8 *Io, Our Moon's Alleged Heat & Young Isotopes on the Moon*

Io Allegedly Burns As a Young Moon

In chapter four of Ackerman's *It's A Young Earth After All* (1993) — still popular among young earthers and still available free online — he puts forth a series of easily refutable claims.

First, Ackerman points out that the Voyager discovered in 1979 that Io had volcanoes. He then claims with no supporting citation that NASA scientists were "excited" because they assumed Jupiter's moon was formed at the same time as Jupiter, 4.5 billion years ago. The scientists supposedly thought that a small body such as Io should lose its heat and dynamism that produces volcanic activity "relatively quickly." (*Id.* at 43.)[1] This is an absolutely false characterization of what NASA expected, as we shall see.

In other words, Ackerman is saying because Io should have cooled off, and no volcanism should still be present, this means Io is young. If it is young, then so is Jupiter which was formed near in time to its moon.

Is it true that NASA expected Io to be non-volcanic because it was very old? Absolutely *not*. Long before 1979, scientists already predicted that Io would have high volcanism despite being very old.

1. Ackerman cites a *Life* magazing article from 1979 in support at http://www.creationism.org/ackerman/AckermanYoungWorldChap04.htm (accessed 12/15/07). However, *Life* magazine is not a scientific journal; it is not written by scientists; and cannot be used as a primary source for science. The statement quoted by Ackerman from *Life* was false although an accurate quote.

When Voyager arrived, it confirmed the prediction of volcanism on Io. Voyager confirmed the expected heat source which supplies Io. It was the fact of Io's proximity to Jupiter, just as predicted. This proximity causes tremendous tidal forces which in turn heat Io's interior by friction. This makes Io the most volcanically active body in the solar system.

Prior to Voyager's arrival at Jupiter and contrary to Ackerman's claim, calculations based on tidal heating predicted Io's volcanism. (See Peale, Casson, and Reynolds, *Science* (1979) Vol.203, at.892-894.).

As is sadly typical, young earthers make blatantly false statements in support of blatantly false claims. Can they really be this ignorant of science? Can they really not be intending to capture some by guile?

But Ackerman is not through. He seems to know something of the issue after all.

Ackerman admits that some scientists believe that Jupiter is pumping Io. He does not explain to us what that means. Obviously, it is a reference to the tidal pull on Io. Ackerman then claims other scientists believe this is a stop-gap solution that "really will not do the job." (*Id.* at 44.) Again, Ackerman provides no cite and no proof for this counter-claim. He then concludes that "maybe Io . . . is not so old after all."

Ackerman's argument about pumping/not-pumping is not put forth in any reliable manner where you can check the claim. If the proposition were so well-established, maybe one could ignore adding citations. But Ackerman knows his ideas are controversial, and it is even more incumbent on him to cite sources.

Assuming Ackerman is correct in every detail, he has not closed every logical loophole so the issue can be resolved. A young earth is not the only answer. If everything he said were true, the facts could mean either (a) Io is young or (b) it is old and tidal friction is causing volcanism. It does not prove Jupiter is young unless Ackerman also provides proof both that (a) Io could not conceivably be caused recently and

(b) that tidal friction is not possibly the cause of Io's volcanism. Only in the latter circumstance can Ackerman arive at the conclusion that the earth/solar system is young.

Ackerman does nothing to provide proof of the missing pieces. Thus, we keep seeing that even if you assume facts that the young earther proposes as true (even when they are clearly false), they still do not use logic to arrive at their conclusion. The inference of a young earth is a fallascious non-sequitur from the proof that they offer.

Our Moon Is Young Due to Its Hot Temperature?

Ackerman continues with more unsupported claims. He says that the lunar material was high in radioactivity. Ackerman then says "scientists conferring at the Fourth Lunar Science Conference wondered how the moon could be very old and not be intensely hot or even melting from the accumulation of heat from the radiation."[2] Ackerman provides no citation and no proof. He then quotes from a creation-science writer, Wysong, and his book *The Creation-Evolution Controversy* (1976), to prove the moon's interior must be "cool" and this "speaks for its youth less than 50,000 years old."[3] The footnote tells you where to buy that book. No explanation is provided for this date by Ackerman.

