REFUTATION OF EINSTEINIAN GENERAL RELATIVITY WITH m THEORY

by

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ABSTRACT

It is demonstrated straightforwardly that Newtonian and Einsteinian cosmology are refuted completely by the velocity curve of a whirlpool galaxy. The m theory of cosmology gives a satisfactory description of all galaxies, their shapes are determined by the m (r) function.

Keywords: m theory, refutation of EGR, velocity curve of a whirlpool galaxy.

UFT 421

1, INTRODUCTION.

In immediately preceding UFT papers the m theory of cosmology has been developed in the most general spherically symmetric spacetime {1 - 41}. In Section 2 the m theory is applied to galactic dynamics and structures and it is shown straightforwardly that the Newtonian and Einsteinian cosmologies are entirely refuted by the velocity curve of a whirlpool galaxy. It follows that the m theory is the only available cosmology that does not collapse when tested with the totality of data. Einstein is well known as writing that it takes only one piece of data to refute his theory. This paper is based on Note 420(1) in the UFT section of www.aias.us. and in Section 3, computations and graphics for whirlpool galaxies are summarized.

2. THE m THEORY OF GALAXIES AND REFUTATIONS OF EINSTEIN AND NEWTON.

Consider the Newtonian conic section:

$$r = \frac{\alpha}{1 + \epsilon \cos \phi} \quad -(1)$$

where r is the distance between an object m orbiting an object M, α is the half right latitude, ϵ the ellipticity in the plane polar coordinate system (r, ϕ). The Newtonian orbital linear velocity is defined by:

$$v_N^2 = \dot{r}^2 + r^2 \dot{\phi}^2 = MG\left(\frac{2}{r} - \frac{1}{a}\right) \quad -(2)$$

where in an ellipse for example the semi major axis is:

$$a = \frac{\alpha}{1 - \epsilon^2} \quad -(3)$$

with

$$0 < \epsilon < 1 \quad -(4)$$

From Eqs. (1) and (3):

$$a = \frac{r(1+\epsilon\cos\phi)}{1-\epsilon^2} \quad -(4)$$

so

$$v_N^2 = \frac{MG}{r}\left(2 + \frac{\epsilon^2 - 1}{1+\epsilon\cos\phi}\right) \quad -(5)$$

The Newtonian velocity goes t zero as r becomes infinite. The Newtonian theory is completely refuted therefore in a spiral galaxy, in which v_N is constant as r becomes infinite, and in which the orbit of stars around a central mass is a spiral and not an ellipse.

The Newtonian result (1) is obtained by using the constant angular velocity:

$$L = mr^2\dot{\phi} \quad -(6)$$

and change of variable:

$$\frac{dr}{dt} = \frac{dr}{d\phi}\frac{d\phi}{dt} = \frac{L}{mr^2}\frac{dr}{d\phi} \quad -(7)$$

to give:

$$v_N^2 = \frac{L^2}{m^2r^2}\left(1 + \frac{1}{r^2}\left(\frac{dr}{d\phi}\right)^2\right) \quad -(8)$$

From Eq. (1) it follows that:

$$\frac{dr}{d\phi} = \frac{\epsilon}{\alpha} r^2 \sin\phi \quad -(9)$$

so Eq. (2) follows by straightforward algebra using:

$$\alpha = \frac{L^2}{m^2 MG} \quad -(10)$$

and:

$$a = \frac{\alpha}{1-\epsilon^2} \quad -(11)$$

Note carefully that Newton is not only refuted but refuted completely, by a whirlpool galaxy.

Similarly, consider the well known orbital function of Einsteinian general relativity (EGR), given for example in UFT150:

$$\frac{dr}{d\phi} = r^2\left(\frac{1}{b^2} - \left(1 - \frac{r_0}{r}\right)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} \quad -(12)$$

Here:

$$r_0 = \frac{2mG}{c^2}, \quad \frac{1}{b^2} = \frac{E^2}{L^2c^2}, \quad \frac{1}{a^2} = \frac{m^2c^2}{L^2} \quad -(13)$$

It follows from Eq. (8) that

$$v^2 \xrightarrow[r\to\infty]{} \frac{1}{m^2c^2}\left(E^2 - m^2c^4\right) \quad -(14)$$

