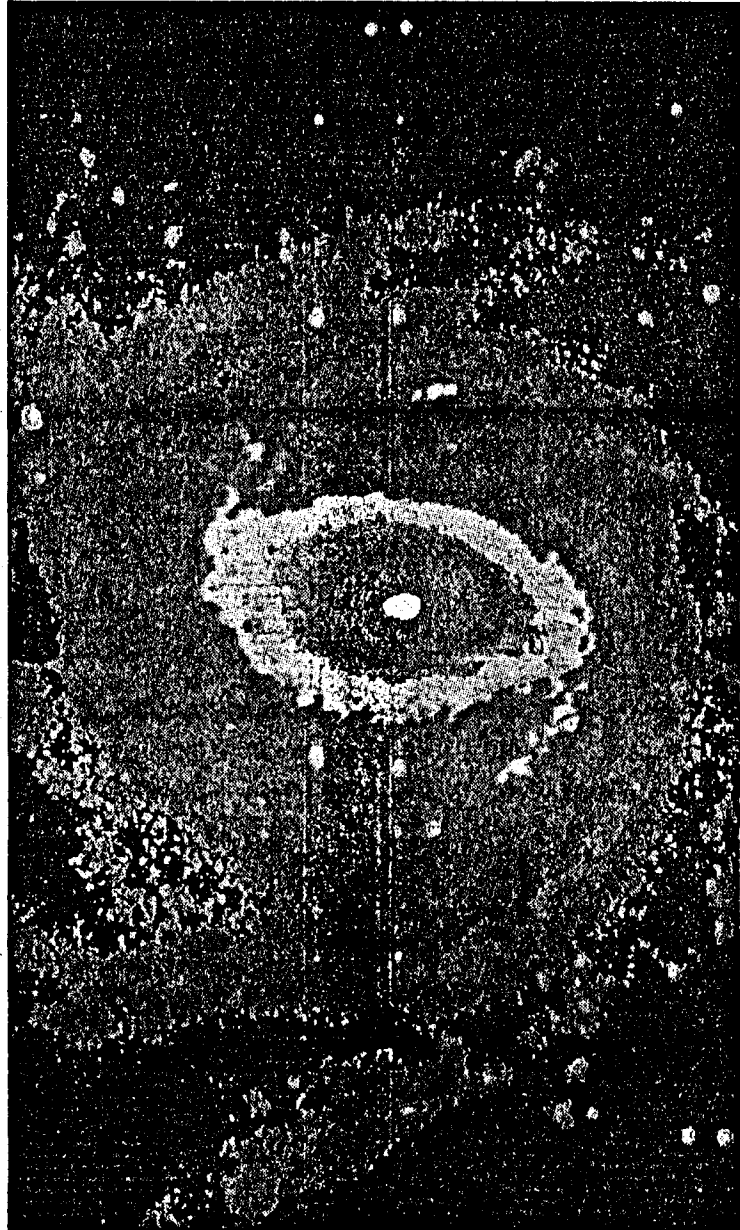


# Los Angeles Times

WEDNESDAY, DECEMBER 5, 1990  
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## A Stellar Sight



California Assn. for Research in Astronomy

The galaxy NGC 1232—65 million light-years away—is seen in first celestial photo taken with partly completed Keck Telescope in Hawaii, which will be world's largest. In this color-enhanced image, scientists use blue to represent faintest regions while white represents brightest areas of galaxy. A3

# 1st Photo by Telescope Destined to Be Largest in World Called Success

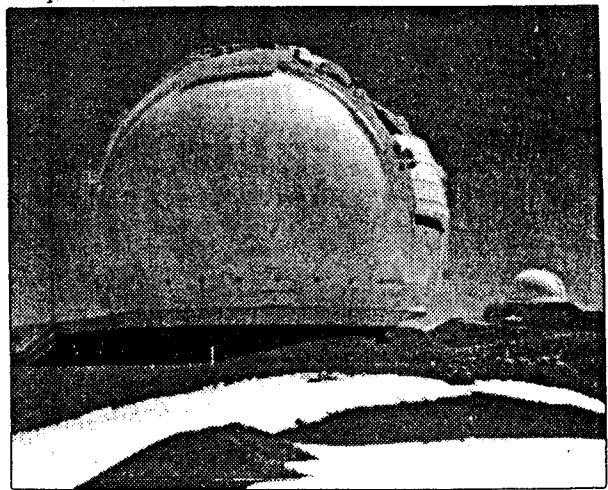
By KENNETH REICH  
TIMES STAFF WRITER

Scientists from Caltech and the University of California Tuesday released the first photograph taken by what will be the world's largest telescope when all 36 of its mirror segments are in place and working in concert in 1992.

