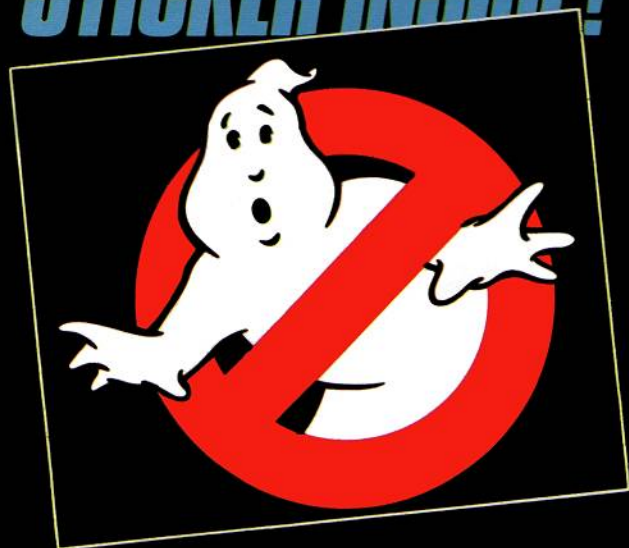


MARVEL No. 76 • SCIENCE FICTION • HORROR • FANTASY • ANIMATION • SPFX • 95p

# STARBURST™



**FREE  
STICKER INSIDE!**



**SPECIAL ISSUE**

**THE MAKING OF  
GHOSTBUSTERS**





**Volume 7, Number 4**  
**December 1984 issue**

**Editor:**  
**Alan McKenzie**

**Assistant Editor:**  
**Roger P. Birchall**

**Designer:**  
**Steve Cook**

**Production:**  
**Tim Hampson**

**Colour:**  
**Cheamworth Ltd**

**Typesetting:**  
**Type Generation**

**Distribution:**  
**Comag**

**Financial Controller**  
**James Sclater**

**Advertising:**  
**Sally Benson**

**Publisher:**  
**Stan Lee**

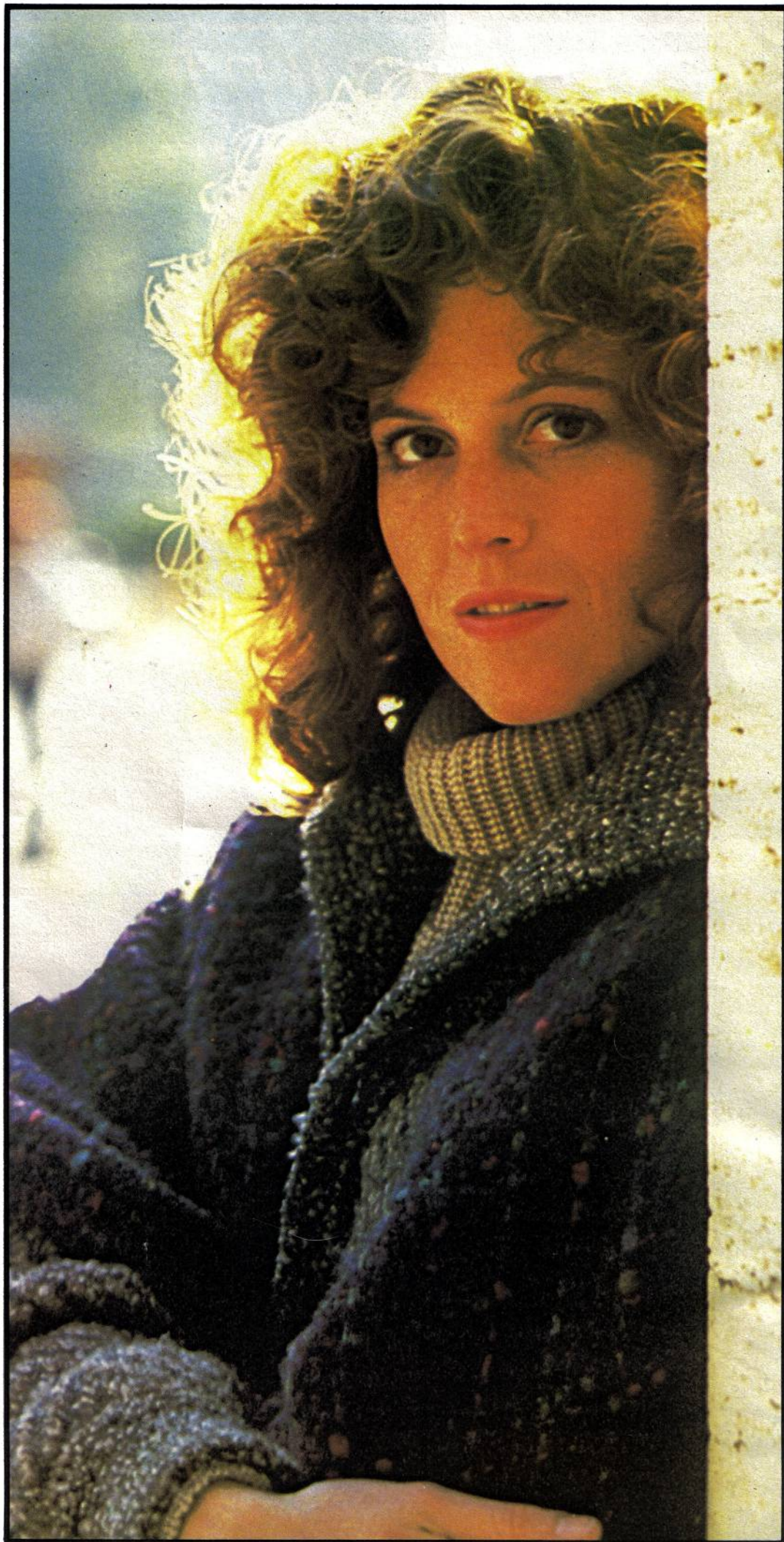
**Writers this issue:**

John Brosnan  
Chris Charles  
Tony Crawley  
Barry Forshaw  
Sally Gary  
Richard Holliss  
Alan Jones  
Francesca Landau  
Jean-Marc Lofficier  
Randy Lofficier  
Frances Lynn

Published monthly by Marvel Comics Ltd., 23 Redan Place, London W2, England. All photographic material is copyright © BBC, NBC, ABC, CBS, ITC, Columbia, New Realm, Rank, Twentieth Century-Fox, UIP, United Artists, Paramount, Warner Bros, Walt Disney Productions, CIC, EMI, MGM, MCA-Universal or Lucasfilm Ltd (unless otherwise stated) and appears with their kind permission. All remaining material is copyright © 1984 Marvel Comics Ltd., a subsidiary of Cadence Industries. Starburst is a tradename and trademark of Marvel Comics, Ltd. While contributions are encouraged, the publishers cannot be held responsible for unsolicited manuscripts and photos. All letters sent to Starburst will be considered for publication.

**Subscription information:** Annual subscriptions to Starburst magazine can be obtained by sending a cheque or postal order (send no cash) to the editorial address for £12.00 (overseas subscriptions are \$28.00 US currency). Delivery is by First Class Postage in the UK and by Air Speed for Overseas.

For display advertising contact Sally Benson at the editorial address. Telephone 01-221 1232. Printed in the United Kingdom.





# • CONTENTS •

## COVER STORY

We present a **Starburst** spooktacular on the making of *Ghostbusters*. Starting on page 10 we devote this issue to the scary, but fun, movie that is sure to take the country by storm this Christmas. *Ghostbusters* has done incredible business in America, and to find out why Randy and Jean-Marc Lofficier interview director Ivan Reitman (page 12), co-producer Michael Gross (page 16) and the technical team responsible for the film's amazing special effects (page 22). Everything you could possibly want to know about this spooky, cooky movie. So have no fear, the *Ghostbusters* are here!



<b>STARBURST LETTERS .....</b>	<b>4</b>
<b>THINGS TO COME .....</b>	<b>6</b>
<b>STARBURST FILM REVIEWS .....</b>	<b>38</b>
<b>VIDEO FILE .....</b>	<b>40</b>
<b>IT'S ONLY A MOVIE .....</b>	<b>42</b>
<b>TV ZONE .....</b>	<b>43</b>
<b>BOOK WORLD .....</b>	<b>45</b>
<b>STARBURST DATA BANK .....</b>	<b>46</b>

**"Our Gang" and "Their Gang" might seem puerile when facetiously describing, respectively, the contemporary crop of Fantasy film makers and The Establishment.**

William Friedkin, for example, is a film director who could be called "establishment", and what with films like *The Night They Raided Minsky's* and *The Boys in the Band* under his belt, this description is apt.

Winning five Oscars for his 1971 film, *The French Connection* — including Best Film and Best Direction, Friedkin's follow-up in 1973 was *The Exorcist*, which besides winning two Oscars (for Best Screenplay and Sound) was the only horror film to be nominated as Best Picture of the year!

But why was Friedkin showered with Establishment recognition — ie, Academy Awards, while authentic horror-thriller-fantasy film directors such as George Romero, David Cronenberg, John Carpenter, Dario Argento, Tobe Hooper, Brian de Palma, etc, go unrecognised? Because Friedkin is taken "seriously" by his Hollywood peers, having helmed general entertainment films

## • OPINION •

before hitting the jackpot with *The Exorcist*, a success he has, to date, not been able to repeat.

Steven Spielberg and George Lucas might be Establishment, but although their films have won Oscars (*Star Wars* won 7), and nominations for Best Picture and Best Direction, none of their films have actually won them the coveted Best Director or Best Film/Production laudat.

Where once correctly described as "new wave" film-makers, Lucas, Spielberg, Coppola, Milius and co are still regarded as "movie brats". But apart from a very few exceptions like Sam Raimi or *Children of the Corn* director Fritz Kiersch who have miraculously emerged from "nowhere" into the ranks of fantasy film makers, there is no totally new fresh creative talent to obliterate Today's fantasy geniuses — ie, "Our Gang" in the Innovation stakes.

The Film Business, like any business is politically incestuous, and giving credence to "It's Who You

Know...", several seemingly fresh-faced new fantasy directors have been more than successful with their new films. But on closer inspection, these talented new directors are themselves, veterans of the film industry, now directing films by virtue of association.

For example, take Nick Castle, director of the controversial film *The Last Starfighter*. He has metamorphosised into directing through his association with John Carpenter. Apart from playing The Shape in Carpenter's hit movie *Halloween*, he has art directed on several Carpenter films.

Scriptwriter Dan O'Bannon, famous for his *Alien* script, is due to direct *Return of the Living Dead* (not to be confused with George Romero's trilogy), a vehicle which Tobe Hooper rejected Hooper's current project is *Space Vampires* (aka, *Life Force*) scripted, curiously enough by Dan O'Bannon!

Take Joe Alves. He helmed *Jaws III* — 3D, but has an impressive career

background before directing his first film. He was not only production designer on John Carpenter's *Escape From New York* and *Close Encounters of the Third Kind*, but designed *Jaws* before working as 2nd unit director on *Jaws II*.

*Romancing the Stone* is directed by "newcomer" Robert Zemeckis, who through his association with Steven Spielberg and John Milius co-wrote Spielberg's *1941*, and co-wrote and directed *I Wanna Hold Your Hand*, which Spielberg executive-produced.

These Associates could be termed a "sub-wave" in the fantasy genre but whatever way one looks at it, may they be working for Studios or Independents, Fantasy film-makers are definitely "Our Gang".

They are more than generous when it comes to helping each other out on a creative level in relation to making Movies. "Their Gang" — The Establishment aren't so flexible in their working patterns, when it comes to helping each other out during a crisis. They weren't overtly sympathetic to now anti-establishment figure, Roman Polanski — were they?

Frances Lynn

# INTRODUCTION

**"G**hosts remind me of men's smart crack about women, you can't live with them and you can't live without them." Although the ghosts in Eugene O'Neill's *Strange Interlude* (1932) are mental ones, the supernatural kind have always been a favourite subject in the movies. Whether they have been portrayed as frightening, as in *Ghost Story* (1981) and *Poltergeist* (1982), romantic figures, as in *The Ghost and Mrs Muir* (1947) and *Dona Flor and Her Two Husbands* (1978), or even as the focus of comedy, such as in *Topper* (1937) and *Ghost Breakers* (1940), a good ghost story is always a welcome diversion.

*Ghostbusters* could definitely be said to have its origins in the latter category. The previous credits of Michael Gross, Associate Producer on the film, include the comedy television series, *Second City Television* and the *National Lampoon* magazine. Gross was also involved with director Ivan Reitman on the *Heavy Metal* movie (1981). He sees *Ghostbusters* as a revival of the comedy/horror genre of the 1930s and 1940s.

*Ghostbusters* had its beginnings in the fertile mind of comedian/writer Dan Aykroyd. One of the original stars of the television show *NBC's Saturday Night Live*, Aykroyd's film career includes such comedies as Steven Spielberg's *1941* (1979), John Landis' *The Blues Brothers* (1980) and *Trading Places* (1983), *Neighbors* (1982), *Dr Detroit*, and a role in *Twilight Zone: The Movie*. Aykroyd had previously worked with Ivan Reitman in Canada in a television show produced and directed by Reitman, *Greed*.