Thus, Ackerman's logic appears to be:

- lunar material is high in radioactivity;
- if the moon were old, it should be very hot from this radioactive lunar material;
- but the core of the moon is cold.

2. This chapter is available online at http://www.creationism.org/ackerman/AckermanYoungWorldChap04.htm (accessed 12/15/07).
3. R. L. Wysong, *The Creation-Evolution Controversy* (Midland, MI: Inquiry Press, 1976) at 177.

- Therefore, since the moon is cold inside and hot in its lunar rock material, this means the moon is not old, but young.

Does Ackerman have his facts straight?

Are Lunar Materials Generally High in Radioactivity?

Ackerman is citing a mismatch between the cold core of the moon and the allegedly hot radioactive rocks coating the moon. This is repeated over and over at young earth websites.[4] For example, quoting *Age of the Earth* at page 17, we read at one website:

> Lunar radioactive heat. Moon rocks have ***relatively high radioactivity***, indicating a young moon, because of the large amount of heat generated.—[*Age of the Earth*] p. 17.[5]

Is this pictue accurate? No.

An article from the Department of Earth and Planetary Sciences at Washington University, St. Louis, says "most locations on the lunar surface are not high in radioactivity...."[6]

Another reputable source says:

> There are many mares on the moon. Yet, there is no evidence for any volcanic activity after formation of maria: the moon froze – [there was] ***not enough radioactive elements so [there was] no heat***.[7]

4. "But the factor of relatively high radioactivity of those rocks indicates a young age for the moon." See http://evolution-facts.org/Evolution-handbook/E-H-4a.htm (accessed 12/16/07). No cite and no proof is offered.
5. *Creation Evolution Encyclopedia* at http://www.pathlights.com/ce_encyclopedia/Encyclopedia/05agee2.htm (accessed 12/15/07).
6. "Lunar Meteorites," from Department of Earth and Planetary Sciences, of Washington University, St. Louis, reprinted at http://meteorites.wustl.edu/lunar/moon_meteorites.htm (accessed 12/16/07).

Similarly, another scholar writes:

> For the case of the moon, the Western maria on the near side are found to be the most radioactive areas, with highlands on both sides of the moon exhibiting lower radioactivity than the maria and ***lunar radioactivity levels in general less than those of the earth***, which is correlated with different chemical compositions of the two bodies.[8]

Where then did Ackerman and his sources go wrong?

Back in May 1972, the results from Apollo 16 were discussed. There was a solitary anomoly of some ***higher radioactive*** rocks in a very specific area. This higher radioactivity, so localized, was easily explained. Could this small fact have been misread by young earthers into a generalized variance between the *entire* surface of the moon and its core? That appears to be what happened: an erroneous *reading* of what breadth this anomoly covered. Here is all that was said in a *Time* magazine piece about this variance:

> One rock from the Descartes area was ***four or five times as radioactive as those picked up in the lowlands by Apollo 15***, though less than those found by Apollo 14. The reason for this high radioactivity is unknown, but Dr. Farouk El-Baz, a geologist, believes the rock "must be a foreign piece which is not representative of the landing site. The only way it can have gotten there is by being thrown in by impact."[9]

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7. Professor Jay A. Frogel, “The Moon: The Earth’s Sister Planet,” at http://www.astronomy.ohio-state.edu/~frogel/Ast161/outline161_a00_part17.html (accessed 12/16/07).
8. Surkov, Iu. A., “Radioactivity of the moon and planets,” (COSPAR, URSI, IAU, IAGA, and IUGG, Symposium and Topical Meeting on the Progress in Planetary Exploration, Budapest, Hungary, June 2-14, 1980.) *Advances in Space Research*, vol. 1, no. 8, 1981, p. 21-38, cited at http://adsabs.harvard.edu/abs/1981AdSpR...1R..21S (accessed 12/16/07).

Apollo 15 and 16 specifically tested for surface radiation on the moon using a gamma-ray spectrometer.[10] Nothing in the abstracts of scientific articles suggest anything more than in some places the surface radiation is *higher* than at other locations.[11] The U.S. Geology Service likewise said there was a radiation anomoly localized to a small region.[12]

To say in some specific locations the radiation is *higher* than others is not the same as saying the radiation on the *entire* surface of the moon is *high*. Yet, that appears precisely to be the leap in *misintepretation* committed by young earthers.

