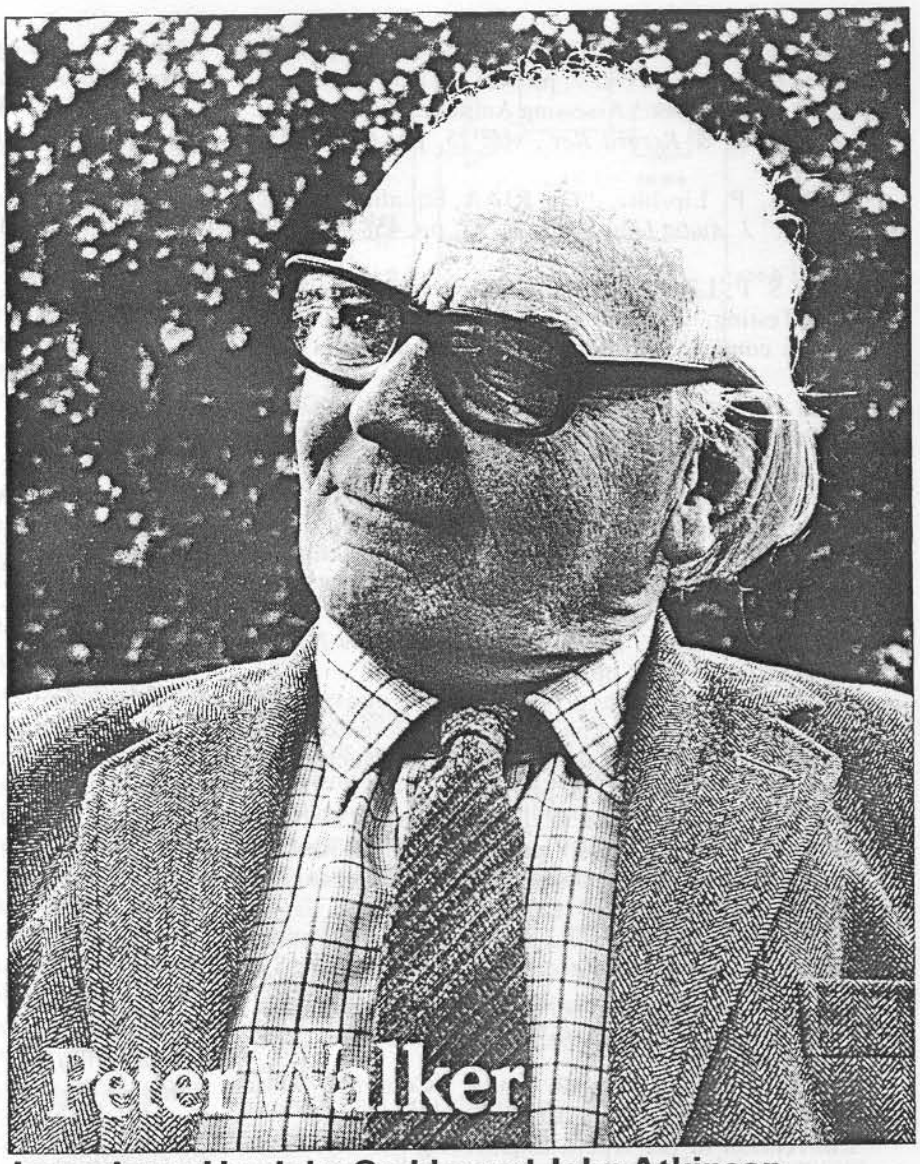
interview



interviewed by John Crabbe and John Atkinson

AN OUTLINE of Peter Walker's career appears on page 41: the active external shell of a man whose thoughts on the problems and objects of sound reproduction deserve some exploration on the occasion of the first Audio Award to be presented to a manufacturer. Peter also happens to have arrived at the traditional retiring age of 65, although we hasten to add that he shows no signs of retiring at present. Indeed, to judge by his capacity to go on thinking and tinkering in audio matters, P.W. will probably be working on his next loudspeaker in the year 2000. Anyway, we recently spent a day at Huntingdon talking to him about his life and his views on numerous audio topics. This produced nearly two C-60 cassettes full of chatter, from which we hope that the following selection will throw at least a little light on a very fine engineer whose personality happens to fit snugly into the best tradition of cheerful English modesty. We start in 1936, when Peter had just got going, aged 20, making his own amplifiers on the strength of a loan from his father.