Aykroyd wrote a first draft screenplay and showed it to longtime friend and fellow *Saturday Night Live* alumnus, Bill Murray. Murray's first feature film role was in *Meatballs* (1979), which had been directed by Ivan Reitman and co-written by Harold Ramis. Murray also starred in *Where the Buffalo Roam* (1980), *Caddyshack* (1980), also co-written and directed by Ramis, and *Stripes* (1981), which co-starred Ramis and was directed by Reitman.

It is therefore not surprising that, when Aykroyd and Murray looked for a director, they decided to contact Ivan Reitman. It was Reitman who was instrumental in shifting the emphasis from the pure fantasy of Aykroyd's original concept, to broader and wilder comedy. It was also at Reitman's suggestion that Harold Ramis became involved as a writer and actor in the film. Ramis, in addition to the above-mentioned credits, co-wrote *National Lampoon's Animal House* (1978), and directed another *Saturday Night Live* alumnus, Chevy Chase, in the recent *National Lampoon's Vacation* (1983).

Once Ramis was involved in the project, the writers went off to Martha's Vineyard where, in the space of two months, a final draft of *Ghostbusters* was completed. Reitman had approached Columbia with the project in May of 1983. By June, the film was set to go, and Michael Gross was hired on. The only problem was, that the studio insisted the film be ready for an early summer 1984 release, in order to be in American theatres well before the Olympic games.

The story, as developed, concerns a trio of Columbia University scientists, the womanising Venkman (Murray), the money-hungry Stantz (Aykroyd) and the maniacal Spengler (Ramis), who are expelled from academia and set out to open their own business – hunting ghosts in New York City. The script included a plethora of special effects, such as the representations of the various ghosts and demons, the sophisticated weaponry used by the *Ghostbusters*, and a climactic battle with an extra-dimensional demon, named Gozer, who conjures up a 112 foot tall marshmallow man (the "Stay-Puft Man"!)

The casting of the film was completed with the addition of beautiful Sigourney Weaver, as Dana, a New York girl who lives in a building which is in reality the temple of Gozer, and whose refrigerator contains a doorway into Gozer's dimension. Sigourney Weaver's credits include Ridley Scott's *Alien* (1979), Peter Yates' *Eyewitness* (1981; UK title: *The Janitor*) and Peter Weir's *The Year of Living Dangerously* (1983). The cast also includes Ernie Hudson as Winston, an extra *Ghostbuster* hired when business is booming, and Rick Moranis as Louis, Dana's unfortunate neighbour. Hudson's recent films include *Spacehunter* and *Two of a Kind*. Moranis is one of the famed McKenzie Brothers from *Second City Television*.

On the technical side, in addition to the skills of Richard Edlund's newly-established B.F.C. special effects facility, which was selected to handle the considerable work of putting together the almost 200 effects shots required in the film, *Ghostbusters* was fortunate to enlist the talents of John De Cuir as Production Designer. De Cuir, who has been in the business since the 1940s, has won Academy Awards for *The King and I* (1956) and *Cleopatra* (1963). His other films include *Hello Dolly* (1969), *The Other Side of Midnight* (1977) and Steve Martin's *Dead Men Don't Wear Plaid* (1982). De Cuir's most difficult task on *Ghostbusters* was the designing of the "Gozer Temple" set on Sound Stage 16 at the Burbank Studios. This set, which was 60 feet tall, covered the entire stage, and cost over \$1 million! It represented the top of a New York apartment building and was surrounded by a back-lit, 360 degree, panoramic, New York skyline backdrop.

In this special *Ghostbusters* issue of *Starburst*, compiled and written by our Hollywood correspondents Jean-Marc and Randy Lofficier, we'll be looking at the making of the movie, through interviews with the director Ivan Reitman, associate producer Michael Gross and just about the whole special effects team, headed by Richard Edlund who has also worked on such movies as *Stars Wars* and *Brainstorm*.

## GHOSTBUSTERS (1984)

Bill Murray (as Dr Peter Venkman), Dan Aykroyd (Dr Raymond Stantz), Sigourney Weaver (Dana Barrett), Harold Ramis (Dr Egon Spengler), Rick Moranis (Louis Tully), Annie Potts (Janine Melnitz), William Atherton (Walter Peck), Ernie Hudson (Winston Zeddemore), David Margulies (The Mayor), Steven Tash (Male Student), Jennifer Runyon (Female Student), Slavitz Jovan (Gozer), Michael Ensign (Hotel Manager), Alice Drummond (Librarian), Jordan Charney (Dean Yeager), Timothy Carhart (Violinist), John Rothman (Library Administrator), Tom McDermott (Archbishop), Ruth Oliver (Library Ghost), Kim Herrin (Dream Ghost).

Directed by Ivan Reitman, Screenplay by Dan Aykroyd and Harold Ramis, Photographed by Lazlo Kovaks, Production design by John De Cuir, Edited by Sheldon Kahn and David Blewitt, Visual Effects by Richard Edlund, Music by Elmer Bernstein, Associate producers Joe Medjuck and Michael Gross, Produced by Ivan Reitman.

Time: 105 mins

Cert: PG

We wish to acknowledge the help of Unit Publicist Nancy Willen and Associate Producer Michael Gross. Without their kind assistance, this dossier would not have been possible.



---

# THE MAKING OF GHOSTBUSTERS

by Randy & Jean-Marc Lofficier





# INTERVIEW

## IVAN REITMAN,

# DIRECTOR

Ivan Reitman has had a multi-faceted career, with achievements in motion picture and television production, direction and writing. A native Czech whose family fled to Canada when he was 4, Reitman's entertainment career was launched after winning a prize in a national student competition for the Canadian Bicentennial. As a student, Reitman had also directed and produced several plays that aired on Canadian television.

Reitman first met with Dan Aykroyd when he produced a live television variety show, entitled *Greed*. Shortly thereafter, he produced *Spellbound* for the Toronto stage, which evolved into *The Magic Show*, a five-year hit on Broadway. After *The Magic Show*,



Reitman produced another Broadway show, based on *National Lampoon* magazine. The success of this production enabled Reitman to become acquainted with the magazine, and eventually led to the production of *Animal House* in 1978, starring John Belushi.

Reitman followed *Animal House* with *Meatballs* and *Stripes*, both starring Bill Murray. Reitman directed *Meatballs*, co-written by Harold Ramis, who also co-starred in *Stripes*. Then, in 1981, Reitman produced the animated SF fantasy picture, *Heavy Metal*. This year, in addition to *Ghostbusters* which once again reunites Murray, Aykroyd and Ramis, Reitman also produced and directed a musical magic show, entitled *Merlin*.

**Starburst:** When did you first get involved with *Ghostbusters*?

**Ivan REITMAN:** Dan Aykroyd had written a script called *Ghostbusters*, and showed it to Bill Murray. They liked it and they decided that I would be the director for the movie. They sent the script to me, and I didn't like it at all. I sort of hemmed and hawed about it, then I sat down with Danny and started discussing what I thought we should do with it. He really liked the ideas. I also suggested that we get Harold Ramis involved as a writer and an actor in the film. That was last May. So, we started all over again, using his draft really for certain incidents and characterisations. We really redid it pretty well from scratch.

We worked all summer. Bill Murray came back from shooting *The*

*Razor's Edge* in France, and we started shooting in October. It's not the fastest film I've ever been involved in, but considering the size of the production it's pretty remarkable.

**How much of the original script is still there?**

A lot of it is the kind of business that they're in. Two of the major incidents in the film were originally in that script, but reworked for the plot that we developed. His movie would have cost \$200 million to make, it was more of a science fiction extravaganza than a comedy. I wanted to make a comedy that also had science fiction stuff and neat effects in it. But, I felt that the weight had to be on the characterisations and the comedy, rather than the other way around, which was his script. I made it much more realistic, also in the process. I influenced its realism. They're the writers, and they did all the writing.

**Was there any resistance about changing it?**

No. Once Danny and I finally sat down face to face and talked about it, he was the most excited advocate. He couldn't wait and he seemed very appreciative of the whole development of it.

**After you got Harold Ramis in on the script, how long did it take from the time you started changing things around until you had a completed script ready to go?**

That first draft took about a month or five weeks. We went off to Martha's Vineyard, stayed there two weeks and did another draft.



Left: Ivan Reitman (this side of the camera) directs an early scene in the film outside the University where the Ghostbusters work. Below left: Hordes of ghosts and demons erupt from Ghostbusters HQ and swarm across the New York skyline. Right: The onion head ghost is interrupted by the Ghostbusters in the middle of a makeshift meal. Below: The Ghostbusters symbol. Below right: Dana Barrett (Sigourney Weaver) is buffeted by the elements as the demon Gozer holds sway over New York.



Then, we did another draft after that, that took two or three weeks. We did three drafts in the space of two months.

*Were there significant changes from one to the next?*

It was clearer where the movie was going with each draft and what the character differentiation was amongst the three of them. What the major plot incidents should be. That kept on shifting around. The science line became clearer.

*While you were doing the script, were you thinking in terms of what the special effects would entail?*

Yes. But we knew that we were going to be in real trouble, time-wise. Right away, the studio was saying, "We need this for next summer." And it was already less than a year away. Michael Gross contacted Richard Edlund, who we had heard was going to leave Industrial Light & Magic and set up a company here. I met him to find out what his plans were - I think this was already in June of last year - and he said it was true.

*What about the trials and tribulations of closing off Central Park for a week when you went on location in New York?*

They weren't happy about that at all. They felt that didn't have a good location manager. We should have been talked out of the location that we ended up choosing. It was right in the middle of three very important arteries. Quite apart from the Central Park West, which is a





Above: Ghostbusters! Dr Peter Venkman (Bill Murray), Dr Raymond Stantz (Dan Aykroyd) and Dr Egon Spengler (Harold Ramis) pose for a commercial before their New York centre of operations. Below: The massive set for the rooftop Temple of Gozer, where the Ghostbusters make their last stand. Right: Chaos reigns at the foot of Dana Barrett's apartment building (which also houses the Temple) as the supernatural forces gather strength.



north-south flowing. . . that was relatively easy to close. It was the east-west, crosstown traffic, flowing through 64th, 61st and 67th, right in the area where we were shooting. We had blocked those up too and one Friday night we apparently gridlocked Manhattan Island for about an hour.

*Didn't the Film Commission try to talk you out of shooting there?*

Yes, they did. But by then it was too late, because we were deep into the building the big set that matched the exteriors, and there was a lot of other money spent, specifically for that building.

*Why did you decide to build such a massive set for the rooftop scene?*

John De Cuir, the production designer, is the last of the grand masters. It was appropriate to the story. For the confrontation, basically we needed. . . I guess we could have built half of a rooftop, and sort of tried to play the action that way. But, it wasn't that great a saving. Once you've built the scaffolding and everything, for the extra ten percent, you might as well go the rest of the way.

*What sort of problems did the size of the set cause you?*

Well, we couldn't shoot at just any angle, but we had a fair amount of freedom. It was also so big, that it took forever to light. I think there are only 12 Titans (lights) existing in the world, and we used ten of them on the stage. During certain key scenes, no other filming could take place on the Burbank lot! So, we tried to do it during the Christmas break time, and we scheduled carefully those days, so it would occur when there was no other filming. I think the last time this kind of power





Left: *Ghostbusters* producer/director Ivan Reitman on location with the cast and crew in Manhattan. Above: Sigourney Weaver plays Dana Barrett, a New York musician who is selected from millions to be the emissary of Gozer known as the Gate Keeper.

was used was for the big set on *Close Encounters*, when the mothership landed.

*How did it strike you, when you read the script, that your major antagonist in this film was going to be a giant marshmallow?*

It was what worried me, because the film was very realistic until that point. As long as you accepted the theory as it developed, each thing led to the other quite naturally, and that's where it suddenly took a left turn and went way beyond. I kept on worrying that it might not work. And, going into filming I still thought that it might not work. Now that I've seen it, I think it works, but I won't be able to tell until I've seen it all complete.

*Did you have as a contingency plan in case it didn't work?*

The reason it stayed was because we couldn't come up with anything that sounded as good. It's part of the risks of film making!

