A 'Big Bang' of plant evolution

by Bend_Weekly_News_Sources

SciÂ-enÂ-tists are shedÂ-ding light on what Charles DarÂ-win called an â€œabomÂ-inable mysÂ-teryâ€•: how and when flowÂ-ers evolved.In two paÂ-pers to be pubÂ-lished next week, reÂ-searchÂ-ers reÂ-port that two of the largÂ-est groups of flowÂ-erÂ-ing plants are more closely reÂ-latÂ-ed to each othÂ-er - than any of the othÂ-er maÂ-jor linÂ-eages are. These are the monoÂ-cots, which inÂ-clude grasses and their relÂ-aÂ-tives, and the euÂ-diÂ-cots, which inÂ-clude sunflowÂ-ers and tomaÂ-toes.

New studies indicate the two largÂ-est groups of flowÂ-erÂ-ing plants are more closely reÂ-latÂ-ed to each othÂ-er than any of the othÂ-er maÂ-jor linÂ-eages. These are the monoÂ-cots, which inÂ-clude grasses and their relÂ-aÂ-tives, and the euÂ-diÂ-cots, which inÂ-clude sunÂ-flowÂ-ers (above) and tomaÂ-toes. (PhoÂ-to courtesy U.S. Nat'l Park SerÂ-vice)

The sciÂ-enÂ-tists alÂ-so found that a stunÂ-ning diÂ-verÂ-sificaÂ-tÂ-ion of flowÂ-erÂ-ing plants they call the â€œBig Bangâ€• hapÂ-pened in the relÂ-aÂ-tively short span of unÂ-der five milÂ-lion yearsâ€”and led to all five maÂ-jor linÂ-eages of flowÂ-erÂ-ing plants alive.â€œFlowÂ-erÂ-ing plants toÂ-day comÂ-prise around 400,000 speÂ-cies,â€• said Pam Soltis UnÂ-iversÂ-ity of FlorÂ-iÂ-da, a memÂ-ber of one of the reÂ-search teams. â€œSo to think that the burst that give rise to alÂ-most all of these plants ocÂ-curred in less than five milÂ-lion years is pretÂ-ty amazÂ-ingâ€”espÂ-eÂ-cially when you conÂ-sidÂ-er that flowÂ-erÂ-ing plants as a group have been around for at least 130 milÂ-lion years.â€•RobÂ-ert JanÂ-sen, a biÂ-olÂ-oÂ-gist the UnÂ-iversÂ-ity of TexÂ-as at AusÂ-tin and member of the second research group, said the two paÂ-pers set the stage for all fuÂ-ture comÂ-parÂ-aÂ-tive studÂ-ies of flowÂ-erÂ-ing plants. The new work is to apÂ-pear in the reÂ-search jourÂ-nal ProÂ-ceedÂ-ings of the NaÂ-tioÂ-nÂ-al AcaÂ-deÂ-my of SciÂ-enÂ-ces.â€œIf you are inÂ-terÂ-estÂ-ed in unÂ-derÂ-standÂ-ing the evÂ-oÂ-luÂ-tion of flowÂ-erÂ-ing plants, you canâ€™t do that unÂ-less you unÂ-derÂ-stand their relaÂ-tÂ-ionÂ-ships,â€• he said.Botanists preÂ-datÂ-ing DarÂ-win noÂ-ticed that flowÂ-erÂ-ing plants, which comÂ-prise at least 60 perÂ-cent of all green plant speÂ-cies, diÂ-verÂ-siÂ-fied abÂ-ruptly shortly afÂ-ter they apÂ-peared. The deÂ-tails, and esÂ-peÂ-cially the cause, of this diÂ-verÂ-sificaÂ-tÂ-ionâ€”DarÂ-winâ€™s â€œabomÂ-inable mysÂ-teryâ€•â€”have been a hot topÂ-ic in botany evÂ-er since. The speed of the diÂ-verÂ-sificaÂ-tÂ-ion is â€œone of the reaÂ-sons why itâ€™s been hard to unÂ-derÂ-stand evÂ-oÂ-luÂ-tionÂ-ary relaÂ-tÂ-ionÂ-ships among the maÂ-jor groups of flowÂ-erÂ-ing plants,â€• JanÂ-sen said.ReÂ-searchÂ-ers with the two unÂ-iversÂ-iÂ-ties anÂ-aÂ-lyzed DNA from plant chloroÂ-plasts, the celÂ-luÂ-lar comÂ-partÂ-ments reÂ-sponÂ-siÂ-ble for plantsâ€™ abilÂ-ity to conÂ-vert sunÂ-light inÂ-to sugÂ-ar. JanÂ-sen and colÂ-leagues at his unÂ-iversÂ-ity anÂ-aÂ-lyzed DNA seÂ-quences of 81 genes from chloroÂ-plasts of 64 plant speÂ-cies; UnÂ-iversÂ-ity of FlorÂ-iÂ-da reÂ-searchÂ-ers anÂ-aÂ-lyzed 61 genes from 45 speÂ-cies. The two groups alÂ-so perÂ-formed a comÂ-bined analÂ-yÂ-sis. Through this proÂ-cess they gradÂ-uÂ-ally built a kind of family tree for plants, a diÂ-aÂ-gram of relaÂ-tÂ-ionÂ-ships among linÂ-eages showÂ-ing diÂ-verÂ-sificaÂ-tÂ-ion over the eons. Based on known rates of geÂ-netÂ-ic change checked against fosÂ-sils of known ages, they esÂ-tabÂ-lished a time scale that showed esÂ-tiÂ-matÂ-ed dates of maÂ-jor evÂ-oÂ-luÂ-tionÂ-ary branchÂ-ing events that proÂ-duced new speÂ-cies.PreÂ-viÂ-ous reÂ-search had found that flowÂ-erÂ-ing plants split inÂ-to three branches shortly afÂ-ter apÂ-pearÂ-ing. That proÂ-cess was gradÂ-uÂ-al, at least comÂ-pared with the rapÂ-id radiaÂ-tÂ-ion, or branchÂ-ing out, that folÂ-lowed. The deÂ-tails of that radiaÂ-tÂ-ion have been murky. The latÂ-est studÂ-ies clarÂ-iÂ-fy the picÂ-ture by showÂ-ing that all plants fall inÂ-to five maÂ-jor linÂ-eages that deÂ-velÂ-oped over five milÂ-lion years or less, reÂ-searchÂ-ers said.The diÂ-verÂ-sificaÂ-tÂ-ionâ€™s cause reÂ-mains mysÂ-teÂ-riÂ-ous, said the UnÂ-iversÂ-ity of FlorÂ-iÂ-daâ€™s Pam and Doug Soltis. It could have been spurred by some maÂ-jor cliÂ-matÂ-ic event, they said. Itâ€™s alÂ-so posÂ-siÂ-ble, they added, that a new evÂ-oÂ-luÂ-tionÂ-ary traitâ€”a waÂ-ter-conducting cell that transÂ-fers waÂ-ter up plant stemsâ€”proved so efÂ-fecÂ-tive that it trigÂ-gered a flourÂ-ishÂ-ing of new speÂ-cies.

Courtesy University of Florida and World Science staff

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