JC: So you wired these up all on your own?

PW: Oh yes, just on my own, then one assistant, and so on from there, as Acoustical Manufacturing Company — it wasn't 'Ltd' then. The amplifiers were just a straight copy from somebody else's circuit, you know, the first one made as a so-called Portable Amplifier for dance bands — who would use a microphone for the vocalist. I was playing in dance bands then.

JC: Were you a keen amateur player right from the beginning then?

PW: Well, you learnt piano at school, that sort of thing. At school we had a little jazz group. Nowadays they have a jazz section at Oundle, all clear and above board, but in those days if you were heard playing jazz...Ugh! But three or four of us did our best. And you could then get jobs all around North London playing alto-sax in various little groups — rather poor, but they were fun days, yes, good fun.

JC: And when did you move on to the flute?

PW: I gave up the sax when I was about 22 and took up the flute at about 40 something. I bought a second-hand flute and thought that all I've got to do is learn to blow down the hole, as the fingering's much the same as the sax and it will come back won't it? It wasn't as easy as that, but that was the general idea.

JA: Were you interested in classical music as well as light music?

PW: Not as a young lad; there was not much music at home at all. It wasn't until I got to Oundle that I realised there were such things as counterpoint: other things were going on, otherwise music was a sort of blur of sound with a tune at the top, without much thinking about it at all. But at school, singing in the choir, you were told to sing Alto as a second line, and you began to realise what music was about, and I became interested then. But I still liked the dance band era — that was fine.

JC: Back to audio, all your early products were concerned with PA in one way or another, but when did you first consciously produce a higher quality device?

PW: You did that for your own benefit. Designs were published in magazines — these you made up for your own entertainment while trying to sell public address amplifiers. You made the latest quality amplifier, direct-coupled triodes, not a tetrode in sight. Class-A, nothing but Class-A. But all these things you did for your own entertainment.

JC: You say 'for entertainment'. What were you playing via these amplifiers?

PW: Records, using an oil-damped Telefunken moving-coil pickup, not forgetting that in those days you could pick up VHF broadcasts and play them on a Voigt speaker. This was possible before the war because television had just started and ... between 7.00 and 8.00pm they had audio transmissions of extremely high quality. I had to borrow the Voigt because they were expensive.

JA: Those were *live* music transmissions?

PW: Oh yes, live music broadcasts could be played through a direct-coupled amplifier on a Voigt speaker, and very good it was too, extremely good, and once you'd heard one of these things, my goodness it was quite different from the radiograms that everyone else had heard.

JC: That was a real revelation then?

PW: Absolutely. I have found that what impresses you most is the advance from the previous thing you've heard, and since that was one order better than what you had heard previously (a 'quantum leap' if you like), it makes a very big impression. If you then go to something better still but it's only a small jump, then that's not quite so impressive to you. That was the biggest jump in my life *ever*, from what I normally heard from radio sets to hearing a Voigt speaker playing.

JC: The amplifiers you made for private pleasure, did any of these creep through to eventual manufacture?

PW: No. Even Voigt, who was way ahead of anyone else, could only sell two speakers a week, and while I did try to sell some of these things to friends, there was no hi-fi business. There were whistles on AM at night-time and on records you had to get used to the surface noise. The high fidelity market didn't really arrive until the LP came along, when you could have a wide range without noise.

JC: But you were producing a quality amplifier before the LP.

PW: Yes, but that was still alongside the PA stuff, which was supposed to earn the money. But the QA12P amplifier did start to sell on the hi-fi market, and very shortly after that we decided to pack up the PA because it's all just as much loudness as you can get for the minimum amount of money, which is not very pleasing aesthetically. We went over solely to high fidelity around 1954, just four years after the Corner Ribbon came out. That was a great effort. At Radio Olympia in 1949 we spent all our money on hiring a stand.

JC: You must have done a lot of work on that ribbon speaker.

PW: Oh yes, but it was all hobby work really, because you wanted to make a better speaker but didn't expect to sell an awful lot. They were £90 or so each in 1950. What's that now? Well over £1000 for a single speaker — and we sold a few hundred, which was quite good going; but you did this mainly because it was what you *wanted* to do.