*Do you think that having to be a part of setting up a new special effects facility made your job more difficult?*

I think it made Richard Edlund's job more difficult. He had to build a company and get it up to working speed. They've only hit their stride about a month ago, so it put them into a terrible crunch, getting this film ready. For us, it's a problem because it means we're rushed in terms of getting some of the effects done. There's 195 effects shots in the film at this moment. And, it was more expensive as a result of a lot of it going into the physical set up, as opposed to into the movie itself. *What are you doing about scoring, since the film isn't yet finished?*

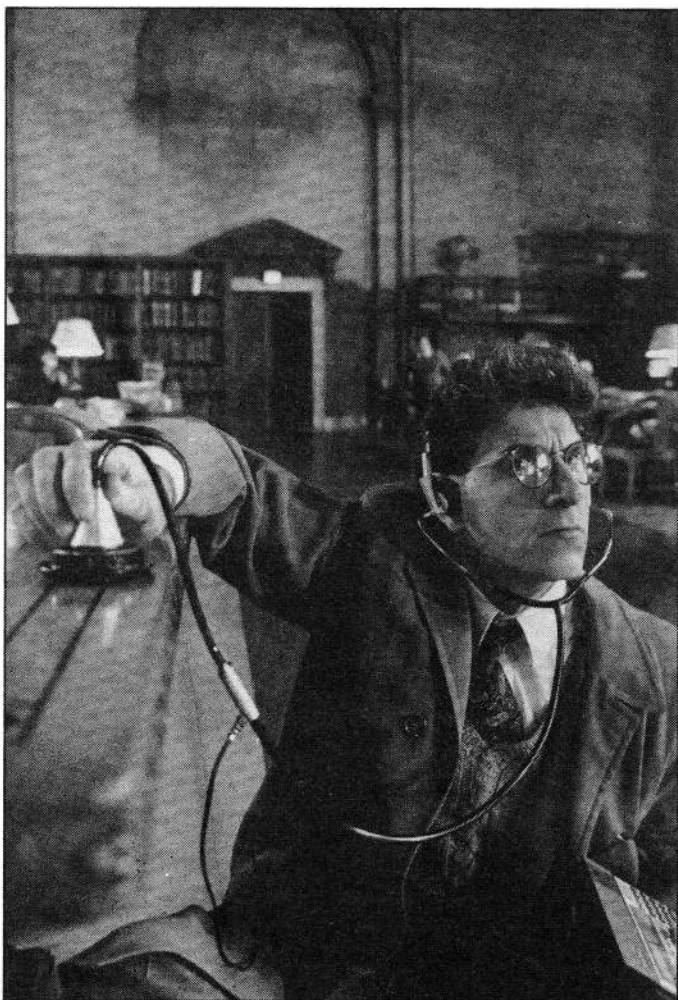
Elmer Bernstein started looking at footage in December, while we were still filming. We had reels cut together before we finished filming. He's been working on it, and he's now into it very heavily.

*You're editing the film, yet the special effects aren't done. Is that a problem for you?*

Yeah! We have these sort of black and white slugs all over the place. They have just a plate or some crude line drawings in them. But one thing I learned from *Heavy Metal* and from *Spacehunter* to a certain extent is that the film better work without the special effects or you can forget it. Whatever inadequacies we felt in the work prints of both *Spacehunter* and *Heavy Metal* didn't disappear when the film was completed. Even though we always told ourselves that, "Well, *Spacehunter* will work better once we actually see it in 3-D, and it's all together with the effects." Or for *Heavy Metal* "Once all the colour and effects are in it will work better." But, it didn't. It worked basically just the way it did only it was more polished.

I screened *Ghostbusters* in its rough state, without any effects at all, except the mechanical ones that we did on set, to small audiences just to see. I figured it was going to have to work as it is. It will only get better, but it better work right now. Fortunately, it did. I found I'm no longer relying on the inclusion of everything to save me. My approach was that it's got to work as a movie without anything in its roughest form without special effects, audio effects, proper colour balancing or music. If it works then, you know it's going to work. ■





# INTERVIEW

## MICHAEL GROSS

### ASSOCIATE PRODUCER

**Starburst:** Could you go over your background?

**Michael GROSS:** Basically, it's a design background. I went to Pratt as an illustrator/artist. When I was a teenager I used to make home movies with Don Shay\*. We did movies together when we were fifteen years old, monster movies, creatures in caves, all the stuff we're doing now! It was a lot cheaper then.

I was the first art director of *National Lampoon* magazine for its first five years. Of course, Bill Murray and Ivan did films for *National Lampoon*. Ivan knew Dan Aykroyd from back in Canada, years ago, when he had produced a television show. Then, Ivan produced a *National Lampoon* off-Broadway show, called *The National Lampoon Show*, which had Bill and Bill's brother in it, John Belushi, Gilda Radner, all of what became the *Saturday Night Live* people. And I was at the *Lampoon* at the time. So I knew all those guys. At that point, I also met Ivan, briefly.

I stayed in magazines and did some other things. When I was in New York I had my own design firm and I was also doing some television work and producing small, basically museum and industrial films. I gave up on print finally. I just decided that magazines were dying, books were limited for what my involvement was, so I left New York to come here to make films.

Because *Heavy Metal* was a sister publication to *National Lampoon*, I was involved in their early plans to make a film out of it while I was in New York. The *Heavy Metal* film project was then taken to Ivan. He wanted to do it, and raised the money in Canada. I got involved in it. I was the production designer on it, but I was also the associate producer. Ivan thought that his involvement as a producer would be picked up a little more by the other producer, but it wasn't. We also had a weak director, frankly. We found ourselves in a position where Ivan was also doing *Stripes*, and *Heavy Metal* had to get done. So, my responsibilities increased until I was really functioning as line producer on the thing, as well as the production designer.

Ivan and I have worked together mostly ever since, but I've been off doing other things. I was with the *Second City Television* show. I have an Emmy nomination for my design work for that. I've done other projects in between, but basically, I keep coming back and working with Ivan.

**What was the first thing that you did on *Ghostbusters* when you started?**

There are two associate producers on the picture, Joe Medjuk and myself. We tend to separate our duties for Ivan. Mine are almost exclusively in the area of design and special effects.

Once an art director is on, he has the responsibility for sets and the look of the movie on a large scale. John De Cuir is a great man. He had no problems understanding that I would also have a lot of input on the design of the creatures, etc. . . It all comes to what Ivan and I both call a kind of contemporary science-fiction, indoor humour sensibility, that is very hard to find if you just plug into people already in the film business. There's a contemporary thing going on that was reflected in *Heavy Metal*, in the *National Lampoon* and in other places, which doesn't involve an entire industry. It's a sensibility. Ivan and I share that sensibility, and he trusts me.

So, if you were to take a lot of people in the film business and ask them to design ghosts, you could be a long time getting there. So what I immediately did was to put together a number of designers. We had some design work that had been done out of the country, in Canada, and we just started putting concepts together. What do the ghosts look like? What does a Terror Dog look like? What is this creature we're talking about? And, of course the script was changing as fast as we could even work on it. But it was just to try and conceptualise what all this was about.

\* Now the editor of *Cinefex*.





Then, we had to start storyboarding immediately. The biggest immediate problem, obviously, was that we knew we had a range of special effects that were so large and extraordinary, and such a short amount of time to do them. The problem was, where were we going to go with it? I.L.M. couldn't take us. At that time, *Dune* was at Apogee, and not only that, but it looked like *Dune* was going to spread itself all over town. . . We could have gone to people like Dreamquest, for whom I have a great deal of respect, but they really weren't big enough to take on a project of this scale. And, they were the first to recognise that there were effects in this film that, although they could have done them, it would have been the first time they were doing them. We also just didn't know how much research and development there was going to be. . . So, we just didn't have the time.

It was at that point that someone came to me and said I should talk to Richard Edlund, because he was leaving I.L.M. and setting up his own shop down here. So, I talked to him, gave him a script, and it all fell right into place. What happened then is that the shop that Edlund set up here is being financed by Columbia and MGM/UA jointly, to do *Ghostbusters* and *2010*. But, if that hadn't happened, where would we have gone? I don't know. Frankly, there's a good chance that we would not have been able to make the film, at least not on time.

We then had the added benefit that a lot of the people that work for Edlund had worked for him in the past on other films, including *Poltergeist*. The advantage of having people like John Bruno, for

example, who have literally handled ghosts before, was a great benefit. Ironically, now, in the cut of the picture, we have removed most of the ghosts.

*Tell us more about the designs of the various ghosts*

While the script was metamorphosing, we had to decide what these things would look like. It's easy to talk about a ghost, but then you say you want an original ghost. . . For example, in the film, we have this thing called Onion Head, which is not a guy running around with a big onion for a head, but is a ghost. So we had to decide on what he would be like.

Another example, the Terror Dogs. At one point the Terror Dogs were dogs that were something running from Gozer's dimension. They were big, buffoon-like, silly, almost loveable animals. Not really loveable, because they were monsters, but stupid, drooling like demented dogs! Then, at another point, they were almost skeletal. But it wasn't until we reached the point in the script when we realised that these dogs were coming here with a purpose – to devour these people – that the concept solidified. But, it solidified in the midst of a schedule that was so difficult that we were actually putting together the effects people to construct it as we were still trying to decide what it was. That kind of race was constant.

*What about the storyboards? That was obviously going on at the same time. . .*

Yes. Again, we had to start storyboarding early, just to get the scenes locked down. We were storyboarding even before we got the effects people on, which is not a great thing to do! It helps the director and everybody else to see just what the scene might be, but really the effects people have to do the storyboarding, because what they do, in effect, is storyboard what they know they can produce. ►

Opposite top: Dr Egon Spengler (Harold Ramis) checks out a New York library for signs of a haunting. Opposite below: The *Ghostbusters* pose by the *Ghostbusters*-mobile. Above: Bad times for Dana Barrett (Sigourney Weaver) as the minions of Gozer take her captive.





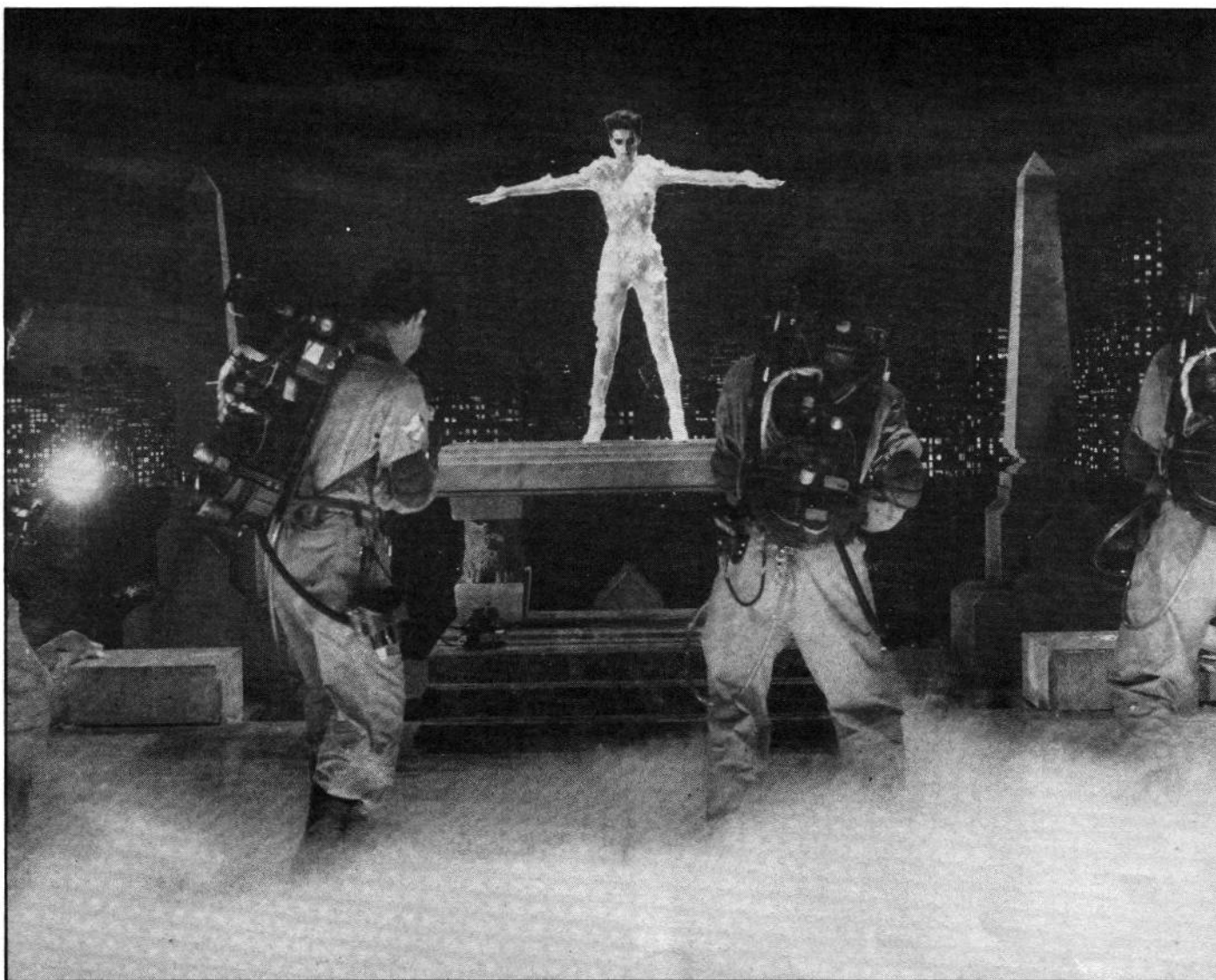
Then, John Bruno came on. We had wanted him on early, but he was in France, working on Cheech and Chong's *Corsican Brothers* film. By the time he got over here, we had half of the film 'boarded already. So, he had to go re'board ninety percent of that, as well as 'board some original stuff that hadn't yet been done. There was some advantage to this, however. For instance, he was given a scene that played in a way that we liked already, so it didn't have to be totally conceived and thought of from scratch. It was just a matter of fixing it to make it work. So, we didn't lose by starting early. We did, in fact, gain because it enabled us to lay a scene down in front of Ivan so that he could see it. He cut some things, because he looked at it and decided he didn't really need them.