Even generally non-mainstream sources at least get the facts straight. When we broaden our view to consider what UFO websites say, they focus on the same unusual radioactivity at ***various locations*** on the moon. [13] Then some of these UFO-ologists also — without citation to any source — say that supposedly the top 8 miles of the moon are more radioactive than expected.[14]

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9. "Mysteries from the Moon," *Time* (May 15, 1972) available at http://www.time.com/time/magazine/article/0,9171,903481-2,00.html (accessed 12/14/07).

10. "Lunar Surface Radioactivity: Preliminary Results of the Apollo 15 and Apollo 16 Gamma-Ray Spectrometer Experiments," *Science* 23 February 1973: Vol. 179. no. 4075, pp. 800 - 803. See abstract at http://www.sciencemag.org/cgi/content/abstract/179/4075/800 (accessed 12/16/07).

11. The abstract of the article cited in the prior footnote states in its entirety: "Gamma-ray spectrometers on the Apollo 15 and Apollo 16 missions have been used to map the moon's radioactivity over 20 percent of its surface. The highest levels of natural radioactivity are found in Mare Imbrium and Oceanus Procellarum with contrastingly lower enhancements in the eastern maria. The ratio of potassium to uranium is higher on the far side than on the near side, although it is everywhere lower than commonly found on the earth."

12. astrogeology.usgs.gov/Projects/PlanetaryMapping/DIGGEOL/moon/1047/lftxt.pdf at 8-9 (accessed 12/16/07).

13. http://ufoexperiences.blogspot.com/2005_11_01_archive.html (accessed 12/16/07).

But notice they do not say the radioactive levels are *high*. Or that this presents a mismatch to the core if the moon is billions of years old.

Thus, upon careful research, we could not independently verify what Ackerman was saying. We found the opposite was true. It appears more than likely Ackerman was misreading the evidence about anomolies that are localized to small regions of the moon, and extrapolating further. What about Ackerman's cited source — Wysong?

Wysong's Unverifiable Citations

We then go to the library and pull Wysong's book, and look at page 177. There he repeats the same points as Ackerman. We find the same pattern: conclusions without facts. Wysong then cites in support a long string of alleged proofs. In the next quote, I will give you this string cite verbatim. This is so anyone can later understand that Wysong is engaged in brow-beating, not persuasion. Here is the proof he offers— simply cites with no facts otherwise stated:

> *Proceedings of the Fourth Lunar Science Conference* 3 (1973): 2515; *Science, 176* (1972):976; 181 (1973): 49; *Nature*, 230 (1971): 359; *Journal of Geophysical Research* 76 (1971): 5947; Further Reference in J. Read's Presentation to the

14."The Puzzle of the Moon's High Radioactivity: Apparently, the upper 8 miles of the moon's crust are surprisingly radioactive. When Apollo 15 astronauts used thermal equipment, they got unusually high readings, which indicated that the heat flow near the Apennine Mountains was rather hot. In fact, one lunar expert confessed: "When we saw that we said, 'My God, this place is about to melt! The core must be very hot.'" But that is the puzzle. The core is not hot at all, but cold (in fact, as was assumed, it is a hollow sphere). The amount of radioactive materials on the surface is not only "embarrassingly high" but, difficult to account for. Where did all this hot radioactive material (uranium, thorium, and potassium) come from?" (D. Hatcher Childress, "Eleven Things That NASA Discovered About The Moon That You Never Knew," From *The Anti-Gravity Handbook* http://home1.gte.net/poofalow/moon11.htm, accessed 12/16/07).

> California State Board of Education, May 8,1975, reproduced in *Bible-Science Newsletter*, 13 (1975):5.[15]

Tongue in cheek, I must declare 'fortunately, every reader has all those sources tucked on their shelf.' Wysong, of course, knows this is not true, and hence this is brow-beating. Wysong needs to provide snippet quotes at minimum to give the reader a fair chance to examine the proof for his controversial claims. No one has the time to pick up obscure references. Help us out. Give us something of a sense of what is the evidence.

In fact, if the proof of such a controvesial claim were so clear, then every square inch of a statement needs an appropriate quote and cite, with an adequate snippet of scientific detail to help the reader. We don't get that. We get a string cite.