JA: Was it the Voigt which set you thinking that you'd like to produce a loudspeaker of very high quality?

PW: Yes. In 1938-39 you could make an amplifier really as good as you wanted to. I made up one of those PX25 amps, direct-coupled all the way through and with a big Partridge output transformer, and for fun I took one of our PA models which wasn't that bad and switched between them. There was not *that* much difference, so then I connected

Amplifiers were better than I thought...

the speaker from the 'hot' terminal of one to the 'hot' terminal of the other, adjusted the volume, and it dipped down to practically nothing. So amplifiers were much better than I had thought they were, and I went to one or two lectures which seemed to show that you could make amplifiers as good as you needed, whereas loudspeakers were far from perfect. I also went to some lectures by N.W. McLachlan on speakers which were absolutely fascinating. It wasn't just a loudspeaker in a box: he talked about ρc and all sorts of complicated things, so I got Olson's book on acoustics and found that this was a difficult area of applied science where the problems had not been solved. It's a fascinating technical problem in itself; you could be completely deaf yet be fascinated by loudspeakers. You've got to produce this thing that makes pressures in the air — it's a problem in physics.

JC: Where did the ribbon idea itself come from?

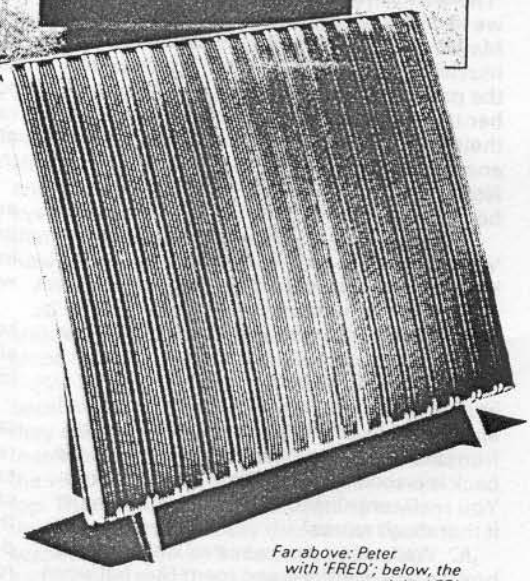
PW: I don't know. I just thought it would be right. I think they'd been written about, also electrostatics, spark speakers, singing arc speakers — all these things. I made a ribbon microphone and fed some signals to it to see what it sounded like when held up to the ear as a headphone. A jolly good headphone it was, all crisp transients — so I thought: 'let's make it a bit louder, use a bigger magnet, put a horn on the end'. All a bit hit-and-miss by today's standards.

JC: You mention electrostatics, but they didn't materialise until about five years later, at around the time you finally dropped the PA side.

PW: Yes, but we had been working on the electrostatic two or three years before then, or at least thinking about it the same time as we did the ribbon speaker, because you thought about all these things — there were all sorts of ways of making air expand and contract. The electrostatic principle is very appealing. As every loudspeaker person says: 'my goodness, a light-weight thing that size, driven all over, the problem is solved isn't it?'

JC: You've given a lot of thought over the years to the electrostatic idea. Now that your second model is in production, are you satisfied?

PW: Yes. It's the best we can do. If you asked me to make another speaker now I couldn't do any better, but I still *think* about doing something better. Very much so.



Far above: Peter with 'FRED'; below, the original ESL

JC: I know that from time to time you have toyed with the idea of a 'whole wall' electrostatic, with delay-line drive for accurate stereo, etc. Have you actually experimented on these lines?

PW: No, but I have done a lot of calculations. It's possible to do, but very difficult to present. You either come along to a person's house with a tremendous picture like *The Last Supper* to screw into his wall (it's got to be something like 12ft long by 4ft high, and the number of rooms you can get it in is small) or you have to do it by strip speakers in the corner, and not many people have two suitable corners. It could be done, but practical considerations make it not very attractive. You could do a one-off for fun, but it would cost a heck of a lot of money and would just whet people's appetites to no purpose.

JA: But do you still feel that the electrostatic is the only way to go, because of its advantages?

