fact that some dealers were offering it again in 1990 suggests that another batch may have been made just before the T60 design was finalized.

Canon's T50 was the first of the new plastic-bodied breed, a basic autoexposure camera for the neophyte.

CANON T60

This model, an afterthought to the T-camera line, was introduced in the late summer of 1990 and was subcontracted to another manufacturer instead of being made by Canon themselves.

Not at all an important camera from any other historical point of view, the T60 actually does fall logically and exactly between the T50 and T70 models in terms of features. It allows aperture-preferred automatic exposures as well as full manual operation, using all of the traditional FD-mount lenses. Obviously aimed at the entry-level SLR user who has for some reason been influenced against autofocusing but nevertheless wants to have access to creative techniques and a broad range of optical equipment, the T60 seemed on its appearance to be a gesture toward the past rather than a serious attempt to keep the FD-system afloat into the future. Many of its features, however, recall the EOS facilities, and its body is very different from those of the other T-Canons.

CANON T70

1984's Canon T70 was a quantum jump forward in use of the technologies that had been made available by switching to the T-design. Essentially a T-version of the A-1, the T70 was marketed at the PMA show in 1984 and became quite a success among professional photographers as a back-up to the F-1. I have one good, wise, and experienced ASMP-member friend who left his F-1 bodies at home and spent several months in China during 1985 shooting stock photos with two T70 bodies and an assortment of Canon lenses.

This was the first SLR to have all functions read out onto a LCD screen mounted on the camera top. Pentax had used such a screen to indicate shutter speeds; Canon gave it the whole ball of wax. The T70 also pioneered extensive use of unorthodox controlling mechanisms -- principally buttons -- but its manufacture was discontinued when the EOS system development hit full stride.

CANON T80

The Canon T80 might have met a better fate if it had not been introduced simultaneously, though accidentally, with the Maxxum 7000 at the 1985 PMA meetings. It was essentially a T50 to which had been added an autofocus system derived from the focus confirmation facility of the AL-1. It required lenses in an entirely new mount, and only three of these were ever marketed. The T80, at first apparently a quantum leap backward beside the Maxxum, in part because the public never really understood that the Canon was a beginner's camera while the Minolta had been designed for a more sophisticated user, was allowed to die an early death in 1986. Examples new in the box may well become sought-after rarities by future generations of Canon collectors.

CANON T90

I spent three months of SHUTTERBUG's time reviewing the Canon T90 after its appearance in March 1986: if you are interested, you can see the April and following issues for that year. I thought then and still think that this model is a landmark in applied photographic electronics. Its few drawbacks have been discussed while we were considering the A-1. The T90 tends to overwhelm some users with superfluous options, it is somewhat bulky and occasionally awkward to handle, and it makes a certain amount of noise which can be distracting in situations that demand subtle documentation of ongoing events.

The general public, particularly those who have not used it extensively, have never quite given the T90 its due, perhaps because it does not include autofocus. Nonetheless, a large number

The Canon T70, on the other hand, was entirely capable of professional results, and sported Canon's first information display panel on its top deck.

The T80 was Canon's first adventure in autofocus, and was pre-doomed by Minolta's Maxxums. Despite what has been said, the T80 was not a particularly bad amateur-oriented camera, but it was also no match for the Maxxum 7000 that appeared simultaneously with it.

of professional photographers dote on it. With its myriad options, it may well do more things than most users will ever ask of it, and do them a great deal better than is necessary; by the same token, it will do almost anything (except autofocus) that almost anyone could possibly ever ask it to do, and do those things better than he has any right to deserve. It was a direct precursor of the EOS-1, and even has facilities that the autofocus camera lacks.

When the EOS system took hold, Canon dropped production of all but two of its FD-system cameras. One that remained was the New F-1; the other was the T90. Too many people admired the T90 to allow its easy demise but it was finally discontinued in late 1991.

The Canon T90 offered the most delicate controls over exposure that anyone has provided up to 1990, though these controls are somewhat fussy in use. It also proved to be a rugged, very dependable model in professional as well as enthusiastic hands.

A NOTE ON THE CANON EOS LISTINGS

It has become customary in the Japanese camera industry to give camera models different names in different parts of the world. Canon began systematically applying this methodology to its SLR cameras with the EOS series. In our discussion of EOSes I shall use the United States model terminology; readers in other countries may find that in some cases their cameras do not quite match either the model names or the model descriptions found here, though I have made an effort to suggest the slight variations in as many cases as possible.

Canon issued new EOSes in profusion during the first three years of the model line. The ones listed here include all that have appeared through 1991. Thus these cameras, with the addition

of the 1990 Canon T60, complete the listing of all 35mm SLRs with exchangeable lenses that appeared between 1959 and 1991, the first 32 years of Canon's SLR manufacturing history.

THE ORIGINAL EOS CAMERAS: CANON EOS 650 AND 620

Almost all of Canon's EOSes bear a strong family resemblance, and there seems to be no reason to illustrate each model. Here an EOS 620, second of the breed, is shown equipped with a Leitz Summicron 90mm f/2 lens simply to demonstrate that manually-operated lens adaptations, in order to fill out gaps in the early EOS lens line, were possible and could be made to work. The eyecup shown is also a special adaptation.

The two pioneer EOS models were outstandingly versatile without being overwhelmingly intimidating. The EOS 650 was introduced in February 1987, and the EOS 620 followed two to three months later.

Production of the EOS 650 presumably began about December 1986, when the first Instruction Book was dated, although design and testing had been in progress for well more than a year before that. The first edition of the combined Instruction Book for the EOS 650/620 is dated March 1987, indicating that series production of the EOS 620 probably began a little earlier that year. The original edition, covering only the 650, may become a collection item considerably rarer than either camera.

People talked of the 650 as the "amateur" model and the 620 as the "professional" version, but in fact this was a misleading distinction. Each offered advantages not available in the other.

The principal special feature of the 650 was its depth-of-field autofocus mode. But on either of the two original EOS models, at any time in any exposure mode, you could close the lenses down to their operating aperture whenever you wished to study your depth of field. This was not true at the time for any other autofocus camera in any of its autoexposure modes apart from aperture priority, and was made possible by the entirely electronic exchange of information and control between lenses and camera bodies.

The EOS 620 was the choice of models for those who wanted to do flash photography under conditions of high ambient light, such as flash fill outdoors; and also for sports photographers who need flash at high shutter speeds. Like the Canon T90, the 620 offered synchronization at 1/250, while the fastest synch speed of the 650 was 1/125. The 620 also emulated the T90 by including a fastest speed of 1/4000, one stop faster than that of the 650.