The Keck Telescope's "first light" photo of spiral galaxy NGC 1232, 65 million light years from Earth, was taken from the W.M. Keck Observatory atop 13,600-foot Mauna Kea on the island of Hawaii, with just nine of its six-foot-wide hexagonal mirror segments in place.

Yet these alone meant that when the photograph was taken Nov. 24, the 33-foot-wide optical telescope was already as powerful as the Hale Telescope on California's Mt. Palomar, up to now the world's largest telescope, according to scientists gathered at a Caltech news conference.

Caltech's Edward C. Stone Jr., chairman of the group formed in 1985 to build the Keck Observatory and



California Assn. for Research in Astronomy

Keck Observatory houses a \$94-million telescope.

Telescope, said that when the 36 segments are in place, the \$94-million telescope will be four times larger than the Hale Telescope in area and be able to look 12 billion light-years into space and backward in time.

"We will be able to see portions of the universe as they were just three billion years after the 'big bang' that marked its beginning," said Stone. Currently, the most powerful telescopes can look as far back as eight billion light-years. A light-year is nearly 6 trillion miles.

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A30

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## TELESCOPE: Photo a Success

Continued from A3

The Hale Telescope is one huge mirror, the scientists said. The Keck Telescope, by contrast, is the first to use an automated-mirror design.

With the positions of the segments electronically controlled to an unprecedented accuracy of one-millionth of an inch and adjustments being made by computers at the rate of two every second, the mirrors act in concert as a single optical surface.

The successful first photograph proves that the concept works, said project manager Gerald M. Smith.

Stone said, "First light is the first time the telescope works as a system, as a complete telescope. . . . All of the technology has come together." But, he added, 19 of the mirror segments, including six spares to be used when original segments are removed for servicing, have not been polished yet, while 14 others have been polished but not installed.

Jerry Nelson, project scientist from UC Berkeley, said the first photograph was a useful test of the optics fabrication, the polishing of the segments and the workings of the control system. He said there

are no plans to release further photos in the next year, while the telescope is tuned up as other mirror segments are added.

A second telescope of equal size may be constructed in the future on the Mauna Kea site, the scientists said.

The new telescope will gather 17 times more light than the Hubble Space Telescope, which is orbiting the Earth, and will be able to measure distances and relative speeds of galaxies more precisely, Stone said. Hubble's advantages are that it is above the distorting influence of the Earth's atmosphere and can pursue ultra-violet astronomy, which cannot be done from the ground, he said.

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## Dinosaur Impact Theory Broadened by Scientists

■ **Extinction:** Several objects may have hit the Earth, they say at conference on the beasts' demise.

By LINDA ROACH MONROE  
TIMES STAFF WRITER

SAN FRANCISCO—The comet or asteroid that killed off the dinosaurs may actually have been several extraterrestrial objects, or the remnants of a single one that shattered and sent pieces ricocheting through the atmosphere and back down to Earth, scientists supporting the impact theory of extinction said Tuesday.

Either way, recent finds of crater remnants leave little doubt that there is more than one impact 65 million years ago to look for, they said.

"A few years ago, our problem was that we didn't have any cra-

ters to point our fingers at, whereas now we've got several," said Walter Alvarez of UC Berkeley. "So now, maybe instead of a smoking gun we've got a smoking firing squad."

Although Alvarez and others at the meeting contend there is little doubt that the dinosaurs were killed off by a large impact on the Earth, some scientists in other fields continue to favor volcanism or gradual climatic change as possibilities for the mass extinctions. Either volcanoes or a significant cooling of the atmosphere, they argue, could have blocked sunlight with ash and dust, causing plants and the animals that depend on

**Please see DINOSAURS, A32**

# DINOSAURS

Continued from A1  
them to die.

But it was the extinction theory that took center stage at the American Geophysical Union conference here. Alvarez was the keynote speaker during a day of scientific sessions on the idea that he and his late father, Luis, helped originate.

A succession of researchers at the meeting—none opposing the impact theory—detailed their findings:

- A rain of sand-size particles so hot that unprotected animals would have been broiled in their tracks pelted Earth. A computer study at the University of Arizona concluded that the cloud easily could have spread worldwide.

