specific cell types. To stimulate innovative research, the Panel recommends the use of interdisciplinary workshops, specific programme announcements in these areas, and the use of short-term, pilot grants for testing new ideas and for encouraging investigators from other areas to enter the field of gene therapy.

2. To address important biological questions and provide a basis for the discovery of alternative treatment modalities, the Panel recommends increased emphasis on research dealing with the mechanisms of disease pathogenesis, further development of animal models of disease, enhanced use of preclinical gene therapy approaches in these models, and greater study of stem cell biology in diverse organ systems.
3. Strict adherence to high standards for excellence in clinical protocols must be demanded of investigators. Gene therapy protocols need to meet the same high standards required for all forms of translational (or clinical) research, whatever the enthusiasm for this (or any other) treatment approach.
4. To enhance the overall level of research in this area, the Panel recommends that NIH support broad interdisciplinary postdoctoral training of M D and Ph D investigators at the interface of clinical and basic science. Mechanisms for physician training in this area might include use of career development awards based on a programme announcement in gene therapy.
5. Investigators in the field and their supporters need to be more restrained in their public discussion of findings, publications, and immediate prospects for the successful implementation of gene therapy approaches. The Panel recommends a concerted effort on the part of scientists, clinicians, science writers, research advocates, research institutions, industry, and the press to inform the public about not only the extraordinary promise of gene therapy, but also its current limitations.
6. NIH has already provided an appropriate initial investment in gene therapy. Future gene therapy research should compete with other forms of biomedical research for funding under stringent peer review. Only with fair, yet critical, peer review will high standards be met and maintained. The Panel specifically does not recommend special gene therapy study sections, expansion of existing centre programmes in gene therapy, or expansion of the recently funded core vector production programme. To ensure that the level of support remains appropriate, the NIH investment in this field should be reexamined periodically.
7. To enhance the contribution of industry to the field, the Panel recommends that NIH encourage collaborative arrangements between academic institutions and industry that complement NIH-supported research, and also implement mechanisms that facilitate the distribution and testing of vectors and adjunct materials for use in clinical studies.
8. In an effort to improve gene therapy research and reduce duplication of effort, the Panel urges better coordination and scientific review of such research throughout the NIH Intramural Programme. In addition, NIH Institute Directors should resist pressures to include gene therapy research in their portfolios (either intramural or extramural) to 'round out' their programmes or compete with other Institutes. Instead, they should include such research only when there are compelling scientific reasons to go forward. Institute Directors should take the lead, where it seems appropriate, to focus efforts on improvement of diagnosis and understanding of disease pathogenesis and await further developments in vector technology before expanding clinical gene therapy programmes.

Asteroids and Earth's evolution – A new perception

Shaking the very foundations of long-accepted geological and geophysical theories, some new unorthodox views which cannot be brushed aside have been put forward by H. R. Shaw, a researcher in the US Geological Survey, in his recent book *Craters, Cosmos and Chronicles: A New Theory of Earth* (Stanford University Press). Shaw feels that asteroids and comets had a much greater role in shaping Earth's geological evolution than has been presumed so far. These celestial bodies did not impact randomly all over Earth, but hit only particular spots, determined by their nonlinear interactions with members of the solar system. The repeated batterings that the Earth has taken in its long past have contributed to the various geophysical phenomena like the distribution of continents, disposition of Earth's magnetic field, triggering of volcanic eruptions and the evolution and extinction of life forms.

Along with colleague William Glen, he chronicled several asteroid impacts between the time period 50–100 million years ago, and surprisingly found that their impact sites fell along a line encircling the globe, which they aptly called the K–T swath, after the famous asteroid impact during the Cretaceous–Tertiary period (Figure 1). Still older impact sites dating back to 600 million years ago were also found to group into three distinct clusters in North America, Eurasia and Australia, instead of being randomly distributed among all continents.

Shaw feels that chaos arising from nonlinear interplanetary gravitational influences dictates the orbits assumed by asteroids which are believed to have been ejected out of the main asteroid belt. Their chaotic trajectories bring them into inner solar system, where they come within the grip of the Earth (or other inner planets) and once within its influence, the uneven distribution of mass inside the Earth causes the paths of these asteroids to shift gradually to specific orbits, in tune with the fluctuating gravity profile over the Earth. In due course, they end up crashing to the Earth, always along circular tracks corresponding to their gravity-tuned trajectories. According to Shaw, these bodies have been crashing along a limited array of sites or 'cratering nodes' over the past half-billion years.

