

# CAPITULO I

## REPRESENTACIÓN VISUAL COMPUTARIZADA

1.1

COMPUTACIÓN GRÁFICA – INTRODUCCIÓN

COMPUTER GRAPHICS - INTRODUCTION

# What is Computer Graphics? (1/2)

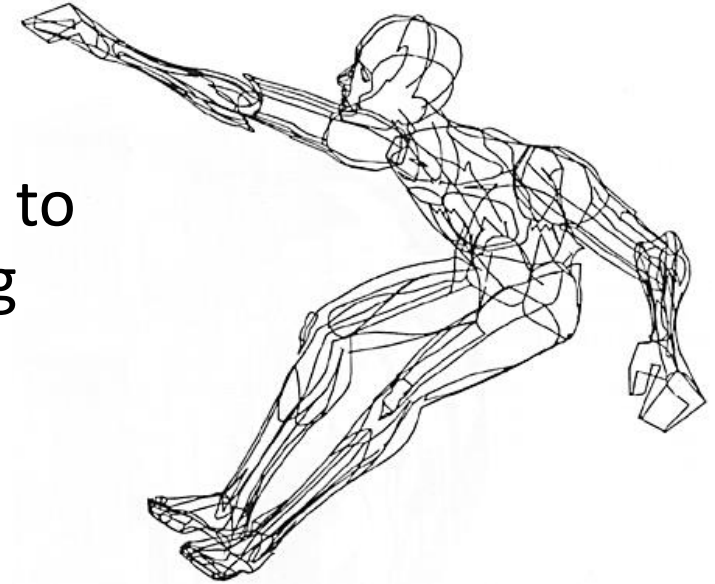
- Computer graphics generally means creation, storage and manipulation of models and images
- Such models come from diverse and expanding set of fields including physical, biological, mathematical, artistic, and conceptual/abstract structures

Frame from animation by William Latham, shown at **SIGGRAPH 1992**. Latham creates his artwork using **rules** that govern patterns of natural forms.



# What is Computer Graphics? (2/2)

- William Fetter coined term “computer graphics” in 1960 to describe new design methods he was pursuing at Boeing for cockpit ergonomics
- Created a series of widely reproduced images on “pen plotter” exploring cockpit design, using 3D model of human body.



*“Perhaps the best way to define computer graphics is to find out what it is not. It is not a machine. It is not a computer, nor a group of computer programs. It is not the know-how of a graphic designer, a programmer, a writer, a motion picture specialist, or a reproduction specialist.*

*Computer graphics is all these – a consciously managed and documented technology directed toward **communicating information** accurately and descriptively.”*

**Computer Graphics**, by William A. Fetter, 1966

# What is **Interactive\*** Computer Graphics? (1/2)

- User controls content, structure, and appearance of objects and their displayed images via rapid visual feedback
- Basic components of an interactive graphics system
  - input (e.g., mouse, stylus, multi-touch, in-air fingers...)
  - processing (and storage of the underlying representation/**model**)
  - display/output (e.g., screen, paper-based printer, video recorder...)
- First truly interactive graphics system, **Sketchpad**, pioneered by Ivan Sutherland 1963 Ph.D. thesis *Sketchpad, A Man-Machine Graphical Communication System*
- Used TX-2 transistorized “mainframe” at MIT Lincoln Lab



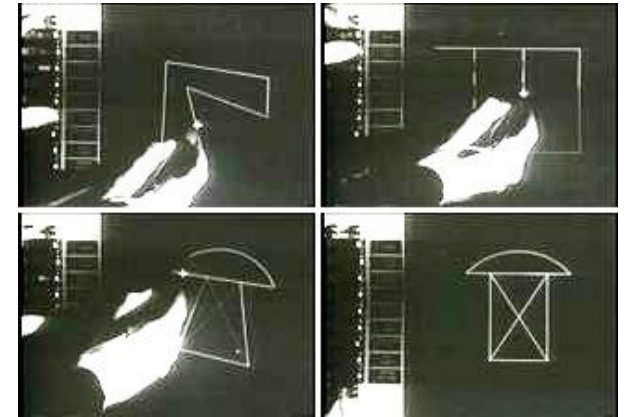
Note CRT monitor, light pen, and function-key panels – the “organ console” showing bi-manual operation

\* Sometimes called real-time computer graphics, and in certain contexts, real-time rendering

# What is **Interactive** Computer Graphics? (2/2)

- Almost all key elements of interactive graphics system are expressed in first paragraph of Sutherland's 1963 Ph.D. thesis

*The Sketchpad system uses drawing as a novel communication medium for a computer. The system contains input, output, and computation programs which enable it to interpret information drawn directly on a computer display. Sketchpad has shown the most usefulness as an aid to the understanding of processes, such as the motion of linkages, which can be described with pictures. Sketchpad also makes it easy to draw highly repetitive or highly accurate drawings and to change drawings previously drawn with it...*



Demo: Sketchpad

<http://youtu.be/546ADZFMBT8>

# What is Batch Computer Graphics?

- Today, we still use non-interactive *batch mode* (aka offline rendering) for final production-quality video and film (special effects – FX). Rendering a single frame of *Finding Dory* (2016, a 24 fps movie) averaged 53 hours on a 30,000-core render farm!