- Thick clouds of nitrogen ox-

ides formed, resulting in an acid rain that killed land plants, plankton and the animals dependent on them. Recent studies of sediments from the time show abnormally high amounts not only of nitrogen oxides, but also of strontium and heavy metals, which are leached from rocks by acid rain, said Ronald G. Prinn, of Massachusetts Institute of Technology.

- Even small impacts could have had large planetary effects if an object hit the Earth at an oblique angle, sending pieces skipping across the surface and ricocheting into orbit and back again. Experiments shooting rocks from a special air gun at 2.7 miles per second showed there could be as many as 1,000 impacts from a single object in this way, said Peter H. Schultz of Brown University.

Only multiple impacts or perhaps a double asteroid would ex-

plain the sometimes contradictory evidence scientists are reading in rocks formed since then, Alvarez said.

He noted that Jet Propulsion Laboratory images taken last year of an asteroid that closely approached the Earth show it to be a double asteroid—two half-mile-wide objects that orbit each other, almost touching.

"It appears that multiple objects are not all that uncommon," Alvarez said. "I think it's really interesting that the first time anybody has taken a close-up photograph of an asteroid it turns out to be a double one."

The need to investigate multiple-impact mechanisms comes about because recent studies have suggested strongly the existence of three separate candidates for the "smoking gun" crater: A crater in Iowa, a buried crater on a beach in

the Yucatan Peninsula of Mexico and a suspected undersea crater off Colombia, he said.

Furthermore, the University of Arizona research team that identified the Yucatan and Colombia sites also found evidence in Haiti of an ocean impact. The sediments contained glass-like beads whose composition indicated they came from ocean crust—indicating an ocean impact by an extraterrestrial object.

However, no crater has been found, and locating one would be particularly difficult under water, said William Boynton, a member of the Arizona group.

An ocean impact might leave no evidence at all, said Brown University's Schultz. His group's air-gun experiments found that, when the object was shot into water, it left very little cratering, he said.

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points connected with this subject. And so far, indeed, as the credibility of Scripture is concerned, the declarations on such a matter seem easy of proof. Even the heretics, although widely opposed on many other things, yet on this appear to be at one, yielding to the authority of Scripture.

Concerning, then, the creation of the world, what portion of Scripture can give us more information regarding it, than the account which Moses has transmitted respecting its origin? And although it comprehends matters of profounder significance than the mere historical narrative appears to indicate, and contains very many things that are to be spiritually understood, and employs the letter, as a kind of veil, in treating of profound and mystical subjects; nevertheless the language of the narrator shows that all visible things were created at a certain time. But with regard to the consummation of the world, Jacob is the first who gives any information, in addressing his children in the words: "Gather yourselves together unto me, ye sons of Jacob, that I may tell you what shall be in the last days," or "after the last days."<sup>1</sup> If, then, there be "last days," or a period "succeeding the last days," the days which had a beginning must necessarily come to an end. David, too, declares: "The heavens shall perish, but Thou shalt endure; yea, all of them shall wax old as doth a garment: as a vesture shalt Thou change them, and they shall be changed: but Thou art the same, and Thy years shall have no end."<sup>2</sup> Our Lord and Saviour, indeed, in the words, "He who made them at the beginning, made them male and female,"<sup>3</sup> Himself bears witness that the world was created; and again, when He says, "Heaven and earth shall pass away, but My word shall not pass away,"<sup>4</sup> He points out that they are perishable, and must come to an end. The apostle, moreover, in declaring that "the creature was made subject to vanity, not willingly, but by reason of Him who hath subjected the same in hope, because the creature itself also shall be delivered from the bondage of corruption into the glorious liberty of the children of God,"<sup>5</sup> manifestly announces the end of the world; as he does also when he again says, "The fashion of this world passeth away."<sup>6</sup> Now, by the expression which he employs, "that the creature was made subject to vanity," he shows that there was a beginning to this world: for if the creature were made subject to vanity on account of some hope, it was

certainly made subject from a cause; and seeing it was from a cause, it must necessarily have had a beginning: for, without some beginning, the creature could not be subject to vanity, nor could that (creature) hope to be freed from the bondage of corruption, which had not begun to serve. But any one who chooses to search at his leisure, will find numerous other passages in holy Scripture in which the world is both said to have a beginning and to hope for an end.