The autofocus system worked extremely well under most conditions, and the most likely exceptions were well covered in the cameras' instruction book. Autofocusing with either EOS was very fast. The EOSes did not go through an annoying hunt-and-peck, back and forth routine with calm but unnerving deliberation. They found the point of focus very quickly with an absolute minimum of fuss. And their accuracy was much greater than that of their Canon predecessor, the unlamented T80. They also worked at distinctly lower light levels than any other autofocus camera that was available when they were first marketed.

Almost all the enthusiastic reviews of the early EOSes failed adequately to emphasize the exceptional accuracy of the segmented-field automatic exposure facility built into the cameras as their normal metering mode. This feature looked as if it were closely related to the methodology first seen in the Nikon FA, but since the Canon engineers had had a longer time to work it out it seemed to produce better results than the pioneering Nikon arrangement. Only after the EOSes had been in production for several years was the accuracy of their exposure metering fully acclaimed.

Naturally, the early EOSes were not without design shortcomings, as must be expected in the first specimens of any new breed. For example, when you used the auto exposure system, repeatedly desired adjustments almost inevitably had to be invoked repeatedly. Thus, a reading obtained by the EOS spot-metering mode could not be held between exposures; one was forced to reset the mode with the thumb-button and re-meter for every photograph. Also, while it was possible to lock both the autofocus setting and the auto exposure setting by depressing the shutter button part way, it was not very easy to lock both when focusing on one area and exposing for another. Focus had to be locked first; metering with the thumb-button had to follow. And both settings were lost once the exposure had been made; the process had to be repeated for every shot.

The EOS 650 was issued later on as the EOS 650 QUARTZ: this was the same camera as the original 650, but packaged and sold with a data back instead of the standard backdoor. Meanwhile, production of the 620 was discontinued as soon as the EOS 630 became available.

CANON EOS 750, 750QD, AND 850

These three models, introduced in September 1988 for the Photokina celebration, were essentially further "amateurized" versions of the EOS 650, intended to appeal to a broader mass market. The two EOS 750 models incorporated a small built-in electronic flash unit, a feature found on many similar models from competing manufacturers, while the EOS 850 did not; otherwise the 750 and the 850 were identical. The EOS 750 QD, sometimes called the 750 QUARTZ, is identical to the 750 except that it includes a date imprinting backdoor; while listed as a distinct model in Japan, in many countries it has not been separately catalogued; in others, not even imported.

The three new EOSes offered the same general features as the earlier 650, but with only the generalized programmed automatic exposure modes; oddly, however, they did continue to incorporate the unusual depth-of-field exposure mode that the fancier EOS 620 lacked. They also used a film winding method new to Canon, though not to the industry, in which film, upon being loaded, is wound all the way to the end of the roll before an exposure is made, then rewound into its cassette after each frame is exposed. This system avoids rewinding at the end of a roll, but at the expense of a slower start when a new roll is inserted. More importantly, if the backdoor is opened by mistake, only one or two frames of exposed film are lost. It is the hallmark of a beginner-oriented camera.

A new, very small Speedlite 160E for the EOSes was a nice accessory that appeared with these models. Capable of being carried in a shirt pocket and used in bounce as well as straight-ahead positions, it also featured a pre-flash that allowed autofocus even in total darkness, as had been the case with the larger accessory unit first seen when the EOS 650 was marketed.

The EOS 850 turned out to be a marketplace failure; buyers were ready to pay the cost, only slightly higher, of the 750 which incorporated an inbuilt flash. The 850 was withdrawn only a few months after its introduction. The EOS 750 prevailed for a while.

CANON EOS 630 AND 600

Early in 1989 yet another autofocusing EOS appeared. The EOS 630 was an obvious advanced step in the direction of producing a professional-quality Canon autofocus camera: it incorporated some new features in addition to a new combination of the assets first seen in the EOS 650 and 620 models. In some markets outside the United States, the EOS 630 is known as the EOS 600.

In effect, the EOS 630/600 was to the Canon line of cameras what the Nikon 8008 had been to that maker's arsenal. The 8008, known as F-801 in most markets outside the United States, presaged arrival of the Nikon F4 and introduced some of the later professional model's new concepts; the EOS 630 signaled the close coming of the EOS-1.

The EOS 630 managed its autofocus function more speedily than had previous EOSes, although none of these cameras was in any way laggard in this respect. It also featured a five frame per second film drive. Automatic exposure and focusing coordination were integrated into a set of seven user-choosable modes that were said to provide the best combination of features for such varied subjects as sports, portraits, and landscapes. Additionally the 630 offered a number of user-customizing features, such as giving the photographer a choice of whether to rewind the film all the way back into the cassette or to leave a small end protruding.

The new model also answered a frequent EOS criticism by not forcing the photographer to make some repeated adjustments, like that previously necessary for automatic bracketing, before each photograph was made: as we have seen, in the two original EOS cameras such functions automatically canceled themselves after every use. On the other hand, as purchased the 630 had no cable release socket, mechanical or electrical; an accessory grip had to be bought at extra cost in order to attain this facility unless the owner was willing to remove the grip entirely and clobber up a set of contacts to mate with those found in the camera's grip well.

The EOS 630's shutter was speeded to 1/2000, as mentioned above in the discussion of the EOS 620. Its fastest flash synch speed was 1/125. With the exception of these two parameters, the 630 was clearly superior to the 620 in overall functionality. It comes as no surprise, then, to learn that Canon discontinued making the 620 once the EOS 630 was ready for their marketing supply channels.

User-customized operational controls were introduced to the Canon line-up in the EOS 630.

The EOS-1, which followed closely on the heels of the 630, was Canon's first professionally-oriented autofocus camera.

The EOS RT, a special model with further professional applications, brought back the Canon Pellix concept in more modern and functionally capable trappings.

CANON EOS-1

The "Professional EOS" was finally announced to select audiences of working photographers and photographic writers in May and June, 1989, only a few months after the EOS 630 was marketed. This new advanced model, the EOS-1, first shown in the United States on a special weekend seminar in photogenic New England, became available for priority purchase in early autumn of the same year.

Previous EOS models had been designed by an EOS design committee. The EOS-1 was principally created by a team directed by the same designer who had led the T90 project, and in many ways the new top-of-the-line autofocus camera resembled the T90 at least as much as it did earlier EOSes. Photographers who were used to handling the 620 and 630 found that there were problems in making the switch because of the revamped control layout.

Indeed, the EOS-1 turned out to be a sort of amalgam of the T90 and the preliminary EOSes. In shape, it harkened back to the T90, becoming a somewhat more curvilinear and bulbous version of the earlier EOS bodies; but of course in order to incorporate its added features the EOS-1 had to be somewhat larger and more all-inclusive than they had been. Part of the extra bulk, too, was the result of additional layers of plastic and metal exterior coating in order to add even more strength to what, in the T90, had already proved to be a robust plastic body that surrounded a sturdy metal cage whose essential purpose was to hold the lens and film in absolute alignment.