PW: It has a lot of advantages, yes. I think if you can get it so that the customer hears the speaker and a little less of the room, then you are getting very nearly there, and the distortion is very low down (certainly an order better than with anything else), you can get the directivity controlled rather better than with anything else, and you can get the coloration rather better than anything else. The only thing is that *power* is expensive: you have to have a certain amount of size for power, and if you want it loud you have to do it a bit bigger, then to keep the directivity right it gets very much more expensive. So in terms of power output you are at a disadvantage compared with moving-coil speakers, but in all other terms you have an advantage.

JC/JA: Peter was then prompted into some discussion of the pros and cons of using a separate stand for the ESL-63, which led him to consider the sort of people who buy his speakers.

PW: It's the musical people who appreciate the speaker more than the hi-fi nuts. It's not as bad as ten or twenty years ago, but people still look at speaker specs in magazines and compare the frequency range: they believe that one which goes down to 30Hz and up to 20kHz *must* be better than one that goes from 40Hz to 18kHz, which you and I know is quite wrong. A speaker is good or bad a long time before it's got to 10kHz. Let's be honest about it, there are still a lot of people in hi-fi who go for the impressive sound rather than the music. But others you get who *are* interested in the music, and who really don't want to get involved in hi-fi as such; yet they can appreciate good quality reproduction when they are offered it. Oh yes, a different type of customer who listens in a different kind of way — he listens to the music.

JC: There's a school of thought which says that because of its elaborate technical image, the hi-fi business too easily misses this latter type of customer.

PW: Yes, they are inclined to buy a music-centre instead, because it's not going to hum and everything matches everything else. Until you have sorted out a good dealer, hi-fi can be a perilous path. This type of customer doesn't generally get dissatisfied until his system makes a nasty noise, then he positively wants something better, or he goes to a friend's house and hears something that's very much better and gets interested. Otherwise I don't know. They go to a concert, it's wonderful, yes, then they go back and play the record — but they don't compare it with the real thing.

JC: Are you saying, then, that it's the friend or acquaintance with a better system who is the real salesman?

PW: I suspect so. Our customers are our own salesmen, I'm quite sure of that. Very often at an audio fair at least half the people in our room already use Quad equipment,

and I don't mind that a bit. They come in to see if we are sounding any better there than in their own home, but they're the enthusiasts, they're the best salesmen we've got. And they're *free* salesmen aren't they? They have their friends around, they hand out the

Customers are the best salesmen...

whisky, cups of coffee, invite them to dinner even, and their friends listen and say: 'yes, excellent'.

JA: To change the subject totally to the other end of the scale, how do you know when enough improvement is enough improvement? How do you know when the returns become vanishingly small?

PW: That's a very difficult question, very difficult. When you sit down and get all there is out of the music I suppose, but that's a silly answer because it's not satisfactory. I'd like to know. I like to have it more and more real, perhaps because we are involved in it and therefore it's our objective to make it better. 'There's the flute!' Wonderful clarity in there, we like it just a little better, that sort of thing. Maybe it's *us* that's wrong, maybe the musician will say: 'That's fine, I can hear all the parts, I can hear the string quartet because I can hear their phrasing, I can hear their balance, the rapport they have one to another. What else is there for me to have? Nothing, except to see them.' He might well be nearly right.

JC: May I take you up on one point there: 'except to *see* them' — or perhaps except to hear them as they would be in the hall in which they are performing, *ie*, the surround-sound thing. What about that, the possibility of hearing the whole environment?

PW: Yes, I agree that it must be an improvement. But if you go to the Albert Hall and you sit in a box you don't get any sound from the back, or that which you get from the back is just delayed by 10 milliseconds or so. You really only listen to 180 degrees. Now is it that much worse?

JC: Well, when you're seated well back in a box it's a bit confined and room-like, but when you sit out there at the front it opens up gloriously, even though it's only 180°.

PW: Yes, I give you all that, but now supposing you sat in the middle of the Albert Hall or Festival Hall and all the sound from the back which you normally heard there was coming from a few holes only, no matter how coded; I think you would get what I call 'sound dazzle'. Ideally you need an infinite number of sources, but one can code two signals such that from two speakers in front you can produce sound all around you. This certainly can be done in a laboratory. You have to bite a board so that you can't move at all, and it's very impressive. But it's rather hard to do, and I would still be for getting a better picture up the front because I think we have what I call a 'cone of concentration' up the front. It ignores to some extent the sounds at the back provided they're not distracting ones, and when you're there you look at the orchestra: you face it and you concentrate on its sounds. The sounds from the back are of less significance.