The infinitesimal line element of EGR is:

$$ds^2 = c^2 d\tau^2 = m(r)c^2dt^2 - \frac{dr^2}{m(r)} - r^2 d\phi^2 \quad -(15)$$

where τ is the proper time and in which the m (r) function is fixed by the Einstein field equation to be:

$$m(r) = 1 - \frac{r_0}{r} \quad -(16)$$

In the limit:

$$r \to \infty \quad -(17)$$

Eq. (15) becomes the Minkowski infinitesimal line element:

$$ds^2 = c^2 d\tau^2 = c^2 dt^2 - dr^2 - r^2 d\phi^2 \quad -(18)$$

which corresponds to the free particle Einstein energy equation:

$$E^2 = p^2c^2 + m^2c^4 \quad -(19)$$

where the relativistic momentum is:

$$p = \gamma m v_N . \quad -(20)$$

So in Eq. (14)

$$v^2 \xrightarrow[r \to \infty]{} \frac{p^2}{m^2} = \gamma^2 v_N^2 \quad -(21)$$

where v_N is the Newtonian velocity given by Eq. (5). So in EGR:

$$v^2 \xrightarrow[r \to \infty]{} \gamma^2 \frac{mG}{r} \left(2 + \frac{\epsilon^2 - 1}{1 + \epsilon \cos\phi} \right) \to 0 \quad -(22)$$

and is completely refuted by a whirlpool galaxy. In UFT419 EGR was completely refuted by data from the S2 star. So tests aimed at showing that EGR is always precise are meaningless and deeply misleading.

In m theory:

$$v^2 = \frac{L^2 m(r)}{\gamma^2 m^2 r^2} \left(1 + \frac{1}{r^2} \left(\frac{dr}{d\phi} \right)^2 \right) \quad -(23)$$

so it follows that:

$$v^2 = \frac{\left(\frac{L m(r)}{m r} \right)^2 \left(1 + \frac{1}{r^2} \left(\frac{dr}{d\phi} \right)^2 \right)}{1 + \left(\frac{L}{mcr} \right)^2 \left(1 + \frac{1}{r^2} \left(\frac{dr}{d\phi} \right)^2 \right)} \quad -(24)$$

$$L = \frac{\gamma r^2 m \dot{\phi}}{m(r)} \quad -(25)$$

with the constant angular momentum L.

The orbital function $dr/d\phi$ is obtained with the Evans Eckardt equations of motion:

$$\frac{dH}{dt} = 0 \quad -(25)$$

and

$$\frac{dL}{dt} = 0 \quad -(26)$$

in which the hamiltonian is the constant of motion:

$$H = \gamma m(r) mc^2 + U. \quad -(27)$$

The potential energy in Eq. (27) corresponds to the Coates spiral and force law:

$$F(r) = -\frac{k}{r^3} m(r)^{3/2}. \quad -(28)$$

In m space:

$$r_1 = \frac{r}{m(r)^{1/2}} \quad -(29)$$

from which:

$$F_1 = -\frac{\partial U_1}{\partial r_1}, \quad U_1 = -\frac{k_1}{r_1^2}, \quad \frac{1}{r_1} = \frac{\phi}{r_0} \quad -(30)$$

So the velocity curve (8) for a Coates spiral reaches the following limit:

$$v^2 \xrightarrow[r \to \infty]{} \frac{L^2 m(r)}{\gamma^2 m^2 r_0^2} \quad -(31)$$

as r becomes infinite. So the experimentally observed plateau is obtained with a constant m (r) if the orbit is assumed to be the Coates spiral (30).

More generally, Eq. (23) gives:

$$\left(\frac{dr}{d\phi}\right)^2 = \frac{\gamma^2 m^2 r^4 A}{m(r) L^2} \quad -(31)$$

and if:

$$\gamma = \left(m(r) - \frac{v_N^2}{m(r)c^2}\right)^{-1/2} \quad -(32)$$

the most general orbit that gives a plateau in the velocity curve must be:

$$\left(\frac{dr}{d\phi}\right)^2 = \frac{m^2 r^4 A}{m(r)\left(m(r) - \frac{v_N^2}{m(r)c^2}\right)L^2} \quad -(33)$$

derived in the limit:

$$v_N^2 \rightarrow A = \text{constant} \quad -(34)$$

so:

$$\frac{d\phi}{dr} = \left(\frac{m(r)L}{m^2 r^4 A}\left(m(r) - \frac{A}{m(r)c^2}\right)\right)^{1/2} \quad -(35)$$

and

$$\phi = \frac{1}{m}\int \left(\frac{m(r)L}{A r^4}\left(m(r) - \frac{A}{m(r)c^2}\right)\right)^{1/2} dr \quad -(36)$$

The shape of any galaxy can be described by a choice of m (r).

In the limit:

$$v_N^2 \ll c^2 \quad -(37)$$

Eq. (36) becomes:

$$\phi = \frac{L}{mA^{1/2}}\int \frac{1}{r^2}\, dr; \quad m(r) = 1 \quad -(38)$$

which is a Coates spiral. The latter is therefore a well defined limit of m theory.

Einstein and Newton fail completely to describe a whirlpool galaxy or the S2 star. In future, it is expected that many other objects will be found in astronomy which refute the standard model completely. Any such object can be described by m theory.