A lot of the special effects work that was in the first draft of the script remained unchanged in the last two drafts. But some sequences were rearranged around. A character was added, other characters were changed, but the effects scenes, a lot of them, isolated as they were, remained in the film unchanged. So, a lot of that boarding, even with the changes, wasn't lost.

*What about reconciling the fact that the film is a funny and a scary film at the same time? That's an odd combination of elements to have to deal with. . .*

That's a good question, because that is the single hardest problem of the whole film. Scary-silly. . . I can only think of twice having to deal with that in a film. As a genre, sometimes in the Thirties and Forties,





you had *Hold that Ghost*, *Ghostbreakers* and all the rest of it. In these films, you relied on the horror movie cliché for the scary part, and then you played the humour against it.

That kind of thinking died away, certainly in the late Fifties and didn't exist at all in the Sixties. Then, Landis came back with *An American Werewolf in London*, in an entirely different way, certainly a drier, wrier bizarre humour, and horror that was truly scary, to the point where either it was brilliant and you loved it, or you hated it. I sat with audiences that were confused as to whether they should be laughing or screaming, and maybe that was his point as well.

We don't have that problem with *Ghostbusters*. We've clearly made up our minds with this film. It's a comedy – broad, big, bold. This is much closer to the Forties way of thinking about it, but with contemporary sensibilities, humour, talents, and a contemporary way of looking at horror. The only exception to that is, that we don't do what a lot of contemporary horror films do, and that is we don't repulse you. It's more a fun film, like the Forties'. There's no blood, there's no people turning inside out. We don't want to put things on the screen that people can't look at.

*The Onion Head ghost is funny. And so is the Marshmallow creature in a weird sort of way.*

Well, the Onion Head ghost is a clear exception to this, because we decided to make him a funny ghost from the start. And, even then, we certainly didn't want to make him like *Casper*. We had to make him something else. We think he works in the sensibility of the film.

As regards the Stay-Puft Marshmallow man, that concept was in Dan's original script. All the way along, we kept asking people, "Do you think this is over the edge?" As we got closer and closer to it, I now think it is brilliant. I think it's just the perfect touch to end the whole movie. It would have been so embarrassing to walk any kind of real monster up that street. You would have had *Godzilla*, which you can't

take seriously anyway. But, at the same time, it walks a line because it has to be threatening, in a kind of ironic sort of way. So you can't have a Thanksgiving Day parade balloon come up the street. It just walks a very, strange fine line. . . . It does work conceptually in the script, and I think it does visually, the way we've produced it.

The Stay-Puft Man would have been ruined entirely, in my opinion, if he ever did a funny take. Or if somebody did something silly with him. He has to maintain a very straight, purposeful path through this. One of the problems that we're having at the effects end, is that a lot of the puppeteers, having had the flood gates opened with the Onion Head ghost, are just overdoing him now. . . . It came out a little too buffoonish, too broad, too silly. So we're having to go back and calm it down a little.



**Opposite:** Dana Barrett (Sigourney Weaver) is possessed by the will of Gozer, a terrifying demon who plans to destroy the world, starting with Manhattan. **Top:** The physical form of Gozer (Slavitz Jovan) confronts the Ghostbusters. **Right:** Stantz (Dan Aykroyd) and Winston (Ernie Hudson) arrive too late to stop the captured phantoms being released from Ghostbusters HQ.





► **What were some of the problems encountered in shooting in New York?**

One of the more amazing feats accomplished in this film was a "stunt" put together by Chuck Gaspar, who does the physical effects, and by John De Cuir, who designed it. They worked out something that's really spectacular. But, it made working in New York quite difficult. . . . That "stunt" deals with a scene in which the boys fall into a hole in the ground in front of the Gozer building in New York City. Obviously, we couldn't dig a hole in the streets of New York, although John De Cuir wanted to! So, for a couple hundred thousand dollars, we worked out a great "stunt".

When the guys rise up out of the hole, as well as when there are people screaming in the streets, what you actually see is tremendous rubble in front of the building. The asphalt is torn up, at extreme angles. There is a police car in the hole, steam pipes are coming out, etc. . . . Well, we couldn't go into the street to shoot this, so all that was built on top of the real street! The street is still there, of course, and there are fake pieces of it, all cut at strategic angles, to cover the fact that there is no hole in it. The automobile is cut in half and tilted up at that angle. . . .

So, now, at one point in the film, you see the ground open up, and you see the hole, and you see the guys fall down in the hole. That was all a recreation of the front of the building and the street, built over here on the Columbia Ranch, and which could only be shot in a limited number of ways. We dug a hole in the ground, and Chuck Gaspar rigged a street that is hydraulically controlled to collapse. So, the pieces just split and collapse, and everything falls right into it, stunt car, stunt men, etc. . . . The steam pipes pop up. . . . When you intercut it with the stuff we shot in New York, you can't tell that it's not there. *What about some of the other problems of shooting in New York, such as closing off Central Park?*

*Peter Venkman (Bill Murray), fast-talking University lecturer, lines up a date with a pretty but gullible student (Jennifer Runyon).*

Mostly traffic problems. New York is a city that is already congested to the limit, and when you take Central Park West and you close down everything but one lane, and it leaves only 65th Street, which is a transverse that runs through the park, and that's already slowed down to a halt — you've tied up a third of Manhattan all the while you're shooting. We even shot through Friday rush hour once.

The hotel where we were staying was down the street from where we were shooting. I remember walking down at the end of one shooting day and hearing car horns beeping from as far away as the low Fifties. I went into the bar of the hotel, and sat down to have a beer. I had a button on my coat which was one of our crew buttons, so we could be identified in the masses. This guy came in and said, "Jesus Christ! Two and a half hours to get from Thirtieth Street to here! What the hell is going on up there!" Some other guy jumps up at the bar and says, "A bunch of sons of b... are making a movie! They're screwing up half the town, making a g-d movie!" So, I took my button off, stuck it in my pocket and hid it. Normally, you'd be in a place like that, kind of proud that you're making a film, but not us! I wasn't going to say a word! At one point, some guy asked me what I do, and I said I worked for a subsidiary of Coca Cola!\*

But, the press treated us very well, and most people had a really good time. People do like to see a movie shot, and the New York extras were fabulous. It was difficult only because we were on the streets the whole time. I can't think of a single outrageous anecdote, however. We only shot there about three and a half weeks. We had Central Park closed off for a week. There was a point, when we were coming to our last day, when we went to one of the cops who headed the group of patrolmen that we had on the film, and he said, "We may need to shoot another half day, a Saturday." He said, "No, you're not. It's over, you're wrapping at 11.30 tonight." They were great, but it was tough on everybody.

\* Columbia, who is producing *Ghostbusters*, is a subsidiary of the Coca-Cola company.



# GHOSTBUSTERS

# SPFX



**B**ecause of the large quantity of special effects required by the story – almost 200 shots – and the pressure of a very short production schedule, *Ghostbusters* could have turned into what industry people sometimes refer to as a “nightmare”. Yet, the film was delivered on time, although not without its normal share of crises and problems.

## ENTER: EDLUND

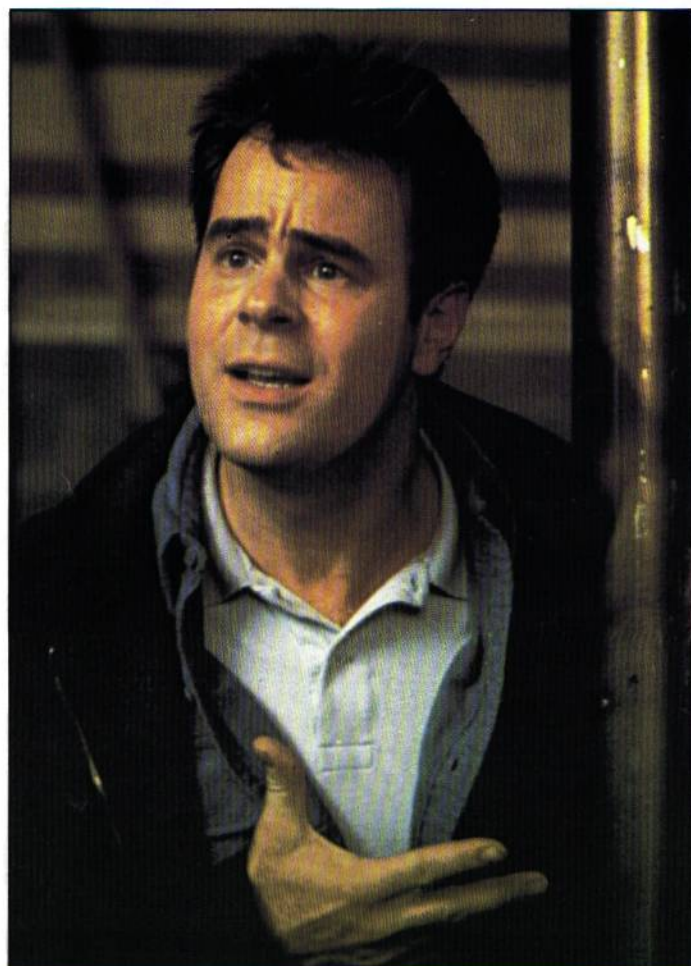
The story of the special effects of *Ghostbusters* is, coincidentally, also that of the first film made by B.F.C., a new special effects house set up by Academy Award winner Richard Edlund. Very early on, a team of designers had started work, storyboarding the film. Meanwhile, the production had gone looking for a special effects house that could handle the sheer volume of work in the prescribed period of time. They were delighted to find that Richard Edlund had left George Lucas' Industrial Light and Magic SPFX company in San Rafael, to form his own effects facility in the Los Angeles area.

“I had spent a great deal of time under the Lucasfilm umbrella,” says Edlund, whose credits include the *Star Wars* films, *Raiders of the Lost Ark*, and *Poltergeist*. “I wanted to go out and get wet myself. I felt that, once I had finished *Jedi*, my job was essentially done. Some opportunities began to present themselves down in L.A. There were a number of close friends and working associates who also felt the need to change their situations, so we mutually decided to come down here.”

Edlund had maintained an “ongoing communication” with Douglas Trumbull since the days of *Star Wars*. Aware that Trumbull wanted to direct pictures (as evidenced by his recent *Brainstorm*), and that Trumbull's partner, Richard Yuricich, wanted to become a Director of Photography in features, Edlund went into partnership with the two men. He and his friends moved into the premises of Trumbull's and Yuricich's Venice-based E.E.G. “We're partners in this operation now, from the standpoint of the facility and the equipment,” Edlund explains. “But the people who are working with me here are an intact group.” They renamed the company B.F.C.



Left: Peter Venkman (Bill Murray) and Dana Barrett (Sigourney Weaver) hanging on in there after the battle with the Stay Puft man. Right: The Ghostbusters hold the Stay Puft Man at bay with their anti-ghost guns. Below left: Gunfight at the Temple of Gozer. Spengler (Harold Ramis), Stantz (Dan Aykroyd), Venkman and Zeddemore (Ernie Hudson) blast the demon. Below centre: Slavitz Jovan as the physical form of the demon Gozer and a Terror Dog friend. Below right: Danny Aykroyd as the bungling Dr Raymond Stantz.



## TOOLING UP FOR GHOSTBUSTERS

Early on, Edlund decided that B.F.C. would do most of its work in the 65mm format. He explains, "I sort of resurrected Vistavision\* on *Star Wars*. Vistavision is a good format, in that you can use spherical lenses and work with a reduction when you composite. When you do that, you always have a generation (quality) loss. By reducing in composite, you minimise that generation loss."

One of the first things that Edlund and his team did, was to either build new equipment, or modify that which was already in place. "I'm not the type of person that has to have all the equipment in hand, in order to do anything. I can build up the equipment and get it all ready to go. That's what we've done here. We have different ways of working than Douglas and Richard. We had to build a 65mm aerial head, optical printer\*, which was a first priority. We built a magnificent printer, and I think it's the best one yet. It's the third one that I've built, basically from scratch. The quality of the dupes are the best that I've ever seen. We built it with a huge casting of ductal iron, so that it's

solid as a rock. We can have an earthquake and not miss a frame.

"We put optics on the other two printers that were here. I also brought my 35mm printer in, so that we have 35mm capability as well. Then, the other main achievement is the high-speed, 65mm reflex camera built by Gene Whiteman (Whiteman was Equipment Supervising Engineer on *The Empire Strikes Back*, *Raiders of the Lost Ark* and *Return of the Jedi*. He also designed the optical printer used on *E.T.*). It's the only spinning mirror reflex 65mm camera that I know of. It's the only 65mm camera that will run over 100 frames a second. We'll have it up to 120 pretty quick, and have had up to 105 so far. I think we can probably get it faster than that, but we just don't want to mess around with it – we don't have time to finesse that last 15 frames a second at this point. The camera is in such demand every day that it's scheduled from shot to shot. We finish one and it's on to the next."