JC: Nevertheless, to do the surround-sound job properly — as perhaps with Ambisonics — does make the reproduction more convincingly real, does it not?

PW: Oh, it's more convincingly real, which of course is the business we're in.

JA: But we seem to be an awful long way from reality even with your 'forward cone'. From reaction at shows to our talks on the subject there is quite a backlash developing against the way records are recorded and miked and balanced. Do you think that, hopefully, as ESL-63s are used by people who make records, they might become convinced that they should record more naturally? They would then be able to *hear* what they are doing before making value judgements, on speakers which are so revealing of what's going on that they become aware of the anomalies and oddities.

PW: I wonder. There's too much expertise goes into the making of the record. If you go to an AES meeting or an exhibition of, say, a

...Selling things to mess up the sound...

hundred exhibitors, and you just look down the list you find that over 90 of those 100 are selling things to mess up the sound: compressors, squashers, graphic-equalisers, mess-it-abouters. They're all doing that, are they not? Now this 'professionalism' has crept in largely through the popular field, but is nevertheless being used more and more in classical reproduction. They've got to squash it down because most of the people can't have a wide dynamic range: 'What about people with car radios?' — that sort of thing.

JA: The sad thing is that the recording engineers who pay cognizance to this whole problem tend to be regarded by the music industry in general as a bit wild, a bit untrustworthy.

JC: Yes, purists of one sort or another who keep saying that ideally one ought to use a simple, cross-pair microphone system are looked upon as cranks.

PW: But fortunately whole lots of people can make records, so if the standard of recording goes down some small firms will crop up who can do a better job, and they can still do this with the Compact Disc, can't they? Because the people who are going to do the pressing will have no say in the recorded balance. That is the safeguard. It can't *all* go rotten on us.

JA: Mention of Compact Disc — do you think digital technology is at present ready for introduction as a consumer product?

PW: I think it's all being rushed. It has to be rushed a bit for commercial reasons — 'first man in is the winner' sort of thing. And I think the engineers working on it would perhaps have liked a slightly bigger disc, because they've got to get a million bits of information on one square millimetre. And what's one square millimetre? A weeny little size, and it's a little bit tight. I think they'd have liked a little more time, as engineers always would for a project. But they *will* get it right, there's no doubt about that, and it will be a great thing for us. I think that 85-87dB of perfect dynamic range, with a grotty noise at one end and grotty noise at other, is fine. One would like it wider than that for 'slippage', because people get things wrong and you've got to get it right within there; but if you do get it right then the nasty noise is below audibility and you don't hit the other nasty noise at the very loud end. Then you are just as good as an amplifier, which I think is very good!

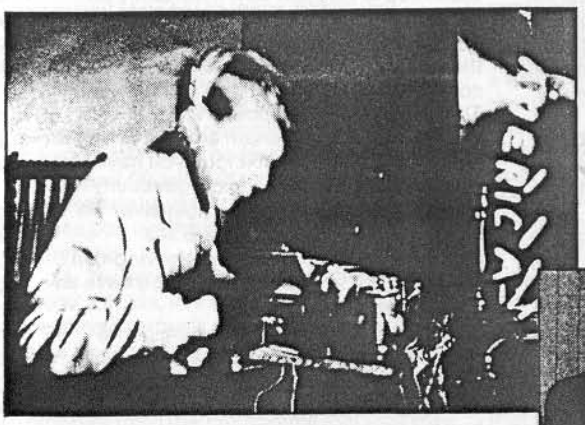
JA: Which brings us back to the question of when does improvement become unnecessary?

PW: We argue this in the lab and we say, well, a PX 25 valve amplifier with about 6dB of feedback in triode days was very, very good. Its output was nearly a copy of its input, certainly for all the program material available. Therefore you can't make a better amplifier, can you? And in fact in 1950 there's a paper in the *AES Journal* by

...with a knowledge of Ohm's Law and common sense...

D.T.N. Williamson and myself saying that. It's there for you to read, saying that you can't make a better amplifier than this, no matter what happens — or virtually you can't. I still hold to that, and that was 32 years ago. It is all quite logical really, with a knowledge of Ohm's Law and some commonsense.

