

CPHDM carried out at Bartol, Berkeley, NASA/Goddard, Queen Mary College, Rome, Santa Cruz and elsewhere. These studies all conclude that cold-hot dark matter (with some 70% cold and 25% hot) is a promising model of large scale structure formation.

Alternatives to CPHDM include retaining CDM but giving up the HZ density fluctuations. But the required deviation from HZ is so large that it probably cannot be realized in ordinary grand unified theories, perhaps not even in other 'realistic' models. Another scenario assumes that the matter density is low, and has a cosmological constant (antigravity). This model may already be in conflict with some recent observations which suggest significant matter concentrations.

The idea that both cold and hot dark matter play a role in structure formation has far-reaching implications for particle physics. The preferred cold dark matter candidates include the lightest supersymmetric particle (LSP) as well as axions. For HDM, the tau neutrino with a mass $2 - 10$ eV is the obvious candidate.

While COBE's discovery of microwave anisotropy is extremely important, these results and other data, spanning a wide range of length scales, are perfectly consistent with a scenario of cold plus hot dark matter, with density fluctuations essentially having the scale invariant (HZ) form predicted by inflationary models based on grand unified theories.

Just as the 1970s witnessed the rise of the Standard Model of particle physics, perhaps the nineties will see the emergence of a 'standard model' of large scale structure formation.

By Qaisar Shafi

Congress in Washington

Over 1200 accelerator physicists and engineers gathered in Washington mid-May for the 15th in the series of biennial Particle Accelerator Conferences (PAC) - the major US forum for accelerator physics and technology. For the first time since their inception, actual attendance declined, however the number of contributed papers stayed around 1500.

CERN Director General designate Chris Llewellyn Smith spelled out the challenges with an opening talk underlining the deficiencies in today's Standard Model. From many directions comes the message that collision in the 1 TeV range must tell us something new - wherefore art thou SSC and LHC?

The secondary shock waves of last year's (fortunately overturned) bid to cancel the SSC Superconducting Supercollider project still ripple around the USA, while progress towards authorization of CERN's LHC Large Hadron Collider has been slower than initially hoped.

The new US administration has indicated a constant rate of SSC funding over the next four years; the figure is higher than the present budget but considerably below the originally proposed budget profile, implying that completion will be retarded by some three years beyond the end of the decade. The SSC Laboratory will clearly have problems to fight increased overall cost and sustain enthusiasm. CERN hopes for LHC blessing in time to allow machine completion by the year 2000.

Pride of place at Washington went to DESY's HERA electron-proton

collider - the major new facility since the previous PAC. Commissioning has been impressive and physics is well underway, with luminosity climbing towards the design figure.

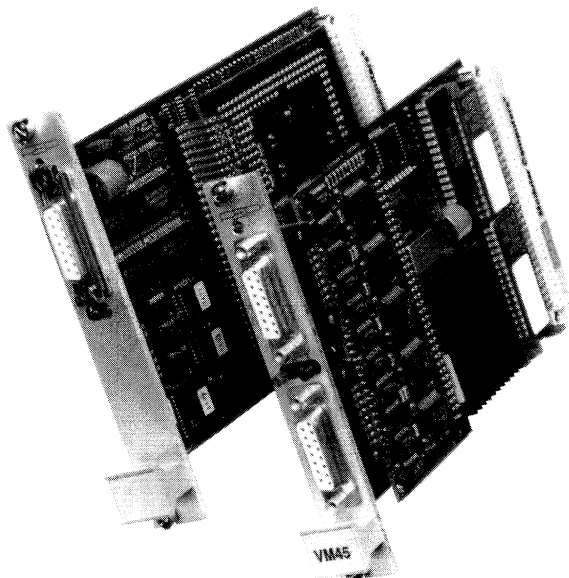
The varied user community of the ubiquitous synchrotron radiation facilities is now considerably larger than that of particle physics and has extensive industrial involvement. Three such machines have come into operation since the previous PAC - the 6 GeV European Synchrotron Radiation Facility at Grenoble, the 1.5 GeV Advanced Light Source at Berkeley, and the 1.3 GeV Synchrotron Radiation Research Centre in Taiwan.

Linear electron-positron colliders - the proposed route for collision energies beyond LEP at CERN - were moved out of 'advanced accelerator concepts'. They are now considered to be in the pipeline, with much work in progress and many test facilities built or being built, leaving techniques like plasma beat wave accelerators in the realm of exotic approaches.

Though the scale and complexity of today's big machine projects imply timescales long on a biennial progress report scale, this superficial impression hides a lot of achievement. Full report in the next issue.

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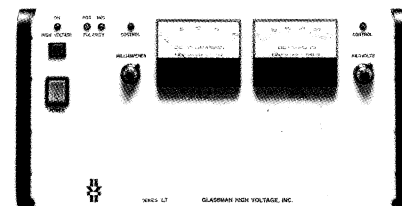


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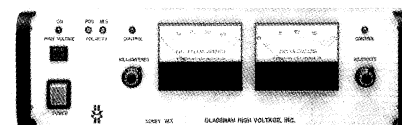


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