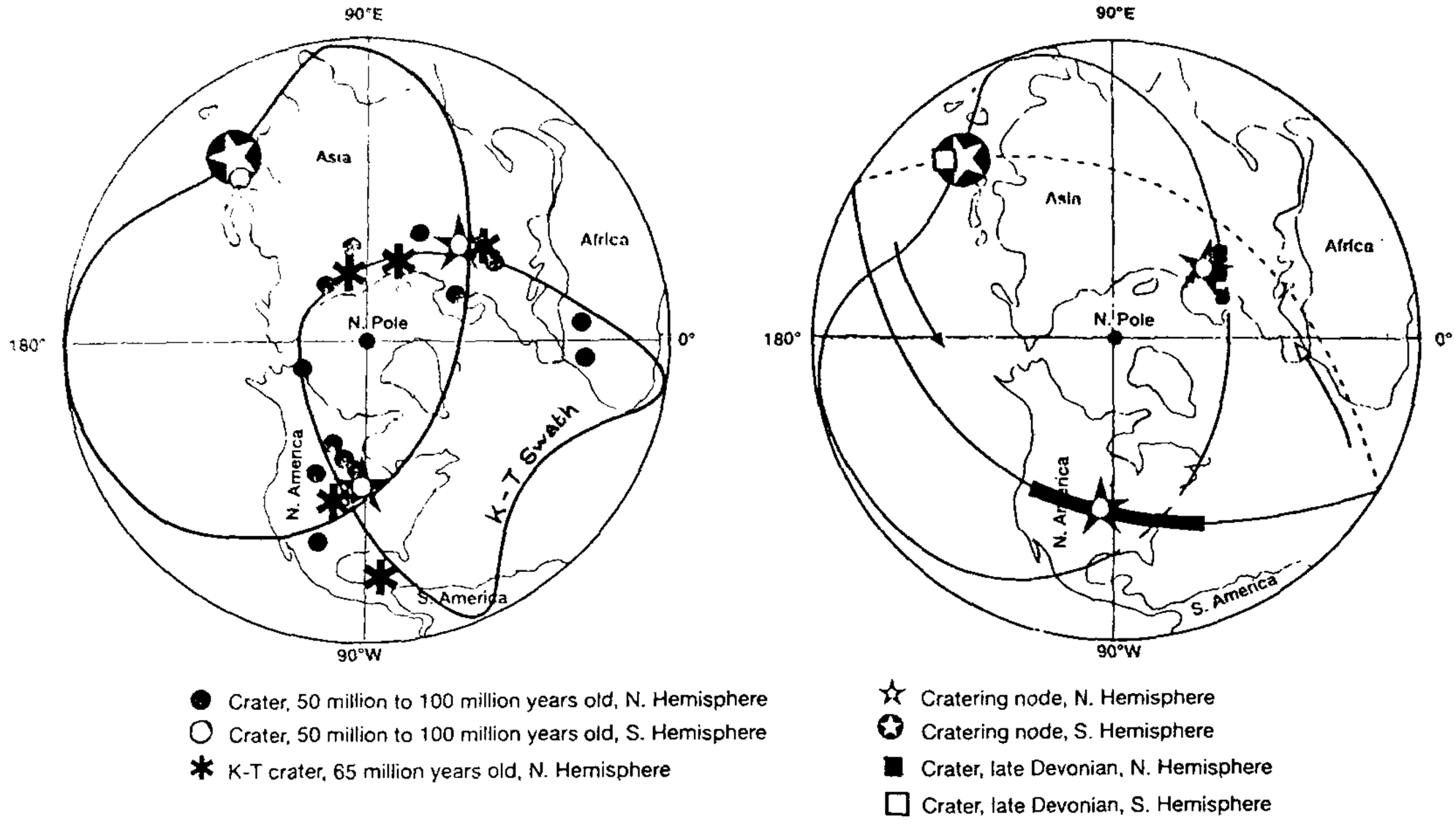

Figure 1.

After elaborate computer calculations, Shaw has derived a potential orbit for Earth-circling asteroids.

While the postulated mechanics of asteroid capture appear plausible, their role as prime agent shaping Earth opposes well-accepted theories. For example, Shaw feels that their powerful impacts in the past triggered some of the flood basalt eruptions which he finds located along the great circle. This runs counter to the accepted idea that they arise as plumes of hot lava from Earth's molten interior. Similarly, his hypothesis is opposed to current theories of plate tectonics, or the drifting of continents. He finds that the regions frequently hit, i.e. the cratering nodes, have remained the same during the vast span of 600 million years, thereby implying that the continents have not drifted for long periods, or they did so, much less than what is believed, or they have been returning again and again to the same location. Even the well-documented shifting of the Earth's magnetic field, believed to be caused by drifting currents of molten iron within the Earth's core is attributed by Shaw to powerful asteroid impacts inducing the drifts.

Although a few scientists in the past have linked asteroid impacts to the onset of volacanism and drifting of magnetic field, it is however Shaw who unified these by applying nonlinear dynamics and predicting patterns in their paths, otherwise not apparent.

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RESEARCH NEWS

The manganese hide out in the photosynthetic reaction centre

M. K. Raval

A manganese cluster oxidizes water to oxygen in the reaction centre II of oxygen evolving photosynthetic organism. This photochemical reaction is crucial for production of biomass and maintenance of oxygen level on earth. Therefore, the study of structural and functional aspects of the Mn-centre has received much attention[1]. Knowledge of structural organization of Mn and its ligands in the catalytic centre and mechanism of photo-oxidation of water might lead to design of synthetic Mn-centre mimicking photosynthetic reaction centre II for harvesting solar energy[2]. However, it has not been