

# Preface

Chua's circuit is considered a cornerstone in nonlinear electronic circuit theory. Up to now and over the last 25 years, wonderful properties of Chua's circuit have been discovered, day by day. Generations of scientists have worked on this very important device, that is the recipient of intriguing phenomena and astonishing behaviors. Even after 25 years since its discovery, Chua's circuit is still timely today.

Chua's circuit is a unique platform both for the understanding of nonlinear phenomena and for the study of experimental chaos. The more and more successful implementations of Chua's circuit allow us to have a wide scenario of electronic laboratories interested in Chua's device, both in industry and in universities.

Chua's circuit has evolved in both time and space. It is difficult to establish a geographical map of all the laboratories in the world where Chua's circuit is implemented and studied every day, due to the large number of people interested in this circuit. In our experience, the role of Chua's circuit is essential also for educational aims even in basic university courses. Chua's circuit has been present daily in our lab since 1994 and is considered a reference system to be taken into consideration to evaluate new techniques, methodologies and theories for nonlinear dynamics. The interdisciplinarity, stimulated by Chua's circuit, have led to the cooperation of groups of engineers, physicists, matter physicists, biologists. In recent years, even artists have been fascinated by it. Companies such as STMicroelectronics are investigating into the potentiality of Chua's circuit in industrial applications and a number of patents based on it have been deposited.

The book we propose reflects the wide experiences acquired together with other researchers in focalizing real circuit implementations of Chua's device.

The book is organized as follows. Chapter 1 gives an introduction to Chua's circuit. Chapter 2 deals with ways of implementing nonlinearity in the Chua's circuit. Chapter 3 presents the implementation of the Chua's circuit based on Cellular Nonlinear Networks. Starting from this implementation, two modifications allowing the generation of new nonlinear phenomena have been introduced: the first is discussed in Chapter 4, the second in Chapter 5. A programmable Chua's circuit is shown in Chapter 6. Chapter 7 presents an integrated implementation of Chua's circuit. Chapter 8 describes how to obtain a Chua's circuit with only four circuit elements. The possibility of exploiting the recent advances of organic technology to build a Chua's circuit is discussed in Chapter 9. Chapter 10 illustrates some of the applications of Chua's circuit. Chapter 11 draws the conclusions of the book.

It is worth noting that most of the circuits presented in the book can be implemented in a classical electronic lab or also at home and can be widely tested with available low-cost instrumentations or with laptop peripherals.

Usually, in our courses in Catania, we provide each student with a kit of a Chua's circuit and we make known the experimental possibility of such a circuit also in undergraduate schools.

We are indebted to the various generations of students who have collaborated with us in the experiments and in the study of the new properties and applications of Chua's circuit. We thank Leon O. Chua for his continuous encouragement in our research work. Moreover, the scientific community should be grateful to him for having offered his circuit. We have been happy to receive it from Chua himself and wish to make it known to future generations of students.

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