UNIVERSITY OF MARYLAND
Department of Fire Protection Engineering

Types of Human Behavior in Fires
Incidents and Case Studies

Triangle Shirtwaist Fire, NY 1911

- **148 garment workers dead**
- 9th floor alerted later than the other two floors
- One stair engulfed in flames, the other stair door locked
- Poorly structured external means of escape

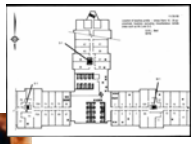
Beverly Hills Supper Club Fire, KY 1977

- **164 fatalities**
- 2400-2800 patrons located in the club
- Found at two overloaded exits
- Rapid arrival of smoke/gases
- Visual separation of people from incident
- Some actions from the staff were helpful, others did not provide aid

Best, 1977

MGM Grand, Las Vegas (1980)

- **85 fatalities, 650 injured**
- Smoke moved up through ventilation system
- Guests alerted early, or already awake able to escape
- Guests alerted later remained in rooms or moved to other rooms
- Most deaths caused by smoke inhalation on the upper floors



SFPE Handbook

http://www.co.clark.nv.us/fire/ccfd_mgm.htm

Valley Parade, UK 1985

- **56 fatalities, 200 injuries**
- Cigarette stub ignited stands
- Fans initially delayed movement
- Exits were locked
- Stand completely consumed by flames within minutes; some deaths occurred in stands

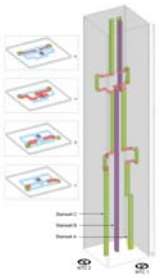
www.morethanmindgames.co.uk/?p=75

King's Cross Tube Station Fire, UK 1987

- **31 dead**
- Poor housekeeping
- No alarm or public address warning given
- Poor staff training
- Normal operations continued - loading and off-loading of passengers
- Conflicting information

World Trade Center Disaster, NY 2001

- 2,749 Fatalities
- 56 – 102 min escape time
- Stairwells destroyed by impact
- Conflicting guidance in WTC 2
- Delayed initiation
- Mobility impaired occupants (6%)
- Transfer corridors
- FF counterflow



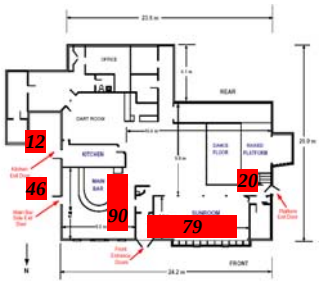
NIST Investigation

Station Nightclub Fire, RI 2003

- **100 fatalities**
- Rapid development of incident; looked like part of the show
- Uneven use of exits
- Design limited access to main exit
- Unfamiliar occupants with procedures/exits

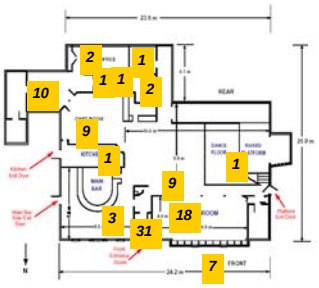
NIST Investigation

Exit Usage



NIST Investigation

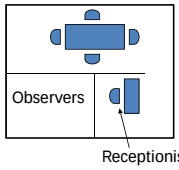
Location of Fatalities



NIST

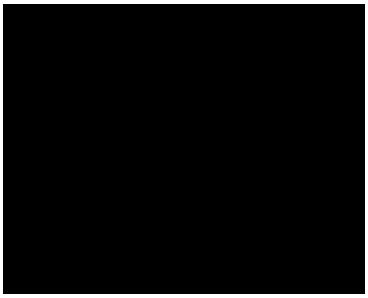
Latane and Darley Experiment

- Social Inhibition experiments
  - Subjects: 17-21 yr. old males (grad. & undergrad.) at Columbia Univ.
  - Volunteered to complete survey on "problems involved with life at an urban university"



- Upon turning 1st page of survey, titanium dioxide (white smoke) injected into room
- Volunteers were expected to stop completing survey and tell receptionist that something was "wrong"
- 15 minute limit

Latane and Darley Experiment



http://www.youtube.com/watch?v=KE5YwN4NW5o

Latane and Darley Experiment, cont.

Groups	# Reporting
Alone	18/24
Subject + 2 passive confederates	1/10
3 naïve subjects	3/8 groups

Reporting Time	Alone	3 Naïve
≤ 2 minutes	55%	12%
≤ 4 minutes	75%	12%
≤ 6 minutes	75%	38%

Summary

- 8 case studies are presented on how human behavior has influenced life safety outcomes (deaths, injuries)
- All different types of buildings and scenarios
- Various years from 1911 to present
- Human behavior is still very much an important component to understand in order to improve building safety in fires

35