The EOS-1 design team took the same tack, but incorporated even more strength into the plastic body element in order to withstand any trial that might be presented to it. In the process they came up with a fairly heavy camera, but one that was very comfortable to handle. A great

improvement over the T90 was the use of rubberized exterior surfaces in many places where the T90 had presented only slippery plastic, especially around the left-hand gripping area.

Further to weather all storms, extra gasketing and other weatherproofing was applied to the EOS-1's joints, and the two command wheels (this camera had grown a second one, conveniently mounted on the backdoor where the user's thumb could control it easily) were additionally provided with sluiceways to drain off some of the precipitation that the camera might encounter. Provision to get rid of any build-up of grime that might result from the combination of dust and wet (or sweat) in the control wheel recesses was still somewhat inadequate. I guess that my long experience in the southwest American "desert" country has made me unduly sensitive to such problems as this.

Only two aspects, other than its "professional" status, really served immediately to differentiate the functions of the EOS-1 from those of the EOS 630, with which it shared a number of attributes. One difference was its beefed-up body construction, a size and feel that were truly comfortable for anyone whose hands were adequately large; the other was the second control wheel just mentioned. True, the EOS-1's shutter achieved 1/8000 with X-synch at 1/250, where the EOS 630 could boast of but 1/2000 and 1/125, and there were other minor differences in degree, but the backdoor control wheel and additional robustness were what really made the EOS-1 stand apart. Indeed, the EOS 630 could achieve a filming rate of 5 frames-per-second as it came from the box, while the EOS-1's maximum rate was 2.5 fps unless its accessory (at extra cost) motor booster was installed.

With the booster the EOS-1 attained 5.5 fps under perfect conditions, 4.5 fps when predictive autofocus was used with shutter speeds above 1/125. This unit also incorporated a second shutter release for vertical format photography and -- a very nice touch -- a secondary right-thumb control button that allowed quick adjustments in exposure in the vertical position without forcing the photographer to fumble through a shift in hand placement.

Unfortunately, when either its data back or its command back was mounted the super EOS-1 lost its second wheel. But if the photographer chose the two-wheel option, as most were likely to do instead of opting for semi-permanent use of a control back, he gained the ability either to control both shutter speed and lens aperture at once, one on each control, in manual exposure mode; or else to fine-tune his exposures in increments of as little as 1/3 stop without having to fiddle with various little buttons after having removed the camera from its eyelevel shooting position.

The EOS-1 was not yet a camera that was fully capable of satisfying all the needs of the professional photographer. By no means, though, should we denigrate it. What the Canon design engineers set out to do with this camera was to provide the first truly "professional-worthy" 35mm SLR completely built around the autofocusing concept, linked with totally electronic communication between camera body and lens. If they failed to succeed in absolutely every respect, they still cannot be faulted for having moved so far in a relatively unexplored direction. And many photographers did adopt the EOS-1 soon after it appeared. More would have done so, in all likelihood, had a more complete selection of lenses been available in 1989.

By way of comparison, Nikon's "professional" F4, a beautifully if idiosyncratically thought-out, but heavy and bulky, SLR that incorporated an excellent autofocus facility, had appeared some months ahead of the EOS-1 and had a better-damped shutter mechanism. It also offered viewfinder versatility unmatched by any autofocus camera of the time. But the Nikon still gave the impression, until you had used it for a while, of being a traditional SLR design to which autofocus had been added. And its apparently traditionally designed controls precluded, for example, the ability the EOS-1 offered to adjust shutter speeds in 1/3 stop increments. Also, as in

the case of rewinding, some of the F4's controls were not just unwieldy, they were downright frustrating.

Historically extremely important, therefore, the Canon EOS-1 was the first "professional" 35mm SLR to have been designed, from the heart outward, around an autofocusing facility combined with almost totally electronic control and, to a large extent, operation.

CANON EOS RT

This originally special-order camera was built on the EOS 630 body but incorporated a fixed pellicle mirror, harking back to the Pellix and the High-Speed F-1 models. Because the EOS RT required a secondary mirror in order to deflect light to its autofocus sensor, it might not have been expected to operate as quickly as had the High-Speed F-1 cameras. The secondary mirror had to be folded down onto the bottom of the lens-to-film well before the shutter could operate.

But in its marked "RT" operating mode, the EOS RT made up a great deal of time. In this mode, the secondary mirror retracted into the base of the mirror box module when initial light finger pressure was applied to the shutter release button. At the same time, the lens diaphragm closed down to its operating aperture. Thus, when the shutter button was fully depressed the only action left to be accomplished was release of the shutter curtains themselves.

In the RT, shutter operation could be set to begin as little as .008 of a second after release in the RT mode. For comparison, the earlier Canon New F-1 required .04 second between the times when the release was depressed and the shutter curtain began to open. For this reason, one of the 15 user-customizing features incorporated into the EOS RT was a setting that delayed the release time from 8 milliseconds to 40 milliseconds, just in order to accommodate the precognitive visual habits that had been formed by prior New F-1 users.

With either delay, and in fact in any mode, the RT's pellicle remained in place so that subject matter could be observed during the exposure, an important asset for portrait and many elements of scientific work, and for some sports situations too. In sports, it's true, once you have missed the shot, even ever so slightly, it is too late to go back and pick it up: but at least you would know what you had missed when you were using the RT. At five frames per second, the EOS RT's fastest motorized speed did not surpass that of a normal EOS 630; its real advantage was the ability to see the photograph at the moment it was being made.

Another asset of being able to see the subject at the instant of exposure was the ability to determine whether or not a flash exposure had been made when called for. You could also judge the expression on the face of your subject at the moment of the flash exposure, should your subject be of the sort given to expressions.

The penalty for uninterrupted viewing was a necessarily dimmer viewfinder, since roughly 60% of the light passed by the lens was directed through the pellicle to the film, while only about 40% was deflected toward the eyepiece. Obviously, too, a real aperture of, for example, f/2.0 was reduced in effect to one of about f/2.5 because of the light bled out of the system by the semi-silvered mirror. In all but the dimmest viewing situations, however, the EOS RT's viewing image remained commendably bright; with the fast films available by 1989, the loss of transmission to the film plane could easily be compensated for.

The EOS RT was certainly among the quietest 35mm SLR cameras ever built so far as shutter operation is concerned; its winding mechanism was noisier. The "RT" in its name stood for "Real Time", a fact which might have been expected to annoy the Zeiss/Yashica/Kyocera group

that produced the RT-Contax system. During the 15 years before the EOS RT appeared, Contax trumpeted the same phrase; it first appeared in the model designation of the Contax RTS. One finds it difficult to believe that the Canon publicists could have been so crass as to borrow this well-established Contax nomenclature -- but they were.