3. COMPUTATION AND GRAPHICS.

This is a section by co author Horst Eckardt.

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December 28, 2018

3 Computation and graphics

The Euler-Lagrange equations for the potential of the Coates spiral have been solved, giving the trajectories of a mass m in the potential energy

$$U(r_1) = -\frac{m\,k}{2\,{r_1}^2}, \tag{39}$$

defined in the space (r_1, ϕ). The factor of 1/2 has been introduced to obtain the radial force

$$F(r_1) = -m\frac{\partial U(r_1)}{\partial r_1} = -m\frac{k}{{r_1}^3}. \tag{40}$$

In observer space (r, ϕ) the variable r_1 has to be replaced by $r/\sqrt{\mathrm{m}(r)}$. The potential has to be re-defined appropriately in m space and gives an additional force term:

$$U(r) = -m\,k\frac{\mathrm{m}(r)}{2\,r^2}, \tag{41}$$

$$F(r) = m\,k\left(\frac{d\,\mathrm{m}(r)}{dr}\frac{1}{2\,r^2} - \frac{\mathrm{m}(r)}{r^3}\right). \tag{42}$$

The additional force term is caused by $d\mathrm{m}(r)/dr$ and represents a spacetime or vacuum force inferred by m theory.

We have solved the Evans-Eckardt equations in Lagrangian form in four cases:

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1. non-relativistic limit with m(r)=1,
2. non-relativistic limit with exponential m(r),
3. ultra-relativistic limit with m(r)=1,
4. ultra-relativistic limit with exponential m(r).

The equations of motion are those of UFT 420 but computed for the potential (41). The m function was that of Eq. (79) in UFT 419. As already discussed in earlier papers, the derivative of m(r) introduces chaotic behaviour and makes the results very sensitive to the initial conditions. It was possible to use the same initial conditions for cases 1, 2 and 4 but not for case 3. The resulting orbits are graphed in Figs. 1-4. The non-realtivistic limit was realized by setting the velocity of light c to a high value. Obviously effects remain so that the spiral in Fig. 1 has a crossing point. Using an m function m$\neq$ 1 in Fig. 2 changes the result drastically. The ultra-relativistic case in Fig. 3 changes the asymptote to a completely different direction. Using the m function (Fig. 4), the direction is changed again, including a crossing point similar to that in Fig. 1. The velocity curve of case 4 is graphed in Fig. 5 (as a time trajectory). It is seen that the velocity moves asymptotically to a constant value, as known experimentally from spiral galaxies and refuting Einsteinian general relativity.

As an example in (r_1, ϕ) space we have repeated the calculations of case 4 with potential (39) the corresponding equations of motion. It was quite difficult to find non-trivial states, i.e. bound states in spiral-like form. One result is graphed in Fig. 6 where the trajectory describes exactly one loop around the centre. Recalculating the observer variable r according to

$$r = r_1 \sqrt{m(r_1)} \tag{43}$$

shows that a deviation between both coordinates is visible only near to the centre where the m function significantly differs from unity. The same effect is seen for the angular momenta (Newtonian and relativistic) which differ only in this region by a peak of the Newtonian value. A similar result holds for the total energies (Fig. 8). It can be seen that the relativistic energy is a negative constant, i.e. a bound state. Since the orbit is highly non-Newtonian, there is a huge deviation when the mass moves near to the centre.

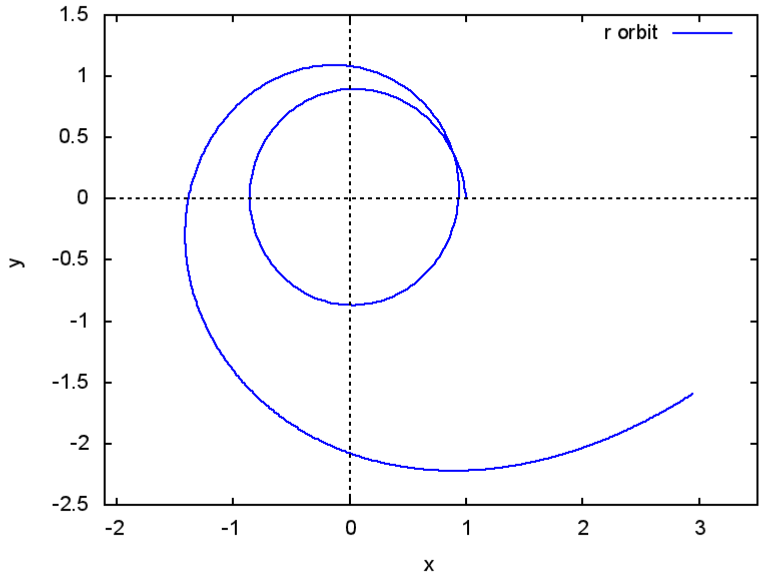

Figure 1: Orbits of Coates spiral in non-relativistic limit with m(r)=1.