But we *can* still give you the same number of watts for the same number of pounds that we could give you then, which is an improvement of at least ten-to-one in power for real money. Also, if you can make an amplifier that's very efficient, say 100%, then all the power goes to the loudspeakers, with none dissipated in the amplifier. That would be the size of just one postage stamp wouldn't it? Don't think that's coming out next year, it isn't, but it is an objective to work towards, and *that's* a better amplifier by definition.



Left: Peter Walker aged about twelve, experimenting with his radio and hoping to hear 'America' — which he carefully wrote on the negative 90 degrees out of phase!

Right: PW receiving his Audio Award from Antony Hopkins at the RFH on May 19th

JC: Why efficiency? You're not using up very much energy from the mains supply with a Class-B amplifier.

PW: No, it isn't that, it's the *cost* of the thing. If we could supply you with a little thing no bigger than a 2p piece that gave you 500 watts at zero distortion, we would have done a good job would we not?

JA: You feel that the main room for improvement is in that direction then?

PW: I don't think you can make amplifiers better in any respect other than to make them smaller, more efficient, more reliable.

JA: What about criticisms that, in general, amplifier measurements in terms of distortion, noise, or whatever, are all steady-state and don't recognize the fact that the music signal is actually asymmetric, it changes, and that therefore there might be effects with that sort of signal which would not show up on sinewaves?

PW: There are a whole lot of such effects, but we don't test our amplifier only on sinewaves and squarewaves and things — the magazines do that. This is part of history. When you had Class-A amplifiers and nothing changed with signal amplitude, that was adequate to express the gross errors, but it's not now. You could make an amplifier which passed all the specs that you couldn't recognize a tune on! You could garble up the performance so much in certain respects that a voice came out as noise, just noise, but you'd put your sinewave on and you wouldn't know.

You don't check that when the input goes up 2dB the output goes up 2dB, do you? No, you put it on at nearly full power, look at the sinewave, and measure distortion; you then measure it at low power, but you don't measure the *relation* of those two. Supposing there's a whole lot of AGC on it? You wouldn't know. Supposing it shifted its bias?

JC: One of the points relating to JA's question is that because music waveforms are extraordinarily complex, and because some loudspeaker loads are also very complex, we can't be quite sure of what exactly happens all the time, that the amplifier remains in command and does *exactly* what it's told.

PW: If we play an amplifier into a loudspeaker, actually on Beethoven or what-have-you, and take the output and input and cancel them in anti-phase, then we can tell what the difference is because A-minus-B *is* the difference, and if that is nothing then the amplifier is doing its stuff and is not altering the signal in any way. If there is anything wrong it would make a noise. Is that not right?

...the anti-phase input/ output test...

JA: That assumes you are doing it in such a way that you're not hiding or covering up anything.

PW: What can you cover up? DC offset? Phaseshift? A little bit of phaseshift perhaps. But a good amplifier simply won't alter the signal in any audible way, and if there *is* a difference between two amplifiers revealed by careful listening tests, you've got to find the cause. Does the output impedance change? Or the current limiting? Is the difference because one's got an output condenser and the other hasn't? Right, take it out and do it again. The difference is still there? Then it wasn't that. Nobody does that, but you *must* till you find out what it was. You've got to prove what it was.

JA: But when you look at commercial amplifier designs, they're full of compromises which could cause these different sorts of effects. So I think that when you say in your famous quote that 'all good amplifiers sound the same', it actually begs the question on the meaning of 'good'.

PW: That could have a different title, it could have said: 'Why all amplifiers sound *different*', because it gave at least twelve reasons why amplifiers sound different that people never, or very rarely, check up on when they do comparisons. You've got to have the same bandwidth of amplifier, for instance, because the bandwidth affects what the speaker does, not always to its advantage. If you took ten modern amplifiers, set the levels correctly and avoided overload, about five of them would sound the same, the other five wouldn't. But that's because you've just got the levels right and you've go no overload. That's all you've done. You hadn't checked the other things which can affect sound quality.

JA: As a personal opinion, I'm starting to suspect that perhaps there aren't many good amplifiers around.