Nevertheless, this borrowing appears to have been a matter of little importance. The EOS RT was and remains an appealing, fine camera: easy to use, versatile, and capable of making outstanding photographs. The construction of its pellicle was much improved over those found in earlier Canon SLRs, better coated, stronger, and more resistant to abuse. Indeed, the RT was just about everything that the ancestral Pellix might have been but was not, albeit a quarter-century later.

CANON EOS IOS AND IODQ

These are two versions of what is essentially the same camera, released during March 1990. Historically, they were important because they incorporated. for the first time anywhere, two new facilities. The first is three autofocus sensors that are linked together, though they read three distinct areas of the focusing screen: a central crossed rectangle similar to that in the EOS 630 and EOS-1, plus a rectangle on either side about midway between the center and edge of the field.

The user can choose which of these areas is to be the active one for focusing, or all three can remain active; the choice can also be made automatically by the camera's computer. The principal benefit of this feature is, however, likely to be for predictive focus. The computer set-up is such that all three readings can be compared and used to analyze subject motion as well as location.

The second innovation was a facility to project a readout of selected exposure data directly into the central area of the finder at will. In the EOS 10 models, this facility is used only to indicate, by projecting bright red frames, which of the three autofocus zones is actively in use.

But this feature has implications for the future. Rather than having to examine data that is implanted in the frame bordering the scene he is photographing (though this readout certainly should remain available), the user may one day choose to examine it in the middle of his screen in full detail. For a photographer working on exacting subject matter which will stay still during the process, this projected readout could surely be a very useful advantage.

The EOS 10 models seem more like augmented EOS 630s than like EOS-1 siblings. Their chassis is quite similar to that of the 630, although construction is said to be more robust and the lines are subtly improved, especially in the handgrip area. Shutter speeds go to 1/4000, one step faster than those of the 630, but are set in half-stop increments like the 630, rather than the EOS-1's third-stop divisions. The internal motor allows five frames per second, like the 630.

Also like the EOS 630, the EOS 10 cameras have several preset "shooting modes" that can be chosen by the photographer: these will automatically make intelligent choices among the camera's various exposure, winding, and focusing options in order to provide ones suitable to such general applications as sports, close-ups, and portraiture. For the first time in a Canon, too, there is a built-in focusing illuminator, like the one originally provided in Minolta's 7000i camera, that will project focusable "spots" into dark surroundings. In the new Canons, three such spots are needed, one for each sensor target area.

Another new "feature" is the accessory bar-code reader. Pictures typifying certain unusual arrangements of subject matter and lighting are contained in a small book; each photograph has

an adjacent bar code block. If the camera is set to the bar-code mode, when the bar-code reader is passed over the code in the book and then input into a sensor on the EOS 10 body, the camera's automatic functions are programmed to do the best job possible of reproducing the situation in the original picture from the booklet. To me, this seems like arrant nonsense!

A pop-up electronic flash unit covers an area sufficient for small group photographs; maximum synchronization speed is 1/125, not the 1/250 of the EOS-1. Automatic flash exposures can be linked to the areas read by all three focus sensors. A new dial, in what once was the traditional rewind knob area, helps ease the photographer's choice amongst programs and modes; the rear control wheel of the EOS-1 is not used. The film guide rails and many other normally metal parts of the camera's film path are, in the 10s, made of plastic. This construction appears to work entirely satisfactorily, based on my own experience so far.

Camera motion at slow speeds has long been a problem for photographers. In the 10-series several of the shooting modes are set so that camera shake is reduced to a minimum; in one mode, indeed, if the possibility of shake is strong, the camera will not allow the photo to be made.

One is led to wonder about the user group skill level for which the EOS 10 models were intended: their combination of very advanced and very basic features is a highly unusual mix. The EOS 10S is the model principally destined for the overseas market; the 10QD has a data back facility, especially popular in Japan, as part of its normal configuration. Backs are permanently mounted, so that the data back cannot be added to a 10S. Also permanent are the focusing screens: the projection system onto three existing frame outlines precludes an easy interchange of screens.

At the same time these models were marketed, Canon introduced the first three in a new series of EF lenses that incorporate a smaller version of the Ultrasonic Drive focusing motor, which previously appeared only in the expensive L-series EOS lenses. More important yet, these three are zooms that have been designed with fully internal focusing. There are no protruding front shells to move back and forth, wobble, and be easily damaged by unfriendly contact. The new lenses should go a long way toward making the whole EOS camera system still more rugged and dependable in stressful conditions; with luck, they presage a future line of similar designs that will overcome this, the principal objection to all autofocusing camera systems that appeared during the 1980 decade.

CANON EOS 700 AND 700QD

The EOS 700 was an entirely beginner-oriented camera, and was destined to replace the EOS 750 when stocks of the latter were depleted; the 850 had already long been gone when the two new models appeared in the spring of 1990. The 700 had a built-in flash which operated in the same totally automatic mode that was used by the 750. Its automatic shutter speeds ran from 2 seconds to 1/2000, but the slowest manually set speed was 1/4. In order to obtain manual speeds or shutter-priority exposure automation the top-mounted dial in the traditional "shutter speed dial" location must be removed by the user, shaken or dropped out of place, turned over, and tightened into place again; the retaining implement is a thumb-operated screw. From the start, this method seemed sure to be fated to make problems for some users.

In the 700QD version, a date-imprinting back is provided; the 700 has none. In both cameras, film speeds are set by the DX-code system only, and only in full one-stop steps between ISO 25 and 3200. Color negative or black-and-white films seem to be those best chosen by the user, but color-negative is the amateur's preference anyway. Like the EOS 750 and 850, the EOS 700 loads its film all the way to the end, then runs it back into the cassette as it is exposed.

The camera was designed to be sold in a kit with a 35-80mm power zoom lens (the first

such in the EOS lineup) speeded f/4 at the short end and f/5.6 at the long. Both this lens and the camera body have plastic rather than metal flanges; though these match the standard EOS specification, the EOS 700 kit is obviously not designed to be often separated. Plastic was also used in the film path, as was the case with the EOS 10s. Many other features are carried over from the other EOS cameras; and for the audience for whom this EOS appears to have been designed, the SLR beginner or someone who wants to outperform most of his point-and-shoot brethren, the EOS 700 will probably do the job quite nicely.

CANON EOS REBEL, EOS 1000, and EOS REBEL S

The Rebel was conceived as an entry-level autofocus SLR; its features are largely similar to those of the EOS 700, but it has a control dial somewhat similar to that of the EOS 10s. The camera appeared during the summer of 1990. It used the plastic construction of the 700, and also was normally sold as a kit with a zoom lens. I cannot understand just how Canon intended to differentiate between the Rebel and the 700 for the class of customers at which both were aimed. Probably the removable shutter dial of the 700 was too large a hurdle; indeed, the Rebel was a quick replacement, and the EOS 700 is surely going to be a valuable item to future Canon camera collectors.

