

# 98-026

# Nintendo

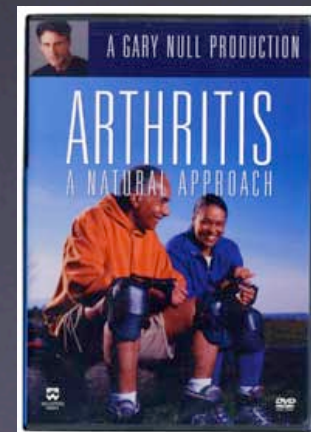
Bob Rost  
January 21, 2004



# Announcements (1 of 3)

## Changes to this Room

- The hard drive and CD-ROM drive were stolen from the lectern computers in this room and several others. If you stole them, please return them.
- There is no longer a LaserDisc player in here. It has been replaced by a DVD-only player.



# Announcements (2 of 3)

## No SOF Postmortem

- It didn't occur to me until Monday night.
- Probably next week.

# Announcements (3 of 3)

What Will Be Covered This Semester?  
(excerpt from a student email)

How much of the course is going to be structured 'here's how you make a game' and how much is going to be us asking each other and you about things specific to our own projects?

How complex will the course go? Any coverage on special sound chips, "color emphasis bits", multi-taps or battery-backed memory, or will you pretty much stick to the basic sprite engine and pAPU?

# Assignment 1 Results

- Total of 70 submitted.
- Your games were not difficult. I beat them all easily. Shame on you.
- Any major problems I should know about?  
What's up with Windows XP?
- Next some pictures...

# Assignment 1 Results

GREGDOR THE MIGHTY

JIMPLES THE CLOWN

JACK LIM IN CAPITAL LETTERS

YOUR NAME HERE

STINKY MC WIENERSCHNITZLE

DAN FERNANDEZ JSD

MICHAEL RAISMAN

# Assignment I Results

HELP I AM TRAPPED IN  
A VIDEO GAME FACTORY  
TO BEAT THE GAME YOU  
MUST KILL ME JJCLARK

MARK  
MARK  
MARK  
MARK

SEAN KELLY

SALLY MOTHER FUCKING BOZZUTO

JAM O SABRINA

MELANIE HASKELL

# Assignment 1 Results

## Late Turnin

### Tristan Dahl

The only person to  
turn it in **late**.  
Wednesday, 12:13 pm  
Please throw things at  
him.





# Assignment I Results

- The Joke Awards

# Free Candy Bar

First to insult me loudly in 7 syllables.  
NOW!



# Good Emulators

- Mac OSX: RockNES 2.4.0, Nestopia
- Windows: Jnes, FCE Ultra
- Linux: FCE Ultra
- Playstation: imbNES
- Dreamcast: NesterDC
- I will link to all of these on the webpage.
- Feel free to recommend more.

# Computer Graphics

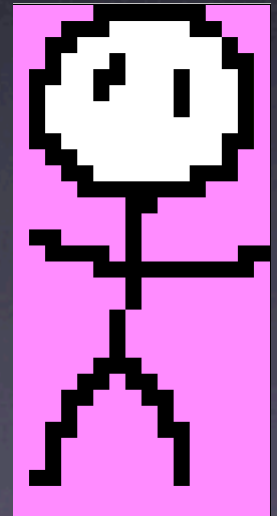
- Let us now quickly cover several semesters' worth of material.

# Pixels

- The basic unit of a computer image
- Resolution: the number of pixels in an image. Usually *Width x Height*.
- Common screen resolutions: 640x480, 800x600, 1024x768
- NES resolution is 248x240 visible



original size  
16x32 pixels



zoomed to  
show pixels

# Television

- NTSC (North America), NTSC-J (Japan)  
29.97 fps, interlaced  
640x480 resolution
- PAL (Europe)  
25 fps, interlaced  
800x600 resolution
- RF, RCA, S-Video