Still from *Finding Dory*



Pixar's Render Farm



# Movies / Visual Effects (VFX)

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# Computer Graphics Applications

## Video Games





# Computer Graphics Applications

## Simulation



## CAD-CAM & Design, Advertising

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Computer-Aided Design (CAD): diseño asistido por computadora (DAC).

Computer-Aided Manufacturing (CAM): fabricación asistida por computadora (FAC).





# Computer Graphics Applications



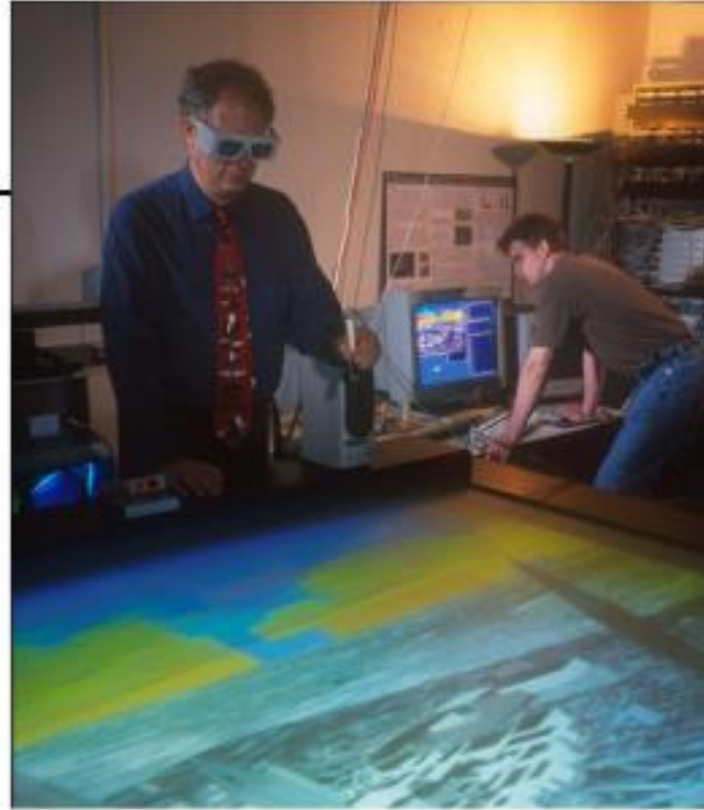
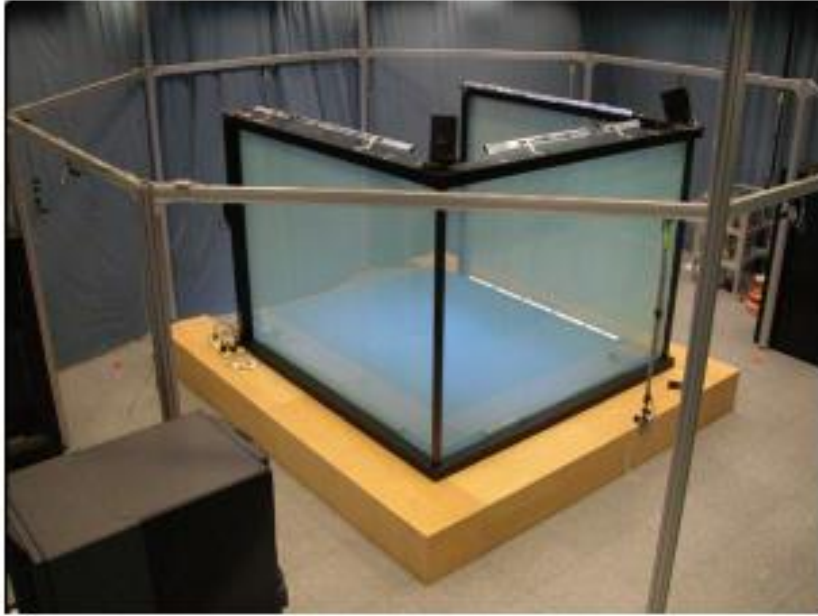
# Global Illumination in Architecture