In Japan the Rebel was available as the EOS 1000 with an automatic flash that could not be included in the version sold in the United States, apparently because of patent problems; a reworked version, the Rebel S, introduced in 1991, incorporated a flash for the United States market without seriously changing the breed. Indeed, the whole Rebel concept in the United States has been defined by the image of Andre Agassi; unlike that fine tennis player, however, the Rebels are made of plastic and many of their joints held together with glue.

Although they do not look like typical examples, the EOS Rebels are in fact Canon's answer to the "bridge camera" concept promoted by Olympus, Ricoh, and many other makers.

CANON ELAN (EOS 815)

This model, introduced toward the end of 1991, is an interesting cross between the EOS 10s and the EOS-1, and from a marketing point of view was oddly situated between the Rebel models and the 10s. It will be discussed again in the chapter that follows; for the moment, we need simply say that its principal attributes are a serious attempt at operational noise reduction, in combination with the EOS 10s top control dial setup and the EOS-1 secondary rear control dial. Its principal defect, to me, is the lack among its custom control functions of any way to transfer autofocus control away from the shutter release button. I use the alternate setup on the EOS-1, with autofocus on a rear thumb button, constantly; if this configuration were available on the Elan, it would be a camera much better suited to my tastes.

IX. CONCLUSION: CANON and TECHNOLOGY

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Many among the 1988, 1989, and even the 1990-1991 EOS Rebel models demonstrated that Canon were, among other things which we shall touch on in a few moments, continuing their traditional practice of adapting a basic design to suit many perceived markets by making a number of variants with only minor changes in configuration, while occasionally adding additional improved features to the line's more or less standard assets.

This strategy began in the early 1950s when, in collaboration with Jardine Mattheson, Canon's then world-wide distributor, the basic IIC/IIIA rangefinder camera design was modified into a number of bewilderingly similar models in order to attract customers who were perceived as wanting slightly differing capabilities in the cameras they bought. It thus was then a marketing-oriented approach to camera design; one in which a group of new concepts is only occasionally brought together at one time by the engineers, but is then adjusted and readjusted, often even fine-tuned, as an inducement to additional sales. The history of Canon's A-series SLRs exemplifies this systematic approach to mass marketing; it seems that in a sense the EOSes are following suit. But this is, in fact, a superficial reading of the situation that exists in 1992, as we shall see.

Whether or not the added cost of producing such a variety of cameras simultaneously under the economic conditions that seem likely to prevail during the 1990s will in fact be justified by increased sales volume is a point which obviously has yet to be decided; though it at at first appears that Canon must still believe the justification indeed exists, and presumably have the statistics and figures to back up their belief, this is only a small part of the reason why so many EOSes have come and gone so quickly. Someday, a complete collection of EOSes through 1991 will be as valuable to a design historian as it may be to a collector.

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In the end, indeed, it is the technology incorporated within the camera, and also the interface between it and the photographer, that determines the camera's value to discriminating users. Back in the 1930s, Canon were not so much interested in technology as in simple design problems and their immediate solutions, as those of you who have read my earlier book on Canon rangefinder camera history will remember; and this situation continued pretty much without exception for at least a decade.

Not until 1945-46 did Canon, still to be the ancestral firm of **Seiki-Kogaku** for another year and a half, make an important improvement to the essentially Leica-based rangefinder camera. Immediately after the war, with the S-II which in fact had been worked out a year or two earlier, they produced the first Leica thread-mount derivative to incorporate a combined range and view finder. In 1950 they added internal flash synchronization at just about the same time that the Leitz factory did so; the Canon solution was more functional than Leitz's, but less elegant. In 1955 they began to experiment with a bottom-mounted trigger wind intended to replace the old-fashioned top knob; this solution had drawbacks and never succeeded in displacing the top-mounted thumb lever that other manufacturers invested in from the start.

The line of Canon V and VI rangefinder camera models were indeed essentially sheep in wolves' clothing, upgrades of the traditional Leica design approach dressed up in newfangled outerwear. The model VI cameras finally ridded themselves of the old dual shutter speed control dials, but in all other respects the only advantages the late 1950s rangefinder cameras incorporated were metal shutter curtains and loading via a backdoor instead of through a detachable baseplate.

By the time Canon arrived at the model 7 and 7s concept in the 1960s, rangefinder cameras were semi-obsolete in the eyes of many photographers. These two final models were worthy competitors for the line of Leica M-cameras and Nikon S-cameras, but were too late on the scene. The Canon 7, in fact, sold better than any other Canon rangefinder camera had ever done, but this was probably as much due to the burgeoning popularity of the pastime of photography as it was to the model 7's inherent quality. After all, the Canon 7 designers had even forgotten (or decided not) to include an accessory shoe!

The technological efforts of Canon's camera designers during the later 1950s and 1960s were primarily aimed at the field of 8mm and later Super-8 cine cameras. Here they were remarkably successful, and often highly innovative. In the marketing area, someone must have thought that cine enthusiasm was going to last forever, because even when the Canonflex came under development no great amount of innovative thinking was applied to its design. It was superbly crafted, but indifferently conceived: no competitor for the Nikon F once it reached the real world, though much better built.

In fact, the first real sign of innovative technology in the line of Canon's SLR cameras was probably the Pellix. Just the reverse of the Canonflex, the Pellix was superbly conceived but indifferently crafted; nevertheless, seen in retrospect, we might view it as suggesting that someone well-sited within the Canon chain of command had finally understood that cine enthusiasm, like stereo, was cyclical, while the long-term importance of SLR camera design had at last to be recognized. Even as the Pellix came onto the marketplace, a high-powered team of Canon's design engineers was assigned to the job of creating an SLR camera that would be fully capable of challenging the then-preeminent Nikon F system.

The result was the Canon F-1, a machine in which new technology was applied in many practical ways to improving the efficiency of traditional mechanical 35mm SLR functionalities. Coupled with the Canon EF of two years later, the F-1 showed that Canon engineers, when they applied themselves to new solutions for old problems, could indeed innovate.

iii

But it was the AE-1 that first clearly demonstrated Canon's ability to break new ground constructively.

The AE-1 and its successors, especially the A-1, showed for the first time just how important the integration of electronics and mechanics could be for the photographer. This was a field which, before the AE-1, had been limited to exposure metering and, for a few manufacturers, shutter speed timing; in the new A-Canons it was for the first time devoted to fully integrated control of the cameras' entire functionality. For several years, Canon had an important lead over all other manufacturers, and did not stand still while others were working to catch up.

