"Easy to use" wins: The µA741 (1968)

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At Fairchild, Dave Fullagar had successfully debugged the 709's process problems. He learned of National's 101 and, according to his colleague George Erdi, wondered why it did not include an on-chip compensation capacitor. He felt that Fairchild's process technology could practically accommodate this goal, and speculated that National's could not yet do so [9]. His answer to the LM101 was the 741, the most popular op-amp of all time.Fullagar chose to retain the key architectural features of the LM101: the input stage is the same compound differential combination of an NPN emitter follower and PNP common-base amplifier, a mirror load provides high gain and single-ended conversion, and the second stage remains a current-source loaded common-emitter amplifier (Figure 5). A straightforward complementary emitter follower provides an output drive current that is limited to the same maximum value, and in the same asymmetrical way, as in the 101.



There are some differences, to be sure. Rather than using an elaborate replica bias circuit, the input stage employs simple feedback biasing to establish the base and collector currents. A Widlar mirror converts the $\sim 700 \square A$ master current in Q11, Q12 and R5 into a 20 $\square A$ collector current in Q10. Transistors Q1 through Q4 act collectively as a single PNP transistor for common-mode inputs, and act together with Q8 and Q9 to form a Wilson mirror. The feedback connection of the Wilson mirror supplies the appropriate PNP base current automatically. George Wilson no doubt would have found the combination of the two mirrors amusing (if dissonant), as his own invention (at Tektronix) was stimulated by the appearance of the Widlar mirror in the 709.

Those minor differences aside, the chief appeal of the 741 is its internal compensation capacitor. The popularity of the 741 validates Fullagar's implicit assumption that engineers are basically lazy (that is, very time-efficient). Engineers seem not to mind that a fixed capacitor degrades performance in most configurations. Ease of use, coupled with "good enough" performance, seems to be more important.

After a subsequent tenure at Intersil, Fullagar went on to co-found Maxim Integrated Products.