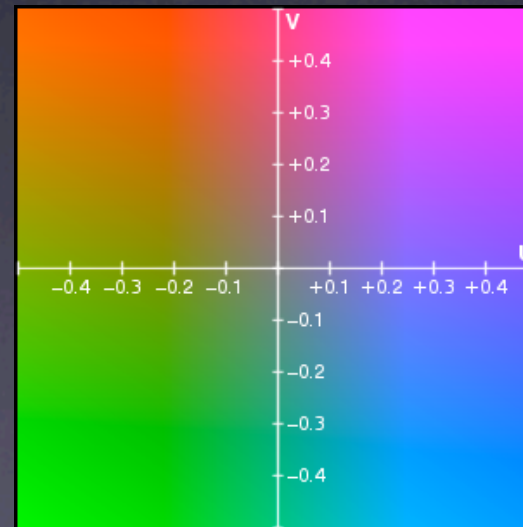


# Color Space

- CMYK
- YUV ( $Y'$ CbCr, YPbPr)
- RGB
- 16, 24, 32-bit Color



RGB Color Mixing



YUV chrominance plane,  
luminance  $Y = 0.5$

# Graphics Memory (technical)

- Memory is an array
- Screen buffer
- Double Buffering
- 16-bit RGB  
24-bit RGB  
32-bit RGBA
- Color planes, bit planes