But God is just. Wysong in 1976 never knew the Internet was coming. Let's see whether we can dig into Wysong's alleged sources using the resources of the Internet at hand.

1. Strike out on *Journal Of Geophysical Research*

Let's start with the article cited as *Journal of Geophysical Research* 76 (1971): 5947. We will find out from the NASA Technical Reports Server (cached section) that this article is titled "Electrical conductivity and temperature of the lunar interior from magnetic transient-response measurements." Its authors are P. Dyal and C.W. Parkin. The NASA

15. You too can pull up Wysong's book through google books. See http://books.google.com/books?id=yNev8Y-xN8YC&pg=PA177&dq=Wysong+The+Creation-Evolution+Controversy+moon+radiation&ei=kfVkR-CgF5a6tgOO4IGnAw&sig=ejAugmufq_WxjXWqSDzakNclTk8#PPA179,M1

abstract summary says its topic is: "Lunar interior electrical conductivity and temperature three-layer model from magnetic transient response measurement in solar wind."

Now we can locate the full text online, which was presented at the Fifth Lunar Conference.[16]

It turns out that this article has nothing to do with radiation. It studies magnetic fields, and the affect of the solar wind on them. Wysong's citation made me suffer reading twelve pages of irrelevant scientific material. Yet, I am no closer to finding corroboration for Wysong's claim. His citation appears to be an effort to brow-beat. To overwhelm the reader with cites a string of multiple sources so as to overwhelm the reader's time and patience. Yet, patient unravelling of Wysong's cites pays off. We are realizing slowly that none of them even remotely confirm his claims.

2. Strikeout on *Nature* 230, 359

The Internet yields us the missing title from Wysong's citation. It is entitled "Lunar Electrical Conductivity Profile,"[17] *Nature* 230, 359 - 362 (09 April 1971). It is partially online still with *Nature*. Its subtitle is: "Measurements of electrical conductivity profile provide information about the mantle–core stratification, near surface thermal gradient, heat flux and composition of the Moon."

We cannot obtain it in full text online. But we can get a description of the key topics. Is radiation one of them, as Ackerman's source, Wysong, claims? No. Here are the descriptive terms for the article:

> ELECTRICAL RESISTIVITY; LUNAR COMPOSITION; LUNAR CRUST; LUNAR TEMPERA-

16.http://articles.adsabs.harvard.edu//full/1974LPSC....5.3059D/0003059.000.html (accessed 12/15/07).

17.The authors are: C. P. SONETT, D. S. COLBURN, P. DYAL, C. W. PARKIN, B. F. SMITH, G. SCHUBERT & K. SCHWARTZ.

TURE; HARMONICS; HEAT FLUX; INTERPLANETARY MAGNETIC FIELDS; LUNAR TOPOGRAPHY; TEMPERATURE GRADIENTS[18]

Other reasonable avenues at *scholar.google* yielded no reference to radiation in any article mentioning this article. It seems that Wysong cited a second irrelevant article.

The proof for brow-beating is mounting.

3. The Fourth Lunar Science Conference 1973

Wysong cites to the Fourth Lunar Science Conference. He gives no date. It took place in 1973! It was discussed in a *Science* magazine article that year.[19] Seven hundred scientists attended.

This conference was summarized by William D. Compton, *Where No Man Has Gone Before* (1996) at 256. He said few results from Apollo 17 were discussed because it had been too soon to do analysis. One result was discussed. It was mentioned that the orange soil was determined to be of likely volcanic origin. The soil was age-dated to 3.5 to 3.7 bya, but this "could not be correlated with any basin-forming event" and therefore could not be attributed to a meteorite impact.

Nothing is mentioned about this supposed radiation incongruity over the entire surface of the moon that Ackerman and Wysong mention. Without a quote and no ready access to this text, I again suspect that *I am being brow-beaten*. I am given cites that cannot be confirmed. The intent appears to be to overwhelm me in that very way rather than to *convince* me with verifiable facts.

18.http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=TRD&recid=A7125632AH&q=Nature%2C+230+%281971%29%3A+359&uid=791868381&setcookie=yes (accessed 12/15/07).

19.*Science* (August 17, 1973) Vol. 181. no. 4100 at 615 - 622.