B.F.C.'s start-up was financed jointly by Columbia and MGM/UA to handle the effects on both *Ghostbusters* and *2010*. "The theory here," Edlund continues, "is to have two projects all the time, one of which releases about six months after the other one. That would be the ideal working situation for us as a group, because I find that to have more ►





Above: The Demon Gozer (Slavitz Jovan). Centre, top to bottom: Ghostbusters Special Effects! The Temple of Gozer, atop Dana's apartment building, is charged with elemental energy. Louis Tully (Rick Moranis) and Dana Barrett (Sigourney Weaver) as Gozer's chosen disciples, absorb the power of Gozer. The Ghostbusters warily enter the inner chamber of Gozer's Temple. Far right top: A Terror Dog, one of Gozer's emissaries. Bottom right: After the climactic battle with the forces of Darkness, Venkman (Billy Murray) helps Dana away from the carnage. Bottom far right: Time enough for Love when New York is safe once more.

► than one project focusing on the same date, in the same house, really causes pandemonium. That way, too, the different departments can segue from project to project, and maintain a continuity of effort over a period of time. I would not want, all of a sudden, to run out of things to do around here, because then you have the prospect of losing this marvellous chemistry of personality and talent!"

This blending of people is, to Edlund, the most important aspect of a top quality effects facility. He feels that the enthusiasm generated by his team has added to their creativity. "I have a 'Hunting Band' theory," says Edlund. "There is a core group of twenty or so people here that all have a good inner relationship. Some of them came with me and others, whom I've known for years were already here. When you have that kind of situation, then you have control of the whole, because everyone within the Hunting Band is going after the same goal. I guess my main function is to go through and talk to all these people, make sure that everything is all right, see what people are doing, maybe making suggestions or listening to suggestions from others. Then, when we all get together in the screening room on a project, everyone gets to understand and come up with a suggestion

for something that doesn't have to do with their speciality."

Richard Kerrigan, Production Supervisor, whose credits include Effects Production Associate on *The Right Stuff*, feels that this "team spirit" is what makes B.F.C. different than other companies. "Someone once told me that filmmaking wasn't a democracy," he says. "But at B.F.C. it is more of a democracy. Richard Edlund is the fountainhead, but people relate more directly to him than in other organisations. Normally, in other organisations, you come to the production manager who assumes more of a stronger political position. But it doesn't work that way here. My job function is more to make sure that everybody is talking to everybody, make sure that the shots are getting done correctly, and generally taking a 'Can I help you?' posture."

## BRUNO AND THE TERROR DOGS

In addition to the considerable expertise and team-work that Richard Edlund and his crew brought to *Ghostbusters*, there was an added benefit in their participation. Most had worked on *Poltergeist*, giving





them prior experience in handling ghosts. Visual Effects Art Director, John Bruno for example, was Visual Effects Animation Supervisor on the Steven Spielberg/Tobe Hooper film. He had also worked with Ivan Reitman on the *Heavy Metal* movie, as Special Effects Director.

Bruno was in France, working as Production Designer on Cheech and Chong's *Corsican Brothers* movie, when he was contacted to work on *Ghostbusters*. "During that time, I kept getting calls telling me that this project was going, and they needed me to come back and start designing the effects shots. I was really swamped over there, and started on this thing six weeks late. When I came back, a lot of the film had been 'boarded'. The only thing that I originally 'boarded' was all the Terror Dogs scenes, because there wasn't anything done on that earlier. Otherwise, it was all basically redone. I came in with a more direct approach as to how the effects would be done. I would design a shot that I believed could be done. I always approached 'boarding' by trying to see the best way, the most spectacular way in which it can be done, within the context of the story."

Bruno would rough out the 'boards and show them to Reitman for approval. Then, they would be cleaned up and sent for final approval,

where it would sometimes be decided if more or less action was needed, or if any other changes should be made. The final stage was to have a meeting of cameraman Bill Neil, Richard Edlund, Terry Windell and Garry Waller of the animation department, and Matte Camera Supervisor, Neil Krepela. They would look over the shots and decide what effects elements were necessary to bring the scene to life. Their decisions were then written into the notes on the storyboard.

"We decided early on," adds Bruno, "that what we didn't have on this film, was the total luxury for research and development, although there was some. We don't have a situation where we have three different methods to choose from. If there were six to eight months to finish, we could experiment and see what produced the best results. In this particular case, it has been, 'I feel that this is going to work, I've done it enough before to know it will. Therefore it's better to go this way than trying to develop another method. . .'"

Bruno sums up his philosophy, "Basically, effects are impression. You're just supposed to show enough so that audiences know what the scene is all about. You don't want to go back and hold on so that you can see the effect. *Star Wars* is a whole series of two-second shots."





► Most good effects films are. We have been pushed to another maximum on *Ghostbusters*, in that some of our shots are fairly long. At this point, we're trying to trim them down a little, because there isn't an effects shot in the world that you can get away with for twenty seconds."

## SHOOTING IN GOZER'S TEMPLE

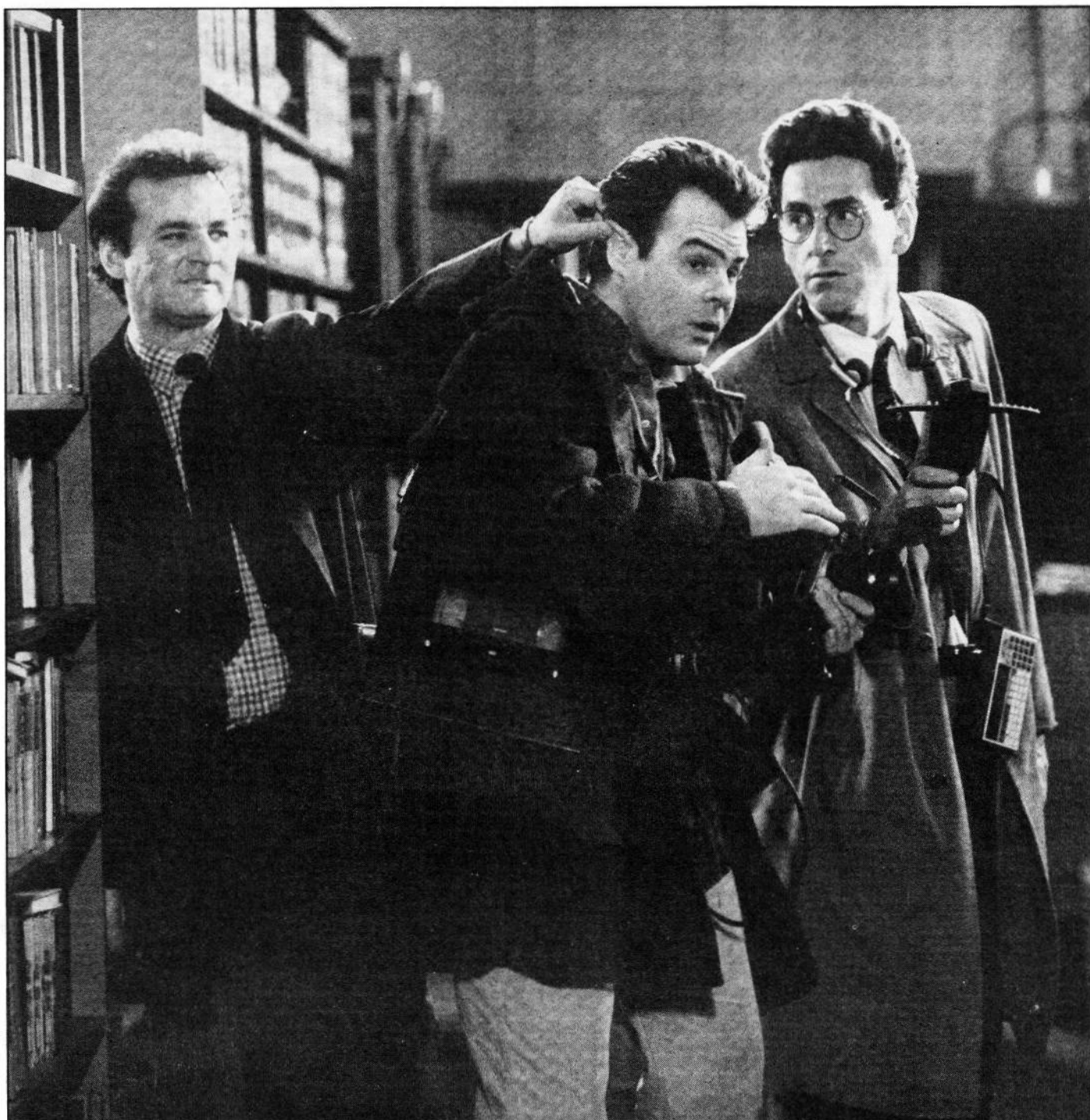
Because *Ghostbusters* was shot partly on location in New York, and partly on Stage 16 at the Burbank Studios, where John De Cuir had built his giant Gozer Temple set, a number of mattes were required to enhance the picture. This job fell to Neil Krepela, Matte Camera Supervisor, who came with Edlund from I.L.M., and Matthew Yurichich who did the matte paintings for the film. Yurichich, one of the most respected matte artists in the industry, has worked on such classics as *The Day the Earth Stood Still* (1951), *Forbidden Planet* (1956), *Ben-Hur* (1959), *Mutiny on the Bounty* (1962), *Close Encounters of the Third Kind*, *Star Trek: The Motion Picture* (1979) and *Blade Runner* (1982).

"There are about fifty mattes in this picture" says Yurichich, "and they're mostly architectural. To match with the temple top created by

John De Cuir, I added about thirty storeys on to the building that we actually used in New York. It's actually an old-fashioned kind of matte work, because you must respect the realism, and yet take license with it. In a way, this is harder because what you're painting is really out there. For instance, there are many buildings two, three or four times taller than this one building. We cut those other buildings down shorter, so that the temple top looks like it's up there alone. We want this to be the building that you see. That in itself is difficult, because the building looks different. Whenever you see the Empire State building in the New York skyline you buy it, because you're familiar with it. This building looks real, but people are going to wonder where it came from.

"The panoramic views of New York posed a problem, because it was like having two paintings on one. On one hand, we're painting a building on top of an existing building, and the two have to fit together. Now, whatever camera trick they use to bring it together, will change my painting of the whole city panorama. So, I have to get the centrepiece tied together well enough that I know how to go on from there.





Opposite top left: Dana Barrett (Sigourney Weaver) as the Gate Keeper is charged with the supernatural power of Gozer. Opposite top right: The Ghostbusters strike an heroic pose after saving New York from a fate worse than oblivion. Opposite below: Stantz (Dan Aykroyd) and Winston (Ernie Hudson) pull up outside Ghostbusters HQ. Above: Venkman (Bill Murray) begins to lose patience with Stantz and Spengler (Harold Ramis) during the haunted library scene.

"We also did a lot of what I call 'band-aid shots,'" adds Krepela. "They're not matte paintings in the truest sense, more like fix-its! It might be just taking one building down. Or, if you're going to shoot one little scene, and you want to change one area to make an effect work better, or because somebody forgot something that's going to cause a problem, we can paint it out or put something else in there. For example, in one scene, we painted out some street lights that really cluttered the frame. It's certainly cheaper than going back with the cast and crew and shoot the whole scene all over again."

## MATCHING SPFX TO LIVE ACTION

Edlund and his crew took one of their two 65mm cameras down to Stage 16 and on location in New York. "We used the high speed 65mm reflex camera, and a Mitchell camera that was all decked out for location shooting," explains Edlund. "The Mitchell, for example, is perfectly steady and hotrodded for effects work. Our field is so rarified, that almost everything has been hotrodded to some degree."

Neil Krepela worked with Director of Photography Laszlo Kovacs,

A.S.C., to ensure that the 65mm footage would match that of the 35mm live action photography. "We used the 65mm cameras to shoot simultaneously with the 35mm cameras," he explains. "We would pick a different angle, or we would have a different shot than the first unit. We shot a lot of the temple sequence using the 65mm in a wide shot, with a bluescreen behind it, while the 35mm was getting the same actions right next to us on a tight close-up on one of the characters. On many occasions, there were four cameras running, two 65mms and two 35mms. We did that because the director wanted to cover all the angles on scenes that were difficult to re-stage."

"We pretty much told Laszlo our needs for exposing our negative. We overexpose, as compared to what he's doing with his negative. We rate our film a little different, more towards the normal of what Kodak specifies, to get a heavier negative. We find that, as we add effects, the heavier negative dupes better in the optical printer than the thinner negative that you get away with in normal live action production. Laszlo knew that, and he always had enough light for us, and told us what our f/stop setting was. It was always the correct one, and he would stop the 35mms down from that. He's got a great eye



► too. We would have storyboards of our shots. We'd line up and he would check the cameras. If he ever moved the cameras around, it was always for the better. You can't fight that!"