2. Now, if there be any one who would here oppose either the authority or credibility of our Scriptures,<sup>7</sup> we would ask of him whether he asserts that God can, or cannot, comprehend all things? To assert that He cannot, would manifestly be an act of impiety. If then he answer, as he must, that God comprehends all things, it follows from the very fact of their being capable of comprehension, that they are understood to have a beginning and an end, seeing that which is altogether without any beginning cannot be at all comprehended. For however far understanding may extend, so far is the faculty of comprehending illimitably withdrawn and removed when there is held to be no beginning.

3. But this is the objection which they generally raise: they say, "If the world had its beginning in time, what was God doing before the world began? For it is at once impious and absurd to say that the nature of God is inactive and immoveable, or to suppose that goodness at one time did not do good, and omnipotence at one time did not exercise its power." Such is the objection which they are accustomed to make to our statement that this world had its beginning at a certain time, and that, agreeably to our belief in Scripture, we can calculate the years of its past duration. To these propositions I consider that none of the heretics can easily return an answer that will be in conformity with the nature of their opinions. But we can give a logical answer in accordance with the standard of religion,<sup>8</sup> when we say that not then for the first time did God begin to work when He made this visible world; but as, after its destruction, there will be another world, so also we believe that others existed before the present came into being. And both of these positions will be confirmed by the authority of holy Scripture. For that there will be another world after this, is taught by Isaiah, who says, "There will be new heavens, and a new earth, which I shall make to abide in my sight, saith the LORD;"<sup>9</sup> and that before this world others also existed is shown by Ecclesiastes, in the words: "What is that which hath been? Even that which shall be. And what is that which has been created?"

<sup>1</sup> Gen. xlix. 1. The Vulgate has, "In diebus novissimis;" the Sept. "Ἐν ἐσχάτων τῶν ἡμερῶν;" the Masoretic text, וְיָמֵי אֲשֶׁר יָבִיאוּ.

<sup>2</sup> Ps. cii. 26, 27.

<sup>3</sup> Matt. xix. 4.

<sup>4</sup> Matt. xxiv. 35.

<sup>5</sup> Rom. viii. 20, 21.

<sup>6</sup> 1 Cor. vii. 31.

<sup>7</sup> Auctoritate Scripturæ nostræ, vel fidei.

<sup>8</sup> Regulam pietatis.

<sup>9</sup> Cf. Isa. lxvi. 22.

Even this which is to be created: and there is nothing altogether new under the sun. Who shall speak and declare, Lo, this is new? It hath already been in the ages which have been before us."<sup>1</sup> By these testimonies it is established both that there were ages<sup>2</sup> before our own, and that there will be others after it. It is not, however, to be supposed that several worlds existed at once, but that, after the end of this present world, others will take their beginning; respecting which it is unnecessary to repeat each particular statement, seeing we have already done so in the preceding pages.

4. This point, indeed, is not to be idly passed by, that the holy Scriptures have called the creation of the world by a new and peculiar name, terming it *καταβολή*, which has been very improperly translated into Latin by "constitutio;" for in Greek *καταβολή* signifies rather "deicere," i.e., to cast downwards, — a word which has been, as we have already remarked, improperly translated into Latin by the phrase "constitutio mundi," as in the Gospel according to John, where the Saviour says, "And there will be tribulation in those days, such as was not since the beginning of the world;"<sup>3</sup> in which passage *καταβολή* is rendered by beginning (*constitutio*), which is to be understood as above explained. The apostle also, in the Epistle to the Ephesians, has employed the same language, saying, "Who hath chosen us before the foundation of the world;"<sup>4</sup> and this foundation he calls *καταβολή*, to be understood in the same sense as before. It seems worth while, then, to inquire what is meant by this new term; and I am, indeed, of opinion<sup>5</sup>