Moon Contains U-236 and Thorium 230

Ackerman claims that Apollo discovered there also were certain "young istopes" on the moon, namely U-236 and Th-230. He cites only Wysong, a fellow young earther.

Wysong accurately says the half-life of Th-230 is 75,400 years and U-236 has a half-life of 23,400,000. Hence, their presence supposedly means the moon can not be older than either figure since there should no longer be any Th-230 after 160,800 years and no U-236 after 46,800,000 years.[20]

Hence, if the moon were truly old, there should not be 'young' isotopes on the moon. If the moon were over 3 billion years old, these isotopes should be gone. Hence, the only explanation is supposedly that the moon is young.

Ackerman says this puzzle was disingenuously solved by scientists. He says that "uranium, thorium, and rare earth elements" were found in the Fra Mauro basalts in the moon, and were "restricted to the vicinity of the Imbrium Basin." Ackerman then says scientists said these young elements "can be most easily explained by partial melting of the anorthositic crust." As we shall see, no one thought these young isotopes was a puzzle for dating the moon's origin-date. Ackerman is giving a false sense of an inner tension on *dating* issues that is not present in moon rock analysis.

20. See also, Dr. Grady S. McMurtry's article "Is the earth 4,600,000,000 years old? Or, is the earth only 2,191,000 days (6,000 years) old?," at his website http://www.creationworldview.org/articles_view.asp?id=1 (accessed 12/17/07). He writes:

Second, we found two radioactive elements on the surface of the Moon, part of original Moon rock and not added later by impact, which ***could not possibly be there if the Moon were old***. We found abundant amounts of Thorium 230 (***Half Life calculated at 75,400 years***) and Uranium 236 (***Half Life calculated at 23,400,000 years***). After nine or ten Half Life decays there should not be enough material left to get a significant reading. The existence of these elements on the Moon demonstrates that the Moon is young."

The Solution on Thorium-230

Thorium-230 does have a short half life of under 80,000 years. However, it is a decay product of uranium-238 which has a half-life of about 4.468 billion years.[21] Uranium-238 makes up 99.28% of all naturally-occuring uranium isotopes. When it reaches the end, it turns into lead.

Thus, a young isotope such as thorium-230 will be continually generated as long as there is old U-238 on the moon that is still in process of decay. And such U-238, if on the moon *naturally*, can permit the moon to be over 4 billion years old.

So the question comes down to whether there is any U-238 on the moon. If there is, then the moon is potentially *old*. If not, the moon is *young*.

Where is the analysis from Ackerman on this crucial issues? He doesn't go there because he does not want to go there. But that is not science. That is guile. It is tricksterism.

The answer is simple. There is plenty of U-238 on the moon. Because if you find uranium, you always find U-238.[22] Based on various analyses, the moon has twice the content of uranium as does the earth's mantle.[23]

More important, when all the various elements are analyzed from the moon, looking at U-238 (the parent of Th-230), scientists long ago explained how they *perfectly* match the age of the earth as near 4.66 bya. Here is the same statement in scientific form from *Science* for January 30, 1970:

21. Arthur N. Strahler, *Science and Earth History* (Amherst, New York, 1987) at 131.

22. "if a rock contains uranium, it will contain both U238 and some U235...." at "Earth Sun, Moon," at http://faculty.bennington.edu/~nderby/ESM-HW1.html (accessed 12/17/07).

23. Kaare L. Rasmussen*† & Paul H. Warren, "Megaregolith thickness, heat flow, and the bulk composition of the Moon," *Nature* 313, 121 - 124 (10 January 1985), available at http://www.nature.com/nature/journal/v313/n5998/abs/313121a0.html (accessed 12/18/07.

> Concentrations of U[ranium], Th[orium], and Pb in Apollo 11 samples studied are low (U. 0.16 to 0.87; Th, 0.53 to 3.4; Pb, 0.29 to 1.7, in ppm) but the extremely ***radiogenic lead*** in samples allows radiometric dating. The fine dust and the breccia have a ***concordant age of 4.66 billion year***s on the basis of 207Pb/206Pb, 206Pb/***238U,*** 207Pb/235U, and208Pb/232Th ratios. This age is ***comparable*** with the age of meteorites and with ***the age generally accepted for the earth***. Six crystalline and vesicular samples are distinctly younger than the dust and breccia. The **238U**/235U ratio is the same as that in earth rocks, and 234U is in radioactive equilibrium with parent ***238U***.[24]

Thus, far from Th-230 proving a young earth, because it is a decay product of a long-age isotope — U-238 — it *proves*, not *disproves* ,the old age of the earth when correlated with other isotopes found on the moon.