PW: There are less than there were in valve days; the valve amplifiers on the whole were pretty good. You just took it from the book, but had to make sure that you didn't put in a signal that the amplifier couldn't take. First requirement of an amplifier: don't make it produce an output that it could not have produced without feedback given a sufficiently complicated input. That was written up by Black many years ago and is what TID is all about. And it says that negative feedback won't make an amplifier do what it could not have done before, given a sufficiently complicated input, because that's what feedback does: it alters the input to produce the output, and if it can't produce 20kHz because it's rolling off without feedback, then no messing about with feedback will produce 20kHz. It'll try, but it'll make a mess of it.

JA: No-one else has said that as you've just said it!

PW: No? But it's known, it's in the literature. People coming into the business make a lot of mistakes, as we all do when we come into things. We made an awful lot of rotten amplifiers, shocking things. But you learn that other people make mistakes too. There are a few dud amplifiers around. Less now, less than there were a few years ago. All much better, the RIAAs are nearly all right. If you measure them you find the RIAAs are now as flat as a pancake; measured 15 years ago they were all over the shop, 2-3dB out. That's improved, and on the whole they're getting a bit better. One has to be careful with control units, though. For instance, not all moving-coil pickups roll off at the top end, and some resonate at 40-50kHz and can give quite a high output there. That causes trouble on some amplifiers. So these are the sort of mistakes, errors, that happen, come along. Maybe you should put on a front-end sharp filter so that it can't happen, but we don't do that. We say you've got to make an amplifier that will accept everything that would normally be fed through to it.

JA: Do you think that certain effects which are thought inconsequential at present might become important as reproduction gets better? Ten years ago you could do all sorts of funny things to phase all through the band and it perhaps didn't matter. But then Lipshitz and Vanderkooy claimed that you cannot do some things in the way of phaseshift without an audible effect.

PW: They said that on *program?* I don't know any effects on program. You can certainly make artificial signals which, when you shift the phase, it messes things up. Obviously you can take a squarewave, shift the fundamental and the peaks have gone up, and if the squarewave's near the output limit of the amplifier, shifting its phase may now cause overload. Things like that can do it, and an asymmetrical signal, your ears are asymmetrical too and will distort one way more than the other. Changing the *absolute* phase, yes it will affect that. But I don't know any test where it's been done on music program. Some say it can be heard on certain test records, and if everything else gets right, everything is perfect, then maybe getting the phase right might be important. But there's no hard evidence that it is yet. You may have to hold the phase down to 20Hz because some transient noises have very low frequency components in them, but practical signals get shifted around all over the place at the bottom end. Maybe we didn't ought to do that, ideally, and will hear the differences as program quality improves.

JC: Talking of program quality, when you were first making hi-fi amplifiers you put HF filters on, in the days of '78s' and so on, and you've kept a fairly elaborate filter system going ever since. Would you agree that there is generally less call for HF filtering now?

PW: Yes, I would agree to that.

JC: To the point where perhaps the elaboration of three frequencies and variable slope is excessive?

PW: Maybe, but how can I judge this because my ears don't hear the top-end like they did 20 years ago? I certainly remember then that you bought an ordinary record and the violins had little violins zizzing away on top. There was an awful noise going on up there — and theoretically there must be. But I suspect that records have got a bit better, and pickups too. The distortion's still a bit high, higher than anyone likes, though I think you could find two or three filter positions that would cover all of it. Maybe one sharper and one a bit more gradual, and perhaps two frequency positions. Something like that.

JC: How did your oft quoted phrase: 'The Closest Approach to the Original Sound', come to be coined?

PW: Oh, it was just one of those things you write down without thinking about it. I remember doing the leaflet for the first Quad amplifier. You open the front page and there is QUAD written across it and you have to put something underneath to balance it up: 'for the best noise'? You've got to put *something* down, so, what are we trying for? Well, 'for the closest approach to the original sound' so I put that.

JC: Well, that's a very mundane beginning for such a famous slogan, but your own hi-fi career has itself been a nice mixture of down-to-earth engineering and questing hi-fi adventure, and whatever its origins, the *closest approach to the original sound* is still a splendid ideal. What in your view are the key remaining areas for improvement in domestic hi-fi, in the search for that ideal?

PW: The speaker and the room are I think the most critical thing. The other things will get solved. The program quality should now go up if we get Compact Discs and so forth — provided the recordings are not all garbled up before they get to the disc. Get the loudspeaker and the room working properly together — that's the thing. ●