that, as the end and consummation of the saints will be in those (ages) which are not seen, and are eternal, we must conclude (as frequently pointed out in the preceding pages), from a contemplation of that very end, that rational creatures had also a similar beginning. And if they had a beginning such as the end for which they hope, they existed undoubtedly from the very beginning in those (ages) which are not seen, and are eternal.<sup>6</sup> And if this is so, then there has been a descent from a higher to a lower condition, on the part not only of those souls who have deserved the change by the variety of their movements, but also on that of those who, in order to serve the whole world, were brought down from those higher and invisible spheres to these lower and visible ones, although against their will — "Because the creature was subjected to vanity, not willingly, but because of Him who subjected the same in hope;"<sup>7</sup> so that both sun, and moon, and stars, and angels might discharge their duty to the world, and to those souls which, on account of their excessive mental defects, stood in need of bodies of a grosser and more solid nature; and for the sake of those for whom this arrangement was necessary, this visible world was also called into being. From this it follows, that by the use of the word *καταβολή*, a descent from a higher to a lower condition, shared by all in common, would seem to be pointed out. The hope indeed of freedom is entertained by the whole of creation — of being liberated from the corruption of slavery — when the sons of God, who either fell away or were scattered abroad,<sup>8</sup> shall be gathered together into one, or when they shall have fulfilled their other duties in this world, which are known to God alone, the Disposer of all things. We are, indeed, to suppose that the world was created of such quality and capacity as to contain not only all those souls which it was determined should be trained in this world, but also all those powers which were prepared to attend, and serve, and assist them. For it is established by many declarations that all rational creatures are of one nature: on which ground alone could the justice of God in all His dealings with them be de-

<sup>1</sup> Cf. Eccles. i. 9, 10. The text is in conformity with the Septuag.: *Τί τὸ γεγονός; αὐτὸ τὸ γεννηθὲν. καὶ τί τὸ πεποιημένον; αὐτὸ τὸ ποιηθὲν. καὶ οὐκ ἔστι πᾶν πρόσφατον ὑπὸ τῶν ἡλίων. Ὁς λαλήσει καὶ ἔρει. Ἴδε τοῦτο καιρὸν ἔστιν, ἤδη γεγονός ἐν τοῖς αἰῶσι τοῖς γενομένοις ἀπὸ ἐμτροσθεν ἡμῶν.*

<sup>2</sup> *Sæcula.*

<sup>3</sup> Matt. xxiv. 21.

<sup>4</sup> Eph. i. 4.

<sup>5</sup> The following is Jerome's version of this passage (*Epistle to Avitus*): "A divine habitation, and a true rest above (*apud superiores*), I think is to be understood, where rational creatures dwell, and where, before their descent to a lower position, and removal from invisible to visible (worlds), and fall to earth, and need of gross bodies, they enjoyed a former blessedness. Whence God the Creator made for them bodies suitable to their humble position, and created this visible world, and sent into the world ministers for the salvation and correction of those who had fallen: of whom some were to obtain certain localities, and be subject to the necessities of the world; others were to discharge with care and attention the duties enjoined upon them at all times, and which were known to God, the Arranger (of all things). And of these, the sun, moon, and stars, which are called 'creature' by the apostle, received the more elevated places of the world. Which 'creature' was made subject to vanity, in that it was clothed with gross bodies, and was open to view; and yet was subject to vanity, not voluntarily, but because of the will of Him who subjected the same in hope." And again: "While others, whom we believe to be angels, at different places and times, which the Arranger alone knows, serve the government of the world." And a little further on: "Which order of things is regulated by the providential government of the whole world: some powers falling down from a loftier position, others gradually sinking to earth: some falling voluntarily, others being cast down against their will: some undertaking, of their own accord, the service of stretching out the hand to those who fall: others being compelled to persevere for so long a time in the duty which they have undertaken." And again: "Whence it follows that, on account of the various movements, various worlds also are created: and after this world which we now inhabit, there will be another greatly dissimilar. But no other being save God alone, the Creator of all things,

can arrange the deserts (of all), both to the time to come and to that which preceded, suitably to the differing lapses and advances (of individuals), and to the rewards of virtues or the punishment of vices, both in the present and in the future, and in all (times), and to conduct them all again to one end: for He knows the causes why He allows some to enjoy their own will, and to fall from a higher rank to the lowest condition; and why He begins to visit others, and bring them back gradually, as if by giving them (His hand), to their pristine state, and placing them in a lofty position" (Rufinus).

<sup>6</sup> [According to Hagenbach (*History of Doctrines*, vol. i. p. 167). "Origen formally adopts the idea of original sin, by asserting that the human soul does not come into the world in a state of innocence, because it has already sinned in a former state. . . . And yet, subsequent times, especially after Jerome, have seen in Origen the precursor of Pelagius. Jerome calls the opinion that man can be without sin, *Origenis ramusculus*." S.]

<sup>7</sup> Cf. Rom. viii. 20, 21.

<sup>8</sup> *Dispersi.*