Plastics were first used in the A-Canons, but they really came to a fore in the T-Canons. When the T50 was announced, there were general hoots of laughter from many sides; by the time the T70 appeared, many professional photographers were more than ready to adopt it as their first-line backup model. (The very simple T60 came much later, and was a mistake.) The T80 was a

disaster through force of circumstance, but the T90 was arguably the finest non-autofocusing SLR camera design that has ever been produced and marketed. It certainly remains the most versatile such photographic instrument. The T-cameras also benefitted from new approaches to automated assembly.

Plastics and electronics and robotics were not the only areas of concern to Canon's designers during the later 1980s, however. They were, in fact, beginning to rethink the whole process of how a camera can best be operated by and even interfaced with its user: a sort of ergonomic approach. The "control wheel" of the T90 was one example of this approach; the T90's right-side finder readout was a second. As they approached the era of the autofocus camera, Canon's engineers were preparing for a second revolution that would take place simultaneously with that of focusing: bringing man and machine into an even closer relationship.

iv

So far as the EOS-1 and its inevitable future descendants are concerned, Canon have broken a great deal of new ground in a short period of time, developing their autofocus plus electronic-linkage concept into a worthy instrument. But what is, in the end, even more important is the fact of their having addressed a number of areas of concern that have to do with the photographer's environmental relationship with his subject matter through the intervention of his camera as a recording machine.

That statement sounds high-blown, I know, but I believe it is one way of stating the goal that Canon's designers are trying to attain. Introduction of the Canon EOS version variously known as the "Elan" and the "815" during the autumn of 1991 is an obvious case in point.

The EOS Elan, superficially an amateur-oriented model, has as its specific marketing point the asset of noise reduction. Otherwise, it is a somewhat simplified EOS 10s to which some sophistication has been added by incorporating the rear secondary control wheel of the EOS-1. Its principal attribute is, simply, its ability to run very quietly indeed.

Let us examine for a few moments some camera design problem areas, especially those that apply to autofocus design. Most important, perhaps, is the focusing methodology itself.

In the beginning, there was a potential problem in the design of some of the amateur-oriented EOS lenses in which focusing involved the movement of an internal sleeve within the outer protective lens shell. This problem still exists in some competing lens lines, though Canon are moving to eradicate it from theirs. Most of the moving shell parts of most autofocus lenses are made of relatively light-weight plastic in order not to overstress the internal focusing motors by making them drive too much mass; and because focusing had to be driven by relatively small motors, there had to be ample tolerance between the two shells. Otherwise they would bind. The overall construction of some of these first-generation optics, as a result, has not unusually been too fragile to stand up to hard use without eventually producing optical degradation.

For example: every time the extended end of one of the early Canon AF lenses rubs against the photographer's body or anything else while being carried, or even rests on a table top when it has been temporarily put down, the relationship between sleeves is altered, moving the inner one and its attached optical cells slightly out of alignment. Second, when any extra weight, such as a heavy polarizing filter plus a lens hood made to screw into the filter threads, is attached to the front of the inner sleeve, the focusing drive has to move more mass than it may have been designed to do. And the extra mass also tends to degrade exact alignment. Leaving the camera, lens, plus screw-in hood combination on a table or other surface for a considerable length of time,

especially with the improper hood holding the end of the lens out of kilter, magnifies the problem of assuring permanent alignment.

The wear that results from such mishandling inevitably tends to create more focusing wobble and misalignment than is good for precise optical results. In SHUTTERBUG magazine for February and March, 1990, I developed the concept of lenses that might fully be contained in a solid shell with no moving parts at all, apart from the diaphragm mechanism. All focusing motion, I suggested, could be handled by an optical relay array mounted between the camera body and the lens unit. With their totally electronic linkage the Canon EOS lenses, I suggested, would seem to be naturally suited to this solution.

By opting to put the focusing motor within the lens unit, rather than in the camera body, Canon's engineers had already alleviated the not inconsiderable problems of chatter and strain introduced by a long and necessarily interconnected mechanical linkage between body and lens. Electrical relays are more dependable than mechanical ones; they are also much quieter.

But in the last two years they have gone farther yet, incorporating internal focusing in their new lens designs. With this attribute, all the moving parts involved in changing focus are fully contained within a solid outer shell, much as I had suggested in my 1990 magazine articles, which were written in 1989. So far, in Canon's case, each of the newer lenses has its own focusing optics rather than depending on a secondary unit for focusing as I had envisioned; Canon's approach, though, leads to better results than mine would have done, since each focusing unit is designed as an integral part of its own total array of optical elements and placed in whichever relationship to the rest that will give the most reliable results. The final result is a self-contained unit which, unlike many of the early EOS lenses, does not change shape during focusing, does not have a relatively wobbly nose extending forward from its main tube, and is not subject to the stresses produced by rough handling in the urgency of making the photograph under whatever situations prevail.

Internal focusing has another advantage. Since the lens does not change length with focus changes, and because only a relatively small portion of the whole lens moves at all, its center of gravity remains stable for all practical purposes. To the user, the lens feels the same no matter at what distance it is focused. In an autofocus lens, if the photographer switches to manual focus, or if the motor allows a dual choice of focusing methods without further adjustment, this stability can be a decided asset in some situations. Macro work is only one example of such an application.

In fact, Canon has used three motor designs for their autofocus lenses. The first, called "MM," is a relatively simple micromotor which could at the end of 1991 be found in the 50mm f/1.8 and a few amateur-oriented zooms; it is not used in any of the "L" lenses. The second is the "AFD" Arc Form Drive, typically found in the 1991 24mm, 28mm, and 35mm wideangles, the 50mm Macro, the 15mm Fisheye, and three "L" zooms: the 20-35mm f/2.8, the 80-200mm f/2.8, and the 100-300mm f/5.6.

The third is the "USM" Ultrasonic Motor. Originally made in only one large size and thus limited to large-diameter lenses like the 50mm f/1.0, 85mm f/1.2, and the exotic high-speed long-focal-length set, this is now becoming available in other sizes, and represents the wave of the future for Canon lens design. Indeed, one principal reason for the slow appearance of a full range of EOS lenses has been the wait while newer versions of the USM were being developed.

The USM has definite advantages over the other types. For one, it is inherently virtually quiet, and since with internal focusing optics it is totally enclosed within an outer shell, what little operational sound it does make is well muffled: USM lenses used with an EOS Elan reduce even that camera's operational noise level quite dramatically. More important, though, is the fact that

lenses with USM motors can be manually focused without having to disengage the autofocus ability, so that the photographer can make adjustments, perhaps in order to improve depth of field, for example, without wasting time changing any control adjustments that would require removing his eye from the finder.