Krepela also precises that a good depth of field is required for matching the live action plates. "For matte painting and effects work in general, if you're going to put something into the scene, such as a monster running towards you, you don't want to have a short depth of field. If you did, it would be mushy back there, and then, when you start shooting your miniature, you've got to match that mush. It just adds a lot of complexity to the thing, and it doesn't always look good, because what you want the public to look at will often be lost."

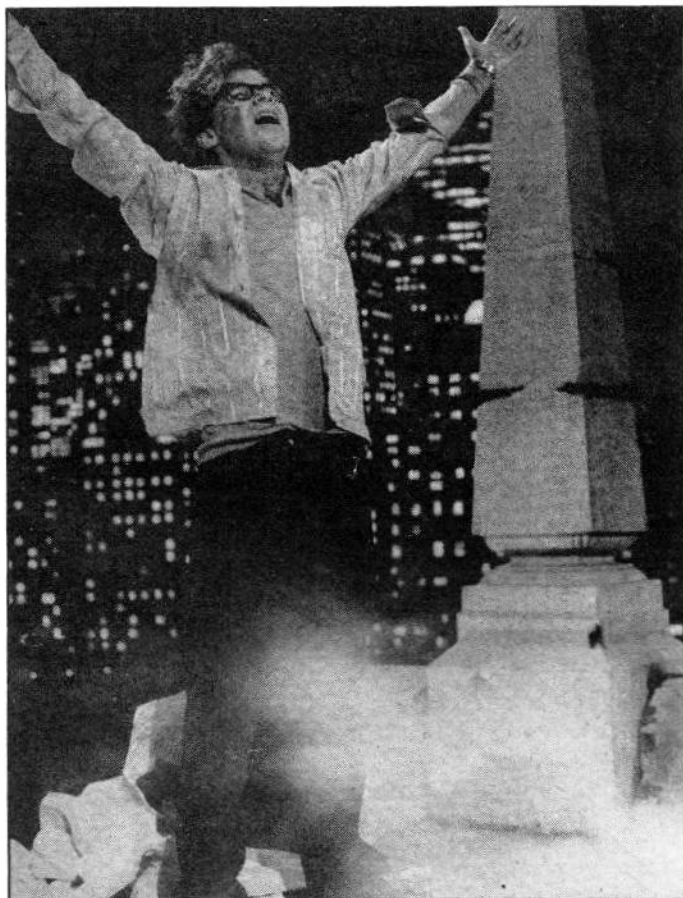
Because the 65mm cameras were always used on set, there is very little chance that any effects would have to be matched to a 35mm live action plate. Says Edlund, "The only time that really happens, is if there are one or two shots that are needed as an afterthought, and which we can do by running the elements in bi-pack in the composite camera. The other reason for that would be if we needed to shoot something at 350 frames per second with a special camera that will go that fast. There's no 65mm camera that can do that. Occasionally we'll shoot an element at 300 frames a second, then take the negative from that, blow it up to a 65mm interpositive, and then it fits back into our process."

## THE GHOST MAKERS

While the live action work was being filmed in New York, and later at the Burbank Studios, the special effects team at B.F.C. was busy trying to meet its deadline. Under the direction of Stuart Ziff, a special Ghost Room was put together to handle the final design and construction of the fantasy creatures appearing in the film. These include a ghost dubbed Onion Head, the Terror Dogs, which are dog-shaped demon-agents of Gozer, and finally, the Stay-Puft Man, which is the giant marshmallow creature used by Gozer in the final confrontation with the Ghostbusters.

John Bruno explains how the ghosts were created. "We had a number of concepts of how many types of ghosts there were. I just took the approach that a ghost is anything dead. You could have prehistoric weird things, strange amoebic blobs, animal ghosts, etc. There could be everything as a ghost, and that's what comes back in this film. In the 'ghost geyser' scene, where all of the captured ghosts escape from the Ghostbusters' headquarters, there's just everything that was ever alive, or ever lived for an instant, such as mosquitoes!"

In keeping with the spirit of the film, some of the ghosts were



Top: Comedian Bill Murray looking pretty cool as Ghostbuster Dr Peter Venkman. Above: Louis Tully (Rick Moranis), Dana's nerdy neighbour, is jolted by the power of Gozer.

conceived to be scary, and others funny. "the Onion Head, for instance, is a funny ghost," explains Bruno, who traces its evolution to... John Belushi! The Onion Head, conceived by Dan Aykroyd and originally designed by Assistant Producer Michael Gross, was finally sculpted by Steve Johnson, who worked on *Greystoke, An American Werewolf in London* and *The Howling* (1981). "The first thing we heard was that Onion Head was based on John," Bruno comments. "So, we studied *Animal House*. We studied the expressions that John Belushi used in that. But then, it evolved and just acquired its own personality, also because of the actor that's in there. Now, if it doesn't get a laugh in the film, I won't understand! But everything else is played straight. If the film is funny, it's in the way it was written and acted. At no time are the Terror Dogs to be considered not dangerous. What happens in Dana's apartment is a scary thing. The Marshmallow man is not funny. He is ridiculous, but we don't approach him as a joke. You never forget that he is a giant demon, a huge devil god."

To bring these ghosts to life (half-life?), Stuart Ziff hired about 40 artists and technicians. Ziff previously worked on *Star Wars*, *Star Trek: The Motion Picture*, *Dragonslayer* and *Return of the Jedi*. "I wanted a really dynamic and creative group," he explains. "But, more than that, I didn't want one look. If I were to just hire people for one genre, everything would have looked the same. So, I made a point of bringing in these different groups, which has really meant a lot more turmoil on my part because of the various personalities. Initially, I hoped to have one person per ghost, and have five or six different things to do. But it didn't exactly work out that way. Some guys got more, some were group efforts, some were one man shows. The sculptures take the personality of the person working on them. For example, Linda Frobos, who is a delightful and bubbly woman, designed the Stay-Puft Man head, and it has her personality in it."

John Berg, who is credited as a Consultant on *Ghostbusters*, agrees with Ziff. "It's always difficult to find people that have that unique gift of being able to synthesise a personality. It's even more difficult on a project like this, because you have several people associated with one creature. So you hope to get a really good group of people able to do that, and that they have enough time and enough good, clear direction to pull it together, so that the entity can start to personify."

## ANIMATED MONSTERS

Deciding when to use a full-size costume, or a stop-motion puppet was a constant problem for the production. John Bruno says, "We ►



constantly needed to figure out if there's something we should do live, to maybe take the weight off the animation department, or stop motion." For the Onion Head, Terry Windell and Garry Waller, the two animation department supervisors and former I.L.M. employees, used a two-inch miniature which they shot on the Oxberry motion control camera. Windell explains, "We're using the miniature, because the actual acrobatics that it does couldn't be done by the large puppet. Annick Terrien and Peggy Regan are two of our technical animators. They are doing a lot of the rotoscoping to meld the characters, such as Onion Head, into the actual live action scene."

In several cases, the original designs had to be modified to fit the animation. Ziff explains, "For example, the Terror Dog design we got looked good, but Randy Cook, who was going to ultimately stop-motion animate it, noticed that, if the mouth closed, the lower teeth were going to puncture through the jaw! *The Terror Dogs* start off as creatures of stone, and transform. We made this rubber claw that had to break through the plaster. But, it was very delicate, and could not push anything. So, Chuck Gaspar had his guys make little pushrods to break the plaster. We also had Terror Dogs with a person half-way inside, and ten people operating all the mechanisms. Just the logistics of moving all these people around, moving the mechanisms and keeping everything working, was a technical headache, although ultimately it worked out fine. We were saved because it was shot second unit. If we would have had to do the first unit, it would have been a disaster."

"Another thing to touch on is, that while we were building all the creatures, we had to be shooting live action. We had to continue to build them at B.F.C. at the same time as we had to deal with production schedules that were just changing constantly. For example, some days, we'd go to the sound stage and they wouldn't even use us. And these were the same people that I needed back here to build things! We worked continuously, seven days a week to complete the Terror Dogs. We got it done on December 5 and they didn't shoot it until fifteen days later."

Linda Frobos, whose previous jobs include sculpting on *Spacehunter* and *Buckaroo Banzai*, made three Stay-Puft Man heads, one happy, one frowning, and a third one with two major expressions, a grimace and surprise. "They gave us several cartoon drawings of him in different poses and angles. We talked a lot about the feeling that he was supposed to have. What I did," Frobos explains, "was to sculpt a maquette of each expressions so that I could look for shapes that could be moved in a certain way, so that they can form either expression. On the face where we need two very different expressions, for instance, I started out with the maquettes and I sculpted a face that is in-between the two expressions required. So the sculpture itself looks very bland. The expressions are achieved with articulations. Because the *Stay-Puft Man* is very smooth, there's a real difficulty and challenge in trying to articulate its face. Something that is wrinkled, hairy or has very distinguishing lines is very forgiving."

Bill Bryan, who built the Stay-Puft Man costume, and acted the part—except in the stunt scenes portraying the destruction of the Monster by fire—describes it as a combination of a sauna suit and a universal gym! "I was handed the design and was told, 'This is what we got approved and it's probably what we want.' To wear the costume, you have to be able to translate just how fast he could walk. I spent some time just figuring out what the walk was going to be. Would it be a fat man waddling, leg and hand moving at the same time? Or would it be more of a Godzilla swing? We ended up with the swing. Since we're shooting at 72 frames per second, I had to translate it into one third speed movement. The body was made from foam sheet. We built front view suits, backview suits and side view suits. Each shot really had its own problems. There are four burning shots, and each of those required two suits. We also built one suit that had extra long arms to force the perspective, and oversized hands for the same reason."



## A BURNING QUESTION

The major problem with the Stay-Puft Man costume was to enable it to burn, and at the same time make it safe for the stuntman that was wearing it. "Originally, I thought that we'd be faking the flame by airbrushing some browning and blackening while on camera," continues Bryan, "and maybe some chemical mixture to get a little bubbling action and some bladders under the surface to get a large bubbling action, and then animate in the flames, or stick them in optically. But, Richard didn't want that, and the word came down that it did have to be fire, and it did have to look like he'd been doused with gasoline and lit. We were lucky in that the method that we had been using to construct the suit lent itself to including a layer of non-burning foam. And we were also lucky in that the type of foam that looked right also burned right! So, we started with inch-thick foam. Then, we decided that, in order not to get as much pollutants in the air, a half-inch thick would be sufficient. Also, that way, it doesn't eat as close to the stuntman. On the body, there's a half inch of flammable foam, then a half inch of the best non-flammable foam which has 42% fire-retardant additives. We glued it down to a more rigid foam and then smeared another fire retardant into it. Now, it's a leathery texture and has no air bubbles in it, which keeps the other foam from absorbing air."

Supervising the destruction of the Stay-Puft Man was the job of Thaine Morris, Mechanical Effects Supervisor, who is another I.L.M. alumnus. "We used an air mortar to blow its head away, but because it was so heavy, we actually had to jerk it out of frame with a string! As regards the actual burning, we had to come up with a foam that would retard the fire and would not burn through and get to the stuntman. Then, we had to find some kind of flame that would conform to the scale of the Stay-Puft Man, which is one-twelfth scale. We ended up using something called Krackle Kolor to burn the guy up. It's a flammable liquid that burns with just a little bit of sparks, and it seems to keep the flame down. We've taken some liberty with the Stay-Puft







Opposite top: *The Ghostbusters see the Stay-Puft Man for the first time.* Opposite below left: *Our heroes lose the first round to Gozer.* Opposite below left: *An innocent bystander (Eda Reiss Merin) is startled by a Terror Dog.* Above: *The Ghostbusters prepare to battle Gozer (Slavitza Jovan, pictured right).* Below: *Dan Akroyd as Ghostbuster Stantz.*



concept, in that we use red sparks instead of blue, when everybody knows that marshmallows burn blue!"

Terry Windell explains how the Marshmallow Man is integrated into the live action footage of New York City, "When the Stay-Puft Man walks down Columbus Circle in New York, he's scaled at 112 ½ feet tall, and there are literally hundreds of people running from him, cars screeching, etc. . . To incorporate him into live action, you have to literally hand draw each of the characters that pass in front of him. Rather, you create the illusion that they pass in front of him by animating the cars and people to eliminate portions of his feet and put him into the background."

## THE BUILDING OF NEW YORK

Mark Stetson, Supervisor of B.F.C.'s Model Shop, was responsible for all the miniature New York buildings in the film. Stetson's previous miniature work includes *Blade Runner*, *The Right Stuff* and *Close Encounters of the Third Kind*. "The biggest thing that we did was Dana's apartment building with the temple on top," explains Stetson.