The non-Christian critics are able to hurl insults at the young earthers as a result of this Th-230 claim. The young earthers thereby justly bring dishonor upon the One whom these young earth Christians claim to serve. As the *Evolution Wiki* says as it triumphs over the young earth bogus claims on Th-230:

> And here's the ***wilfully ignorant part***: ... Th-230 ... can be generated through radioactive decay of U-238 — and U-238 is not short-lived. In point of fact, the half-life of U-238 is a bit less than 4.5 billion years! Th-230 is part of the normal sequence of decay products generated by U-238.[25]

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24. Mitsunobu Tatsumoto and John N. Rosholt, "Age of the Moon: An Isotopic Study of Uranium-Thorium-Lead Systematics of Lunar Samples," *Science* (Jan. 30, 1970) Vol. 167. no. 3918, pp. 461 - 463, available at http://www.sciencemag.org/cgi/content/abstract/167/3918/461 (accessed 12/18/07).

Ackerman's Claim of Stumped Scientists

Before we explain U-236, let's mention again that Ackerman claimed the scientists were utterly stumped by the young istope Th-230. He claimed that scientists were grasping at straws, suggesting that they were young due to the melting of the anorthositic crust. This too was utterly false. There was no age-date anomoly that concerned anyone because all scientists knew there was uranium on the moon.

What Ackerman or his sources (apparently Wysong) got mixed up over is something utterly different. There was observation of more such young isotopes near the surface than below. What was puzzling was how to explain why there is more thorium-230 near the surface than below. This is where mention of the anorthositic crust came into play.[26] It had nothing to do with any kind of dilemma posed by a supposedly young istope and the belief in an old moon.

The Solution on U-236

The other argument of Ackerman was that U-236 expires in 25 million or so years, and it too should not be present if the moon is much older than 25 million years.

This is just as bogus about the claim about Thorium 230.

25."Short-lived isotopes Th-230 and U-236 exist on the moon," at http://wiki.cotch.net/index.php/Short-lived_isotopes_Th-230_and_U-236_exist_on_the_moon (accessed 12/17/07).

26.Tatsumoto, M.; Numes, P. D.; Unruh, D. M, "Early history of the moon: Implications of U-Th-Pb and Rb-Sr systematics," NASA, Washington The Soviet-Am. Conf. on Cosmochem. of the Moon and Planets, Pt. 2 (1977) at 507-523 (SEE N78-12958 03-90), abstracted online at http://adsabs.harvard.edu/abs/1977ccmp.conf..507T (accessed 12/17/07).

Solution on U-236

Dalrymple (1991, at 376) says "U-236 is rare but is produced by nuclear reactions in some uranium ores where sufficient slow neutrons are available." In other words, U-236 can be produced in small quantities by neutron capture, in a similar process that creates C-14 here on earth. Or in layman talk, U-236 is produced by uranium ore whenever there is enough slow neutrons in the neighborhood.[27]

If you want the detailed science, here it is. U-236 has a precursor known as Pu-240 which decays by emitting alpha particles. Neutron bombardment from cosmic rays can generate Pu-240 from U-238 by two successive (neutron, gamma) reactions to form U-240 which would then decay by beta emission via Np-240 to Pu-240.[28] This then becomes U-236.

Hence, U-236 has the same origin within an old-age isotope as does Th-230 — Uranium 238. There is plenty of it on the moon. It can have been around for as long as 4 billion plus years.

These young isotope claims never proved a young earth. The true background demonstrates *just the opposite* — that ancient rock is the source of these younger istopes. That anyone would ever *ethically* consider using this argument is hard to fathom.

27.http://wiki.cotch.net/index.php/Short-lived_isotopes_Th-230_and_U-236_exist_on_the_moon (accessed 12/18/07).

28. http://www.asa3.org/archive/asa/199811/0065.html (accessed 12/18/07.)