Thus it is here that we find the advantage of internal focusing, mentioned above, becoming a really worthwhile practical application in yet another way, different from its positive allowance of a solid outer lens shell. USM motors, typically, can be combined with internal focusing in order to produce lenses that are quiet, accurate, capable of manual override, uniform in response throughout their focusing range, as well as being able to withstand the occasional rough handling that is almost always necessary in field use.

Quiet operation, the forte of the Elan, is a problem which, like invisible flash, often seems impossible of solution despite the wishes of a good many active photojournalists and other users. The EOS RT, with its pellicle mirror descended from the Pellix via the several High-Speed F-1 models, approached one source of noise despite the fact that its primary goal was to shorten the time between shutter release and film exposure, secondarily allowing the photographer to observe his subject at the exact moment of truth. The noise of a flapping mirror is one component in the totality of sound made by an SLR camera in its operational cycle.

The Elan has gone farther down the sound reduction path by incorporating several different features, without using a pellicle viewfinder. Chief among them, perhaps, is the innovative substitution of belt drives in several areas, such as rewinding and shutter tensioning, which were previously managed in most cameras by gear trains. The rounded cogs of the plastic rubber Elan belts greatly reduce chattering without, apparently, introducing any appreciable unreliability.

The Elan designers also advanced toward "quiet" by substituting worm drives for some additional gear drives, a step first taken in the Contax 137 models some time ago, but not yet generally adopted by the industry. In addition, in the Elan, a great deal of attention has been paid to damping noise by carefully chosen bushings and absorbant padding at a number of vital connecting points. It seems likely, in fact, that the Elan is a test bed for many features of whatever Canon model eventually arises to replace the EOS-1.

Vibration is yet another problem encountered in SLR cameras with focal-plane shutters. For most users vibration creates complications only during the use of lenses with very long focal lengths, or during exposures between, say, 1/60 and several seconds' duration; it nonetheless must be addressed by camera designers. For another series of articles in SHUTTERBUG, that one dealing with use of the Questar telescope as a camera lens, I had during 1990 and 1991 to face and test the ramifications of camera vibration.

One interesting result was my conclusion that the traditionally identified gremlin of vibration, the slap as the camera's mirror bangs home against the bottom of the focusing screen assembly at the end its upward travel, has in a number of cameras been successfully subdued, often indeed by the use of a worm drive to control the mirror's ascent.

But this solution has only made it easier to identify the effects of a second banging, that of the shutter's first curtain hitting the stop at the end of its travel. Indeed, I first identified this problem for myself during my tests of the EOS-1 in conjunction with the Questar. Its immediate symptom is blurring across part, but not all, of the image frame at relatively high shutter speeds, in the area of 1/250 to 1/1000. With a vertical shutter, such as the one used in the EOS-1, the blurring will be toward the top or the bottom part of the frame, the last area to be exposed. The same source of vibration surfaced later when I tested the Nikon F4, a camera whose mirror is superbly damped, and even with the Contax RTS III, which appears to use a worm-driven mirror.

Indeed, I was unable to find any camera model with a fastest shutter speed of 1/8000 whose shutter did not display this singularity. I should add, as I did in the SHUTTERBUG series, that this is a vibrational problem of very small importance to most users in almost all circumstances. I do not intend it as in any way an adverse criticism of the EOS-1, the F4, or the RTS III: it is simply an arcane observation about an arcane application.

But it is interesting that the 1/4000 shutters of the Canon EOS 10s (along with similar shutters in the Maxxum 7000i and Contax 167 that I had the opportunity to test) were remarkably free of any vibrational tendency that could be attributed to the impact of the first shutter curtain as it came to the end of its travel across the film plane. This fact suggests that Canon's engineers (and those from Minolta and Kyocera, too) have identified the same source of vibration that I did, and are learning to subdue it.

v

Clearly, all of these developments demonstrate that the Canon designers and engineers are working together to make the camera, as a generalized photographic instrument, as little intrusive as possible a filter between the photographer and his subject, whichever and wherever that subject may be and under whatever circumstances the encounter takes place. The major reason for the rapid succession of EOS models is that each is a test bed for one or two new features, which if they work out can then be applied together in later models.

Let us look at some examples. The EOS-1 tested the rear control wheel, which later resurfaced in the Elan. The EOS 10s tested the left top control dial as a replacement for the earlier arrays of buttons; this, too, was carried forward in the Elan. The EOS 630 first allowed customized control functions, now a standard EOS feature. The early 650 tried out the depth of field program which is also now a standard. The EOS 700 tried to make it with a reversible top control dial, and mercifully died a quick death.

This, I must suggest, is firm evidence of sympathetic technological thinking. It is progressive in both meanings of the word.

vi

I have added the few following notes simply because EOSes are the current Canon SLR cameras as I write, and any folk who have bought this monograph looking for helpful advice on using as well as collecting Canon SLRs may be grateful for a few added hints about their operation. I have in fact used EOSes since they appeared, and a few of the things I have learned may be useful. The next memos, then, will augment the material in EOS instruction books, which should always be completely absorbed, especially by novice users, before the camera itself is loaded for bear, quail, or even mice.

EOSes, especially the earlier models, tend to a slight flaw: the color of the subject matter makes a difference in the result of the autofocus procedure. Apparently the optical system of their focus detection sensors, unlike the Canon lenses through which the sensors look out at the world, are not completely color-corrected. Red isn't their favorite color. The same is true for nearly all phase-detection autofocus systems that I have examined: it is not a Canon exclusive. One or two makers in some of their instruction booklets warn the user to avoid trying to autofocus on reddish objects, or through red or orange filters, but to date I have not noticed a similar injunction in any of the Canon books. As you familiarize yourself with your new EOS, check out its focusing system's color sensitivity.

It might also seem from examination of the literature issued by Canon that stopped-down exposure metering through non-autofocusing optics, for example when the EOS cameras are to be used on a telescope or microscope, is not readily available. But a general answer to using the earlier EOS cameras in this situation does exist: place the camera in "Av" (aperture-preferred autoexposure mode) and use the control wheel to index the lens aperture at f/1.0, which is the exposure meter's null point on all EOSes prior to the EOS-1 model. "00" comes up automatically, and is the proper and equivalent null position, on the read-out for the EOS-1's exposure metering system, as well as those on the 10s and the Elan. Usually, the "1.0" or "00" configuration will result automatically in passably proper exposure of the film, despite the fact that so far Canon's instructional material has not usually covered this procedure.

The same technique serves if you use adapted lenses on an EOS. I have, for example, made an adapter that mounts Visoflex-II Leitz lenses onto any EOS. If the camera is placed in "Av" and indexed to the "1.0" or "00" aperture setting, the autoexposure facility will work properly no matter what f-stop is used on the lens. As the user changes apertures on the lens, the camera's shutter speed settings will also change automatically in correct sequence. Try it for yourself: you will see it change.