"The miniature we built for that started at the eighth floor level. From there up it's about a fifteen foot miniature. We stick it up on a five foot platform to indicate the bottom eight floors, and that gives us a twenty foot model to shoot out in the parking lot. There are several shots on it, mostly involving physical gags with contact of some kind. When the building doesn't have something physical happening around it, generally it's a matte painting. When the Stay-Puft Man is on it, generally it's the miniature, although there are shots of the existing building, with plates of the Marshmallow Man composited to it."

"The Gozer temple is blasted apart at the end of the film, and that was all done as a pyrotechnical gag on the model," continues Stetson. "Thaine Morris has had five shots at blowing the top off. We quickly rebuild it each time he does it." Morris explains, "The miniature explosion thing has sort of fallen into a situation where there's two or three of us in the industry that seem to be able to get away with it, and make it look reasonably well designed. What you have to do is blow it up slow. That sounds like a contradiction in terms, but what it means is that you have to use a bunch of smaller explosives and actually push whatever it is apart. You time it so it's stretched out, so you get what ►



looks like a very large explosion that's actually a whole bunch of little ones. I have a timer so that I can control them to .001 seconds."

The model was built with strong construction plywood and meticulously put together. "There's no stage we have here that's tall enough to accommodate the whole building," comments Stetson, "so we had to build it in such a way that it was open enough inside to be able to light up rooms as required, and strong enough to be able to withstand people climbing on it. It had to be able to come apart in three sections, and finally to withstand the pyrotechnic blasts. Most of it was a matter of careful construction to begin with. In the pyrotechnic area, we had prepared a bomb chamber. The temple floor is quarter-inch steel, and has big, square, tubular steel upright columns welded on to both the bottom and top cover plates, so that the entire blast is actually contained in welded steel. To the upright columns we added aluminium fixtures and cast urethane panelling. In the first test, the aluminium braces were actually riveted to the steel, and the rivets were blown out.

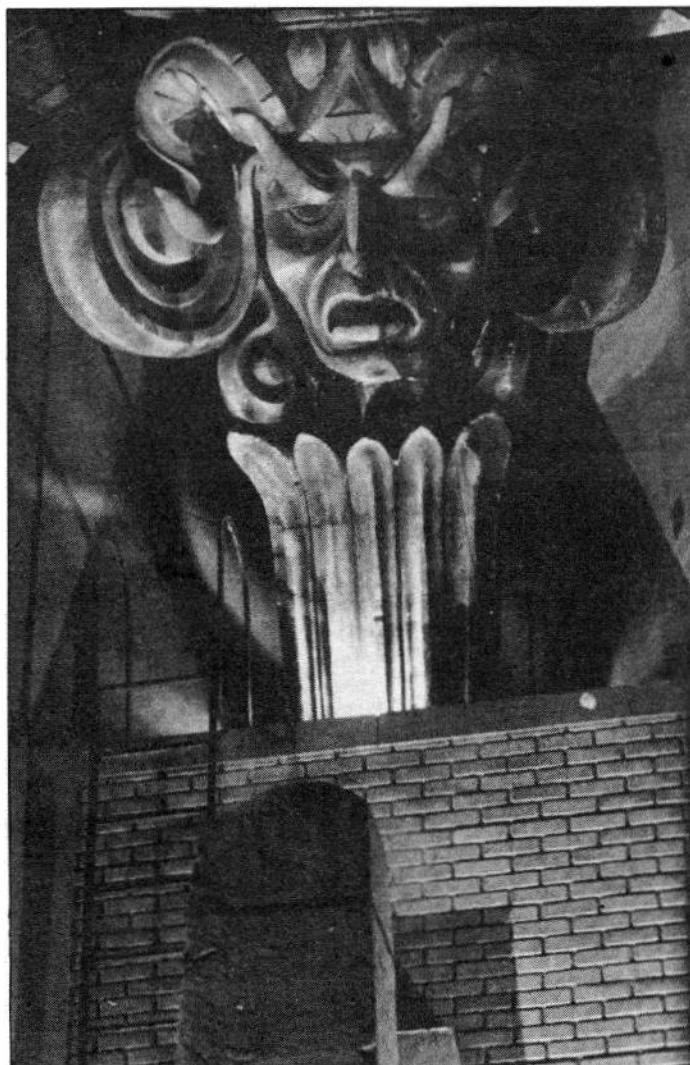
"The facade is all in either vacuum form, brick panelling or ornamental cast urethane to simulate ornamental plaster. Some areas on it are break away and are cast in lighter urethane or plaster. The top fountain-like ornament is in fibreglass. The scale of the building was determined based on the size of the Stay-Puft Man. Since it was decided that that would be a man in a suit, and since we knew that he was supposed to be 112 1/2 feet, we scaled the building to that. It came out to be a 1/18th scale building. Which is an awkward scale to build in, because there's nothing available in that scale that you can buy stock components of. It was about a ten week job and we've been maintaining and modifying it for the last two or three weeks."

## THE PHANTOM GUN SLINGERS

Another weird concept that was created in the film was the weapon used by the Ghostbusters to deal with the various creatures they encounter. These Neutrons Wands are actually used by the Ghostbusters to entrap their phantom victims. "We wanted something different," explains Bruno. "We didn't want lasers. We didn't want lightning bolts at the ends. What the guns are doing is pulling atoms out of the wall. When you move it, it moves like a hose of water and is stuck to a point and dragging all the time." The Neutrons Wands were animated by Gary Waller and Terry Windell's department. "At first we designed them to be a straight, black and white high-contrast element," Terry Waller explains. "In other words, we produce black and white artwork, shoot a negative which then becomes the optical printing element, which they print in colour. It's designed in such a way that there are actually three separate pieces of artwork per frame



Top: A detail from the full-size mock-up of Dana Barrett's apartment building. You can just make out the rafters of the studio in the top corners of the picture. Above: Venkman (Bill Murray) and Dana (Sigourney Weaver) emerge triumphant from the apartment building at the end of the movie.



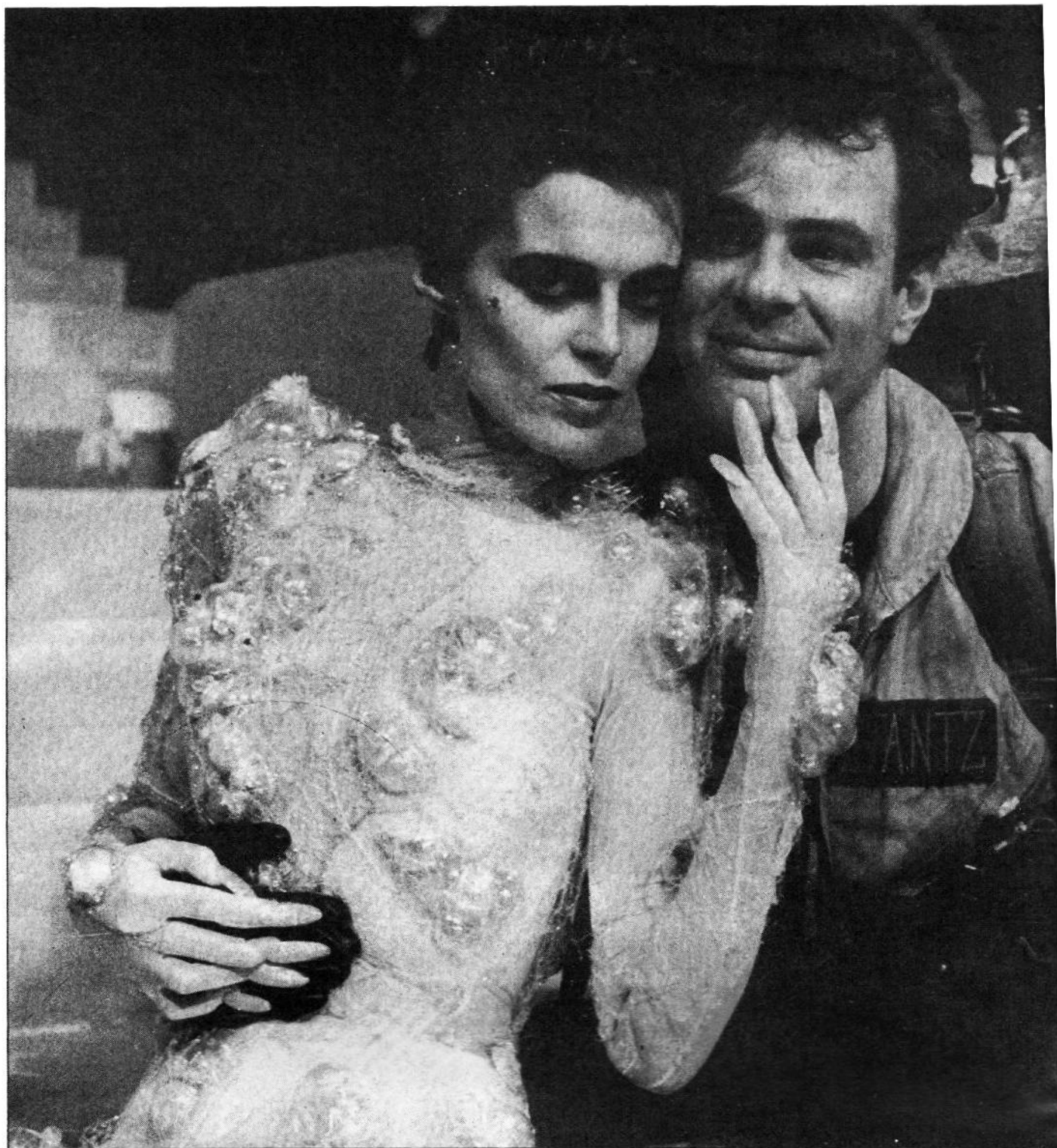
on black and white. The wand is thus animated, inked, and separated into three levels, shot and sent to opticals.

"Since then, it's now multiplied up to five elements. Several new colour elements are compounded with multiple moves, such as the guntips now flare as if they have a muzzle flash. There's a spectral light, like two lines of a starburst. It's a magenta flare bisected by blue, horizontal light. The centre is like a laser, only rubberised. It's as if the gun is shooting out energy and sucking in molecules at the same time. It's very hard to do convincing animation, because they have to be more than a slick laser. The first time they come on, they get a laugh just because of the Ghostbusters' reactions. But, at the same time you have to give them enough polish so that it merits the laugh."

## SOMETHING WEIRD IN THE FRIDGE

Waller and Windell also developed a tunnel effect to portray the door into Gozer's Dimension that is located in Dana's refrigerator. "It's basically a Hitchcock effect," says Waller. "Something's coming at you, but you zoom away from it." "What that is, at this point of the film, is a glimpse into the future," explains Bruno. "We want everybody to see it, and not know what they saw. Technically, we're taking a plate that we already shot of the pyramid and the stairway. We did a painting earlier, that's basically a typical hell setting of flames and orange colours and a lot of heat. In there are the clouds that you will see at the end of the film, but everything will be orange. There will be flames, and as we move into the refrigerator, there will be Terror Dog images. You'll be able to see it if you know what it is, but at that point you probably won't know. In the long shot we don't want to be quite able to see it. The close up will have a dog rise right up into the frame, and there will be a flare coming out of its mouth that will obscure anything that you think you saw, and which will scare Dana enough to close the door. We need dry ice smoke at floor level for the effect. But, the problem is that you can't have flames come up through it, because it puts out the smoke. So, Thaine Morris has come up with some other solution for that problem - yellow smoke, a light lemon colour with flames coming out of that, and the dog rises up and jumps out."





► For this sequence, Gary Platek designed and executed various laser-generated effects. Platek worked previously on *Star Trek: The Motion Picture*, *Poltergeist*, *The Right Stuff* and *Gremlins*. He explains, "The laser system is a 5 watt argon laser. Which gives me about nine different shades of greens and blues and ultraviolet light. Then, I also have a dial laser which gives me continuous shading control over yellow, orange and red. Anything in between, I can turn a little dial and it changes those colours. The outputs of those are aimed at an X-Y galvanometer, which are little electromagnets with mirrors on top. They're like small electric motors. One moves vertically and one moves horizontally. Combine those two and you can draw a circle. Combine them even faster, you can write a name or draw a picture. The galvanometers are hooked up to an Apple computer. That computer has a Gibson light-pen and a program that was written by a man named Gary Leo. We started this little system on *Poltergeist*. Basically we built it up in a week, and over the next year refined it. With the light-pen, I can draw on the computer screen whatever shape I want the laser to draw. I can draw up to sixteen shapes, and then I can pick what order I want those shapes to appear in, in what size and on

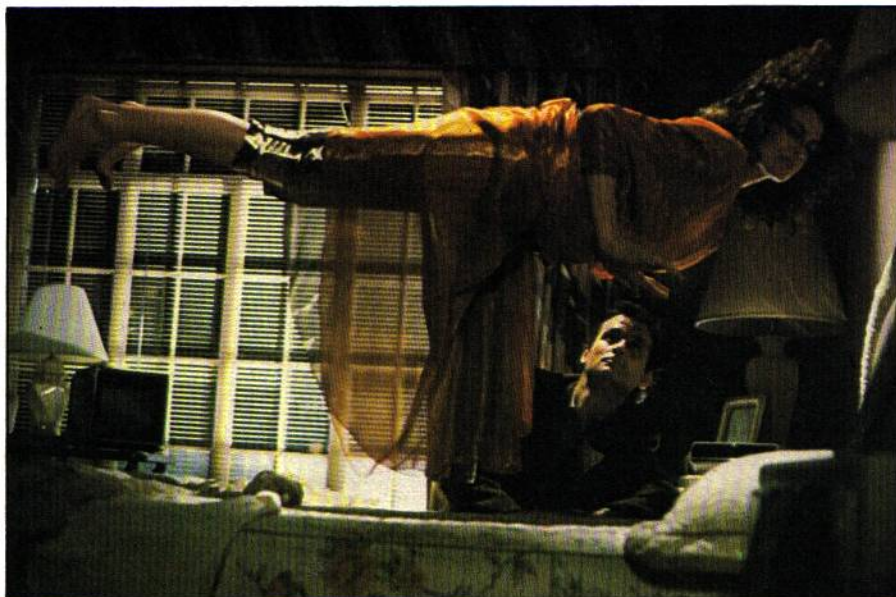
what path. I can make a whole little animation. It has the capability to draw a little man that runs around and changes size and shape. I don't do that, but I could. What I usually do is draw in something abstract, maybe ten abstract shapes that are related, then I animate those to get an effect.