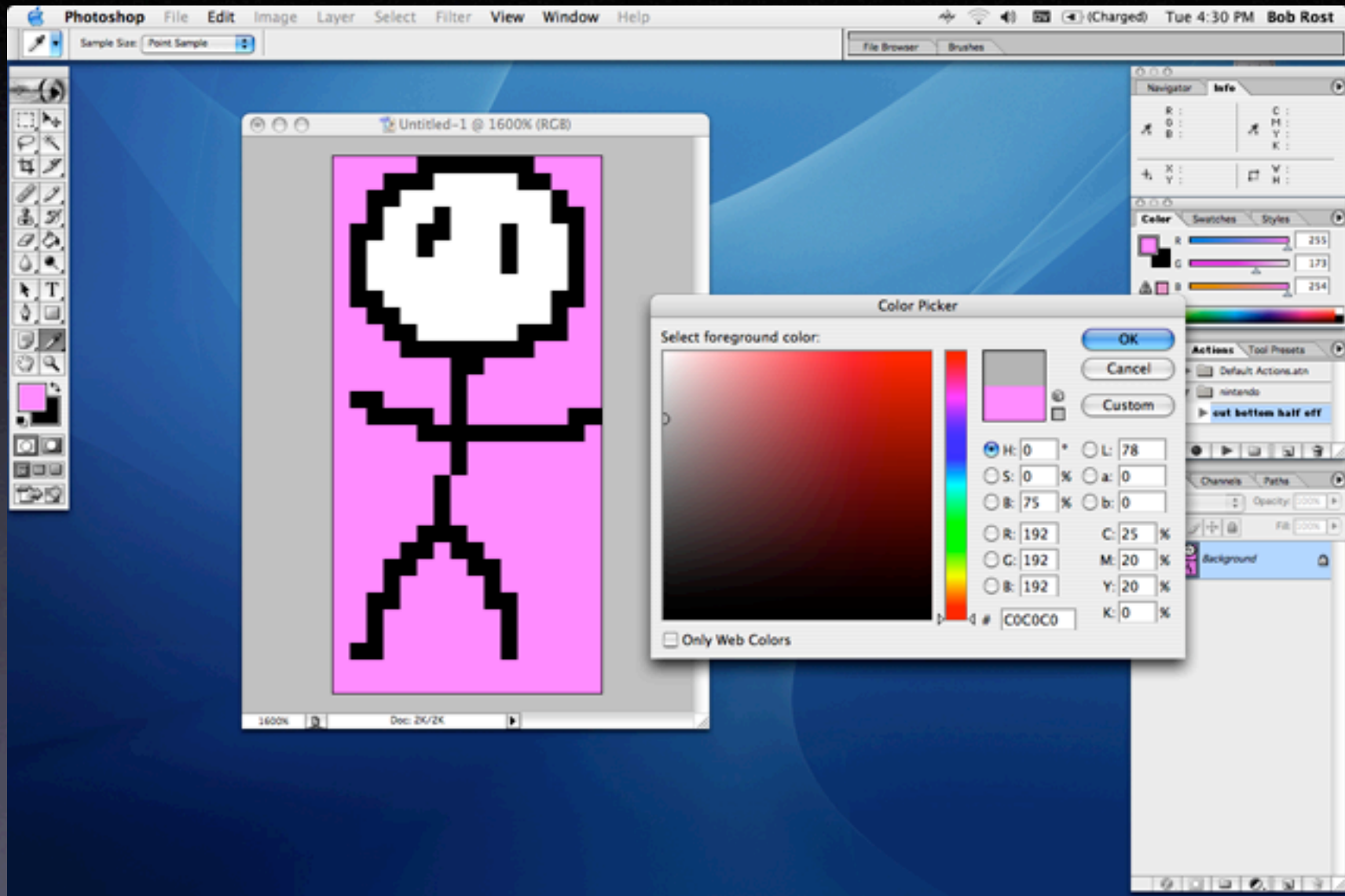


# Color Palettes

- Color index
- Bit Depth
- The NES global palette:

30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F

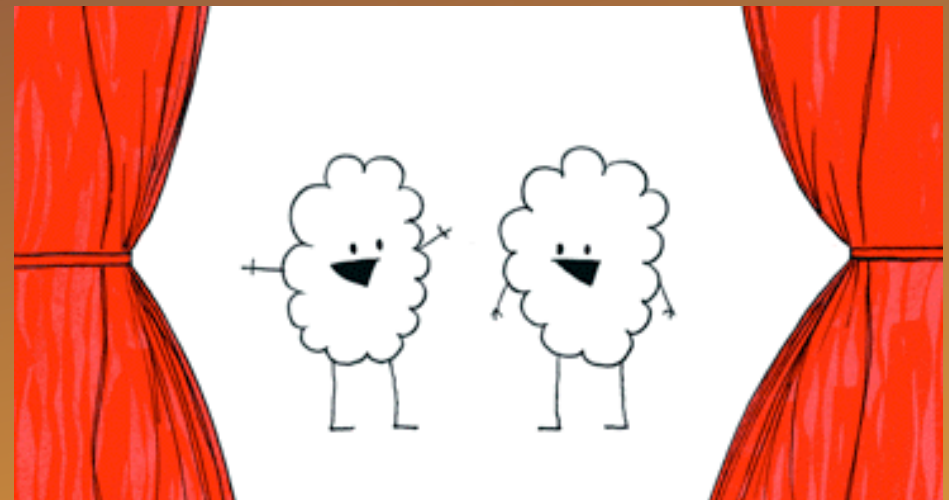
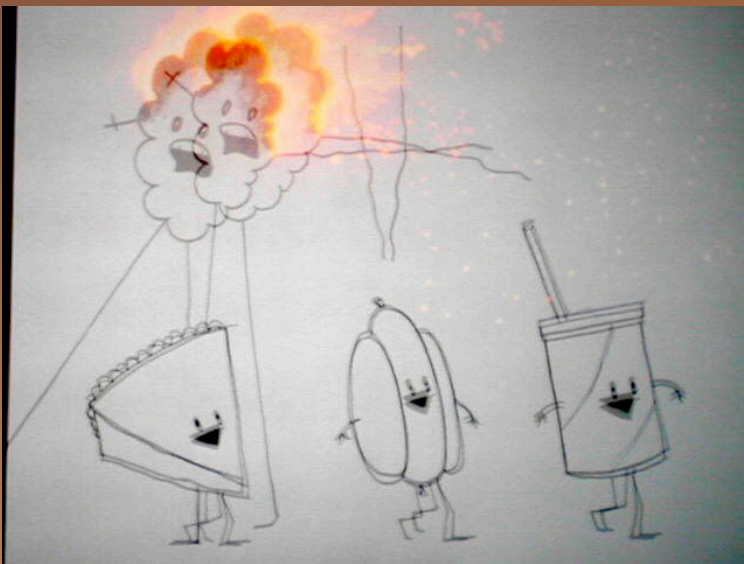
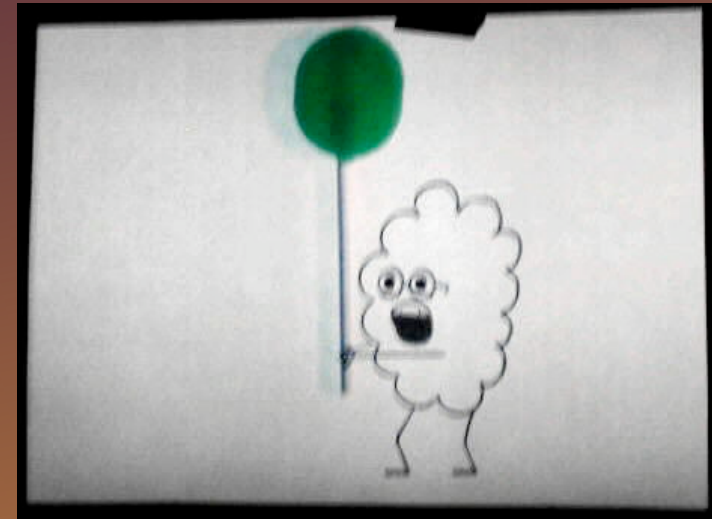
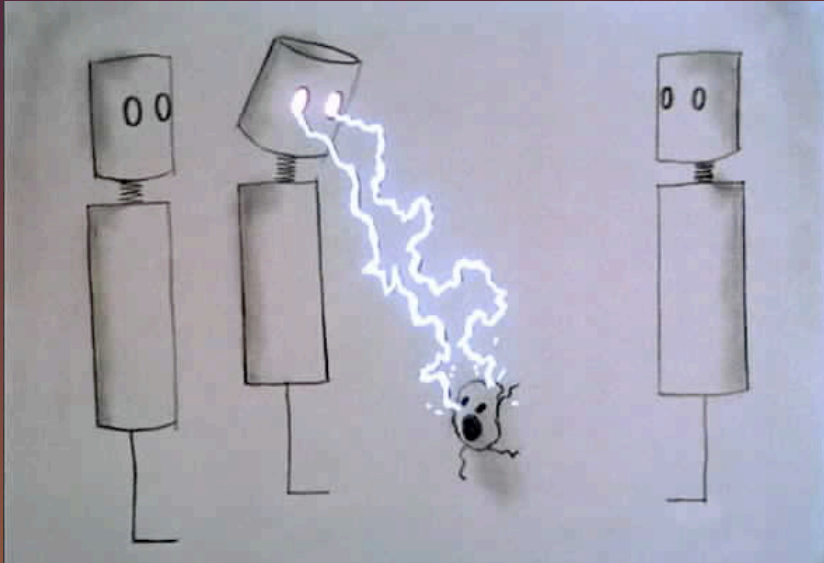
# Photoshop