# Computer Graphics Applications (Virtual Reality)

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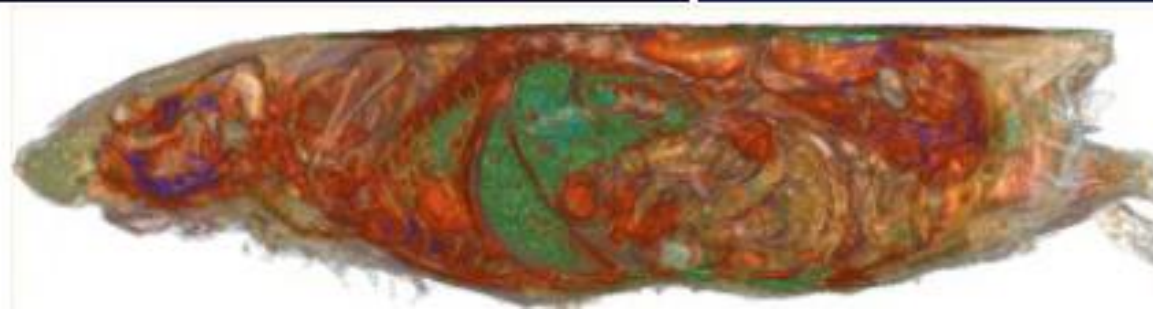
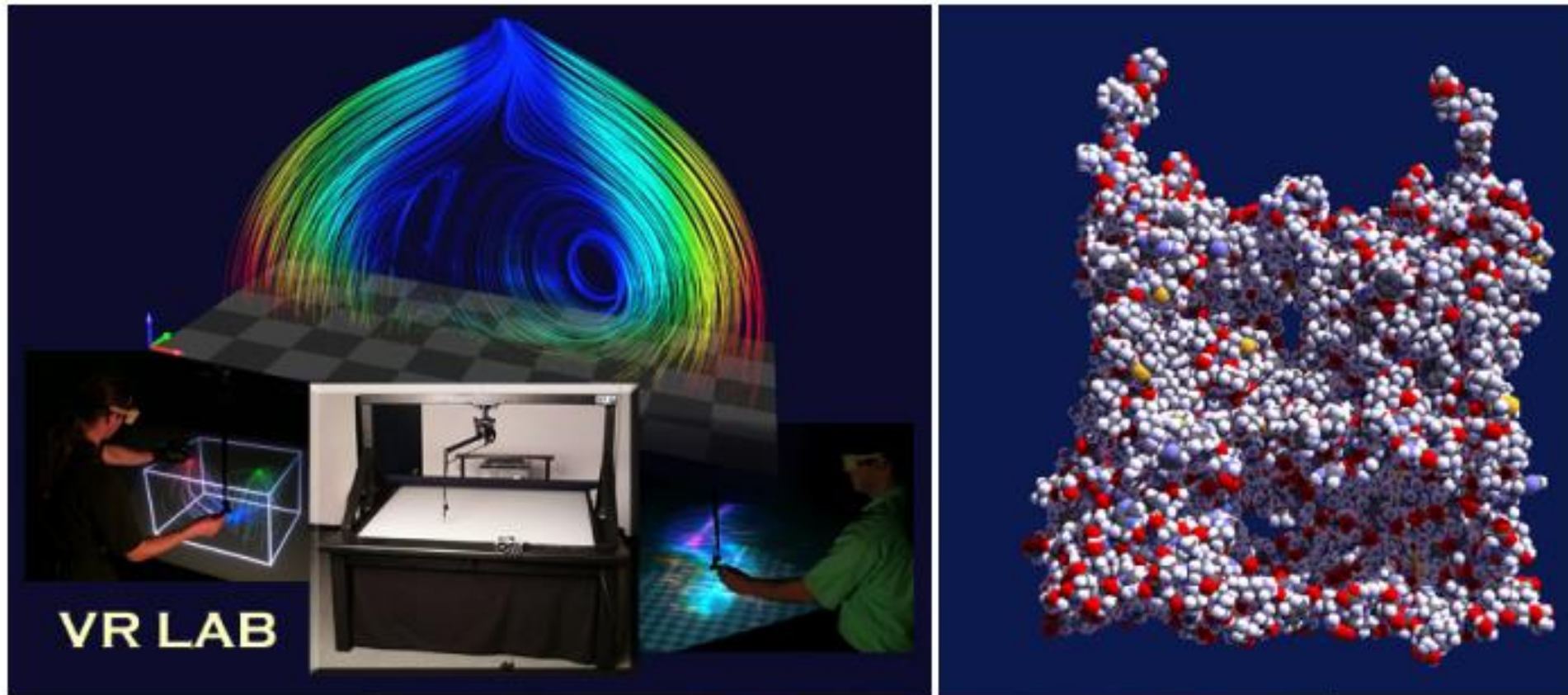
# Augmented Reality

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# Scientific Visualization



## Medical Imaging

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