"For example, in the end sequence, in the temple, at the top of the pyramid, there will be a golden, yellow light coming out of it. That's a laser effect. What I did, was to draw a pyramid shape, with no bottom and I aimed that at a piece of mylar, then I aimed that right at the camera, right around the lens. So, you have a pyramid shaped piece of light coming at you, but you can't see it. So I have to introduce something into the air that will let you see it. For that, I have a fifty gallon drum of water that I heat, then put dry ice in there and blow the dry ice towards the camera for about three feet. That way, we get this sort of light fingers effect. Another place where I use the laser is with Onion Head. He's going to go crashing into a wall in one scene. They wanted an "ectosplat" effect. All I did that time was draw a straight line with the laser in a parallel to a table, with the camera above it looking down to match the angle of the camera looking at the wall in





Above: A special effects technician adds some finishing touches to one of the full size Terror Dog models with a fine paint brush. Right: "She sleeps above the covers ... four foot above the covers!" Possessed by the demon Gozer, Dana Barrett (Sigourney Weaver) levitates before the curious eyes of Venkman (Bill Murray). Below: Bewitched, bothered and bewildered, that's the Ghostbusters. In this picture they look about them as the power of Gozer rocks New York to its collective foundations.



the scene. Then, I took a beaker of hot water with dry ice in it, and then just let a little wad of smoke go down to hit the table, and all you see when it hits the laser light is that shock wave."

## THE WHOLE SHOOTING MATCH

Bill Neil, the cameraman, was in charge of photographing the special effects plates and the miniature photography. "My contribution hopefully doesn't stand out. I hope that it all blends in and becomes a part of the story. Part of what I do is to try to understand what the Director of Photography is doing and why he's doing it. What he does is a guide to what we do here, in terms of lighting and the feel of it. Even in terms of composition. We often have to have much more light on the set because we have much less depth of field. So, where the first unit 35mm can shoot at a 3.5 exposure, we have to use 4 or 4.5. We have to be at least a stop and sometimes two stops hotter than they are to hold the field. It varies. We also expose for a denser negative, so that we can manipulate the film. First unit film is not going through the generations that we're going through. We can't work on the edge, we

have to have a very well exposed negative.

"We don't have scaled down lights. I was able to do that on one picture, and it worked out pretty well. With this one, we're working pretty much with stage lights, the same kind of lights we use in the studio. We just have to cut them and play with them to fake the scale. We're often running not at 24 frames, but some elevated or lowered frame rate, and that changes the way the light appears too. I may be using a 10k to light a very small building, and it's a huge light source, so I have to squeeze it down in some way to get the levels I need, as well as to have the apparent source match what Laszlo used in 35mm. Wherever there's reference material from the first unit, I try to use that as a guide to try to get this material blend in and disappear, and not look like it was done at another time and another place and scale."

The Stay-Puft Man, because it was made of foam, and had a white, reflective surface, posed its own set of problems. "When you have a miniature building that is in darker earthtones, and you have this pristine, white Stay-Puft Man that's supposed to be dimly lit," Neil explains, "then we have a problem. The building takes much more light than the Stay-Puft, so you play around and keep the light off the





Top left and left: *The Ghostbusters crash into action with their most potent weapons, the Neutona Wands, which are used to immobilised "spiritual entities" while a ghost trap is placed in position below them. Bottom left: "Are you the Key Master?" purrs the possessed Dana Barrett (Sigourney Weaver). Above: The real Key Master, Louis Tully (Rick Moralis) revels in the power of Gozer. Below: One of the stone creatures at the Temple of Gozer which will later come to life to be a Terror Dog.*



Stay-Puft Man. When you have Stay-Puft right against the building, it becomes a real problem to light the building at one level and Stay-Puft at another, while trying to keep it all looking like it's coming from the same sources. You just have to deal with it shot by shot. It's part of the challenge of the whole thing, to do that in such a way that it's not obvious. Fortunately, in this end of things, we often have the luxury of doing some bracketing ahead of time. We can test out how the Stay-Puft Man behaves in different lighting situations. For example, we found that the Stay-Puft suit changed its reflectivity with time. If the suit was made a week ago, it would photograph differently than if it were made yesterday. The foam yellows in a mysterious sort of way. It's not that it changes colour, it changes in apparent brightness. So, you have to keep track of it. I've worked with a lot of creatures, and I've never had them change from day to day!"

## PUTTING IT ALL TOGETHER

The task of putting all these special effects together went to Conrad Buff, Visual Effects Editor, whose credits include *E.T.*, *Poltergeist* and





Right: Dana Barrett (Sigourney Weaver) as the Gatekeeper and Louis Tully (Rick Moranis) as the Key Master. Below left: Her mind under the control of Gozer. Dana is drawn to the Temple of Gozer on the roof of her apartment building. Below right: The Ghostbusters battle shoulder to shoulder before a vicious mystical onslaught.



**The Empire Strikes Back.** "My responsibilities are to take all the elements that are shot and try and compose them and synchronise them in such a way that they play well in the scene, based on what the live action editor has done. In the case of *Ghostbusters*, there are a lot of live action things which we are adding to. I have to edit out the pieces that I think will work best physically with the scene. The only problems are in terms of pacing and timing elements, trying to give them life and make them physically look like they belong in the scene, that the characters are reacting and the ghost is reacting. All of that takes a lot of designing on my part, along with the cameraman and the art director initially. So, I had a lot of input up front, as opposed to having things delivered to me and trying to make them work."

Mark Vargo supervised all the optical composites, which is the culmination of combining all the elements: mattes, animation, models, plates and blue screen. "Even though everyone's efforts contribute equally to the final outcome," he says, "it really is an optical printer movie, because of the illusion of reality that has to work, otherwise it looks phony."

In spite of the large number of effects present in *Ghostbusters*,

director Ivan Reitman relies essentially on the comedic elements to carry the film. "I screened *Ghostbusters* to small audiences in its rough state, without any effects at all, except the mechanical ones that we did on set. I figured it was going to have to work as it is. It will only get better, but it better work right now. Fortunately it did. I found I'm no longer relying on the inclusion of everything to save me. My approach now was, that its got to work as a movie in its roughest form, without anything, without special effects, audio effects, proper colour balancing or music."

As it's turned out, Ivan Reitman needn't have worried. *Ghostbusters* worked just fine for American audiences. Released in the United States on 8th June this year, *Ghostbusters* proved a big hit with the paying customers, hitting the number one spot in the film charts and within 66 days has taken a staggering \$163 million at cinema box-offices on that side of the Atlantic. Which makes it, in financial terms, the film of 1984.

*Ghostbusters* opens in Britain on 7th December to take advantage of the Christmas holiday season, and very likely will do equally good business here. See it. You won't be sorry!



# GHOSTBUSTERS

"A resounding popular hit."

A Starburst Film Review  
by Alan Jones

Being thrilled, amused and scared in equal proportions is big at the box-office at the moment. Now, hot on the heels of *Gremlins*, comes another expertly crafted roller-coaster ride through the more insane horror-comic elements of recent times. *Ghostbusters* is nothing more than a *Saturday Night Live* sketch done on a 30 million dollar budget, but apart from a lapse in pacing during its central section, it can't be faulted. It aims to please and makes certain we are all having a good time.

Bill Murray, Dan Aykroyd and Harold Ramis are booted out of their cushy college-funded parapsychology programme and decide to set themselves up in business as spook exterminators for hire. After dispatching a particularly greedy ghoulish green blob from a hotel ballroom, they find themselves the darlings of the media and are quick to capitalise on this by endorsing sundry items like diet/exercise courses. Enter Sigourney Weaver, in a role that will win her even more attention from her existing legion of fantasy fans, as a musician with a demon living in her refrigerator. The stage is thus set for the biblical prophecy of Judgement Day to become a reality especially

when the Ghostbusters' HQ is forced by the Department of the Environment to shut down its netherworld spirit safe and the Ghostbusters find themselves battling it out with the greatest nemesis the world has ever seen – a giant marshmallow man!

Everything in *Ghostbusters* is larger than life and outlandish. Mainly it is the perfect showcase for Richard Edlund's *Poltergeist*-inspired special effects and the deadpan humour of actor Bill Murray. Edlund really does pull off some spectacular stunts marked by flourishes of originality. The benign library spectre that suddenly frightens the life out of you is just one example. Another is the wonderful panoramic

shot of Manhattan with various ghosts dispersing all around the city from the roof of the Ghostbusters establishment. My real favourites though are the power guns, used by our intrepid team to force the apparitions into steel traps, which resemble *Star Wars* laser guns gone berserk.

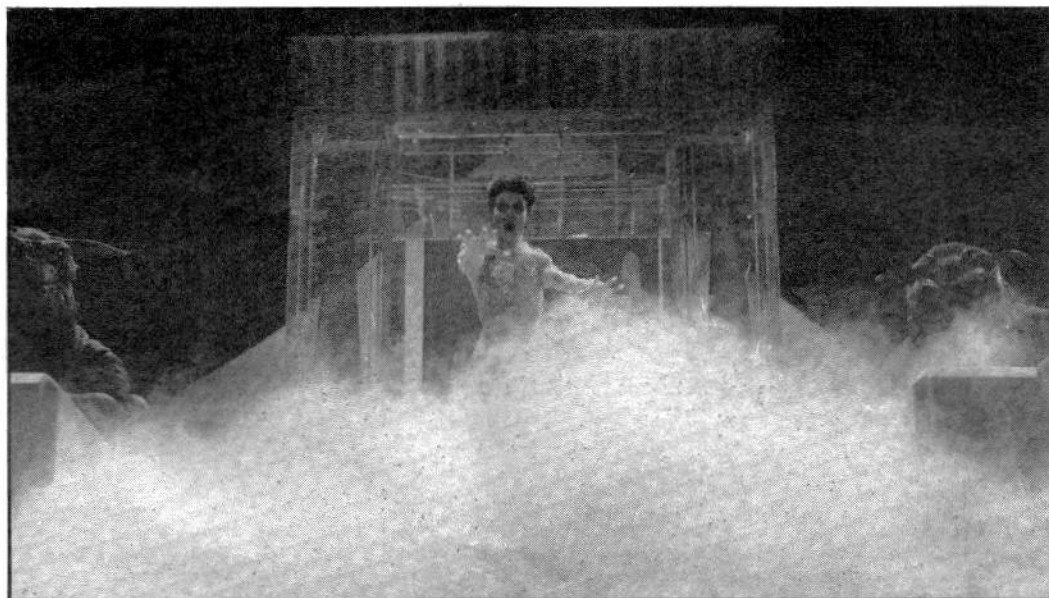
It must also be noted that the scope of *Ghostbusters* is pretty impressive for an Earthbound fantasy and the fact that director Ivan Reitman has pulled it off in a remarkably short production schedule with such fine results nearly makes me regret all I've said about his *Meatballs* and *Stripes*.

But it's the meshing of broad-based comedy with the paranormal that hits

home the hardest, especially in the battle with ancient gods atop a Central Park West penthouse. Here the witty repartee – as Weaver turns into a stop-motion hound from hell, Murray deprecatingly apologises for his girlfriend being "A dog" – takes the edge off the H.P. Lovecraftian horrors.

This horror/comedy formula is nothing new of course. Bob Hope did it years ago with *Ghostbreakers* – a scene cut from the film actually had Aykroyd listing all the films that were inspirations – but only today's technology could make this melding such a resounding popular hit.

Note: See page 10 this issue for full cast and credits listing.



Above: High above the streets of Manhattan the Great Gozer (Slavitz Jovan) displays her power. Below: The Ghostbusters (Dan Aykroyd, Bill Murray and Harold Ramis) in a haunted hotel.





**THIS FILE WAS PROVIDED BY**



**SPOOKCENTRAL.TK**