Pay Attention Here

# The Thiiiiiiiiird Dimension

will not be covered in this class

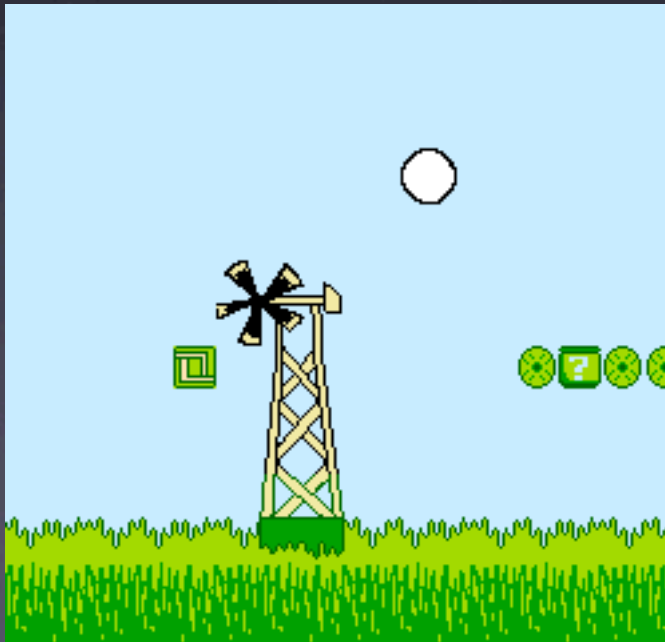


# 2d Game Graphics



example pattern table

- Image planes
- Pattern table, Background tiles
- Sprites, Sprite Animation
- Sprite Flipping