While I have not experimented with all the EOSes, I have found that with the 620 and 630 models operated in automatic exposure modes, partial metering, Canon's EOS-lingo for semi-spot coverage, and whatever general mode or modes are provided will work with telescopes and adapted lenses in the same "Av" way. This is true even for the EOS-1 and the Elan; but if you use the very central spot-metering mode with the EOS-1 in connection with non-EOS lenses, you will get false readings. Avoid the true spot-metering setting when using Questars, adapted lenses, and the like.

Since Canon have devised and are marketing on a very limited scale an optical adapter that allows use of most FD lenses of 200mm or longer focal length on EOS bodies, with concomitant loss of auto diaphragm facility and a penalty of about 2/3 of a stop of light loss (resulting from a magnification factor of about 1.26X caused by the adapter's internal optics), the concern about exposure metering is not limited to enthusiasts like myself who delight in mating unlikely lenses to outstanding cameras. It matters to anyone who wants to use this Canon-devised adapter.

All in all, the EOS cameras represent a brave gamble on the part of Canon. At one stroke they made the entire FD system at least semi-obsolete, a point we shall return to in a moment. In order for the gamble to work, the EOSes have to be not just as good as all of the other autofocus SLR cameras on the market; they have to be noticeably superior to those made by anyone else. It is to Canon's credit that many reviewers, and users of the majority of EOS cameras that so far have been made available, agree that in fact Canon's great gamble seems to have been a reasonable bet.

Thus ends the history to date of Canon's SLR cameras. It covers their first thirty-two years, from the first Canonflex through the 1991 EOS Elan, and should realistically be considered an extension of the history which I wrote a decade ago about the Canon rangefinder camera family.

To my mind, Canon for many years have been among the very few photographic manufacturers who have demonstrated a realistic and effective awareness of the relationship between the possible futures of photography and the products that they make. And, as we have just seen, to this equation they have more recently added the photographer-subject relationship itself. Existence of this viewpoint has been shown over and over in the cameras they have marketed during the last decade.

In the summer of 1988 Canon announced in Tokyo that they intended to suspend production of all SLR cameras that did not use autofocus. The demand for the EOS series, they explained, made this step necessary. They later appeared to draw back from this position, and even three years afterward quite a few FD lenses (largely the more esoteric ones, fleshed out with various zooms) and two FD cameras, the F-1 and T90, remain quite readily available.

At the beginning of 1990 they repeated their earlier announcement, but a few months later the T60 appeared. It now seems likely that the T60 was at best a temporary marketing expedient, and that all but the L-line and a small handful of other FD lenses will be finally removed from production. The T90 is officially dead as of 1991, and in fact its sales between 1988 and 1991 consumed bodies that had all been made before the 1988 announcement, when T90 production really did stop. The F-1 will eventually hit oblivion too. No important new FD-based technology can realistically be expected.

As the record has shown with examples like the AE-1, the A-1, and the T90, Canon are capable of solving technical problems of whose like we uninformed photographers have never even dreamed. They are doing so right now, and solving our human-to-instrument interface problems as well. We old geezers may lament the FD days, but the EOS system will come to be a genuine standard in its time.

Acknowledgements and Notes

I especially want to express my deep gratitude to Dave Metz and Chuck Westfall of Canon USA. Chuck, author of the vital booklet on the interface between the EOSes, T90, and the myriad Canon flash units, supplied expert assistance with more details of the Canon F-1 High-Speed camera technology than I could possibly incorporate into this historically-based text. Dave Metz, prototypical Canon "guru," brought me up to speed on the EOS Elan at the final moment. Both Dave and Chuck have also been very generous with the time taken by my questions about the EOS system and other technical matters.

Fellow photographers who have in one way or another contributed to my thinking about things Canon that relate to the SLR cycle, and to the achievement of the present study, include Bob Shell, author of a user's guidebook to the EOS which is absolutely the best camera guide that I have ever seen, Bill Kendall, and Grant Kalivoda. In particular, Bob and I have engaged in many discussions about the Canon SLR system over the years since he first joined the staff at SHUTTERBUG, whose editor he now is.

Fellow collector-historians who have sharpened my perceptions to the benefit of what has gone before include Rudi Lea, Bill Fadner, Tom Surovek, and my publishing and photohistorical compadre, John Baird, about whom another note in a moment. Dick Jones, a shining light among the motley of camera store owners, has been a great deal more than simply patient and helpful in the face of my insistently arcane queries: "What's new? Got any literature? Can I look it over?"

At Canon Japan, Yoji Miyazaki is an indefatigable optical historian and has discovered many facts about both cameras and lenses, early and late. He and his colleague Masamichi Kakunodate, who was one of the principal camera designers in the first F-1 era, have helped with very illuminating information and insights. Harley Ferguson wrote a number of the 1960-70s Canon SLR English instruction books; we all owe him a debt. And again, as in matters of early Canon history, I am grateful to Hayato Ueyama; though his own Canon interest centers largely on the

Seiki Kogaku years which do not directly concern the Canon SLR story, he has dug out SLR information that I had not found elsewhere. I highly recommend Hayato's book on early Seiki-Kogaku Canon history; so far it is available only in Japanese, but an English language translation has been promised. It is a model for future camera histories. Thanks also to Adam Lang for catching me up on serial numbers for the A-1.

Two among my earlier books have been mentioned in the text of this one. CANON RANGEFINDER CAMERAS: 1933-1968 was published in 1985 by Hove Foto Press in Great Britain. THE CONTAX CONNECTION was published in 1990 by Historical Camera Publications, the same folk (John Baird is most all of them all by himself, with devoted help from Rinda and the kids when emergencies like binding time come) who have brought this Canon SLR monograph to you. The fact that this one has several times been updated during the two and more years between my first sending it to John and its publication now is primarily responsible for any instances of peculiar tenses or irrelevant references that may have beclouded your reading: I have tried to spot them all, but new ones keep popping up every time I make the effort!

And as always, I am grateful too to Glenn Patch and all the SHUTTERBUG folk for their apparently enthusiastic support of the multitudinous vagaries to be found in my monthly "Dekkam File" articles in that fascinating publication. In fact, an earlier version of this essay, a multi-part sequence, as well as separate articles on the Canon A-1, the T90, and the first two EOSes, appeared in SHUTTERBUG Magazine during 1986, 1987, 1988, and 1989. The present revision of those pieces into a monograph, with corrections and a great many additions, has been prepared during the years 1988-1991.

My perceptions and interpretations are obviously (some might even say idiosyncratically) entirely my own, but all these good folk have joined with me in bouncing around some of the facts, data, observations, ideas, theories about investigative methodology, and chronologies from which those perceptions and interpretations have been derived.

Many thanks!

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