background image plane



foreground sprite plane



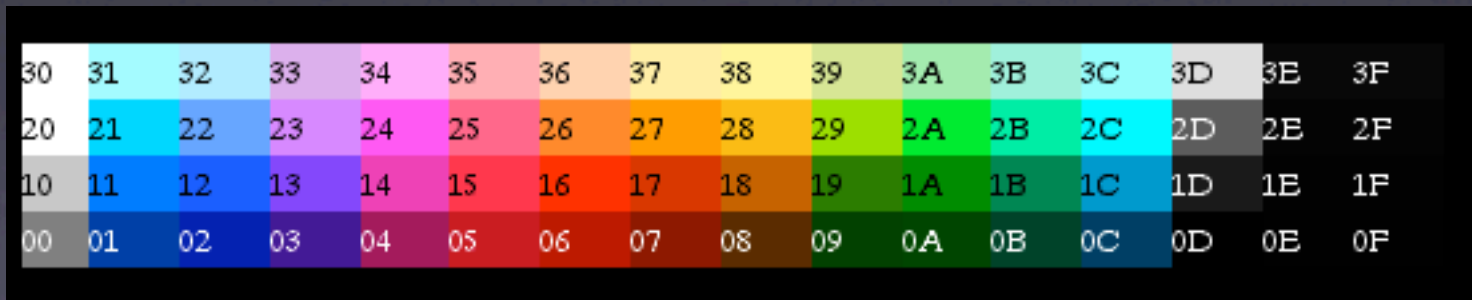
resulting image

# 2d Game Graphics

- Scrolling
- Parallax Scrolling

# NES Color Palettes

- 64 Colors in the system palette
- 16 Colors in the background palette
- 16 Colors in the foreground palette



30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F

The NES system palette

# NES Sub Palettes

- Background and Foreground palettes are split into sub palettes of 4 colors.
- The first entry in each background sub palette is the same primary background color.
- The first entry in each foreground sub palette is transparent.



an example palette  
*background on top*  
*foreground on bottom*



# NES Sub Palettes

- Sprites and background tiles are 2-bit color (4 colors max).
- Each pixel color value is a lookup index into the current active sub palette for that tile.
- This allows the primary color and 3 unique colors per background sub palette.
- Each foreground sub palette has 3 non-transparent colors.
- How many colors can actually be on screen at once?

# NES Sprites

- 8x8 or 8x16 pixels.
- May be flipped horizontally or vertically.
- 3 colors and transparency
- Usually used for main character, enemies, Tetris pieces, and any other moving objects.

# NES Sprites

- Maximum of 64 sprites on screen at once
- Hardware limit of 8 sprites per scanline
- Not all emulators respect the 8 sprite limit

# Assignment 1 Graphics

- Draw text as tiles on the background layer
- Why lowercase letters didn't work
- Why might you not want mixed case?
- How can we make the text move?

```
! " $ % & ' ( ) * + , - .  
0 1 2 3 4 5 6 7 8 9  
@ A B C D E F G H I J K L M N O  
P Q R S T U V W X Y Z [ ] ^ _
```

Uppercase Font

```
! " # $ % & ' ( ) * + , - .  
0 1 2 3 4 5 6 7 8 9  
@ A B C D E F G H I J K L M N O  
P Q R S T U V W X Y Z [ ] ^ _  
a b c d e f g h i j k l m n o  
p q r s t u v w x y z
```

Mixed Case Font

# Assignment 2

- Not due for a while (around mid semester)
- Start thinking about it
- Commercial opportunities?
- Consider whether you would like to work alone or in a group

GAME OVER