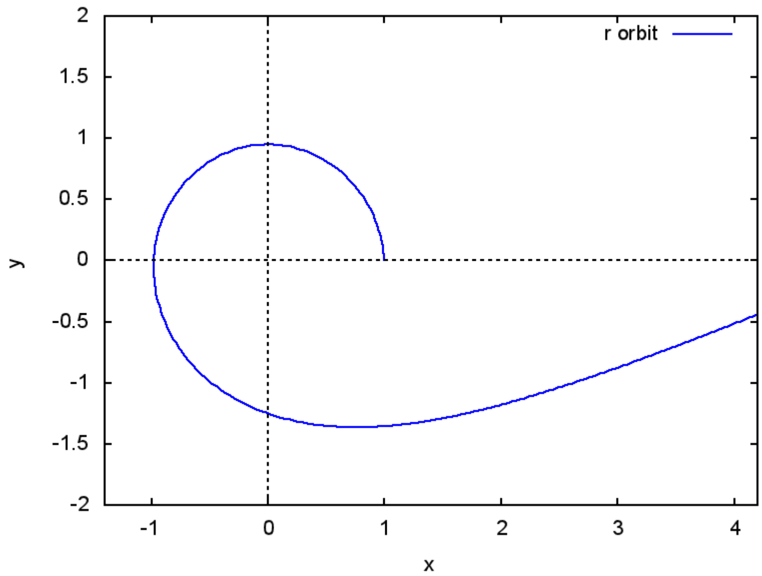

Figure 2: Orbits of Coates spiral in non-relativistic limit with exponential m(r).

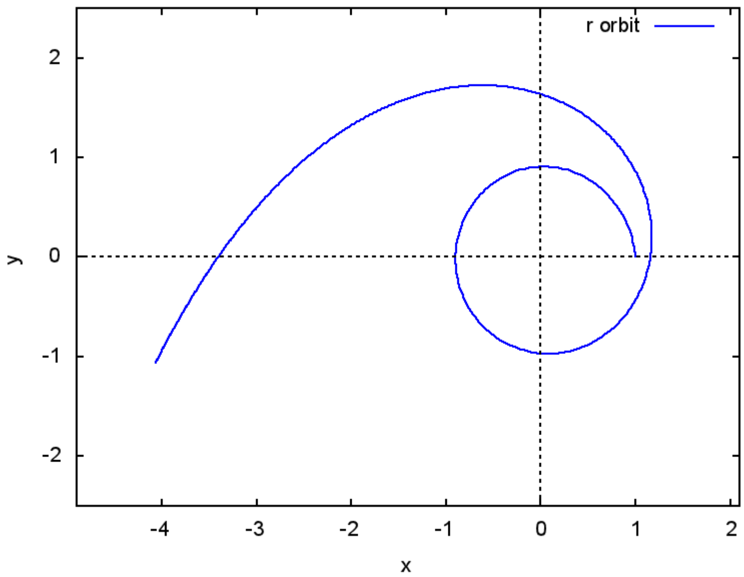

Figure 3: Orbits of Coates spiral in ultra-relativistic limit with m(r)=1.

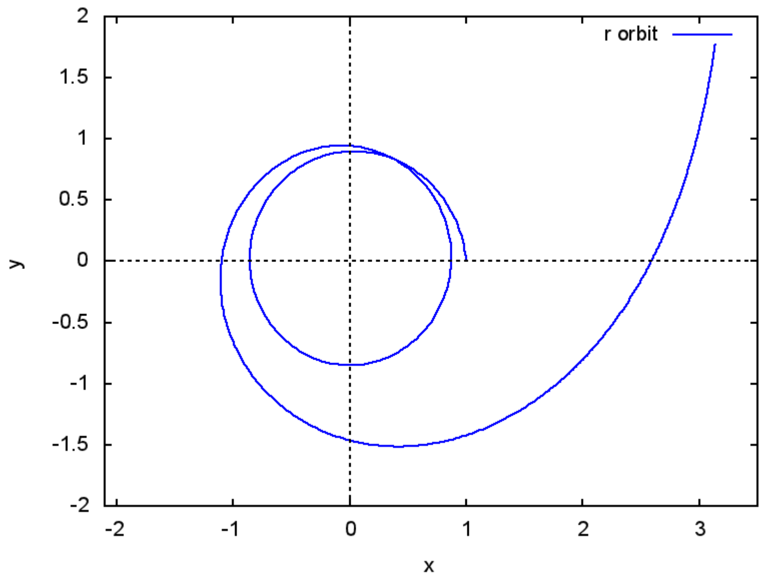

Figure 4: Orbits of Coates spiral in ultra-relativistic limit with exponential m(r).

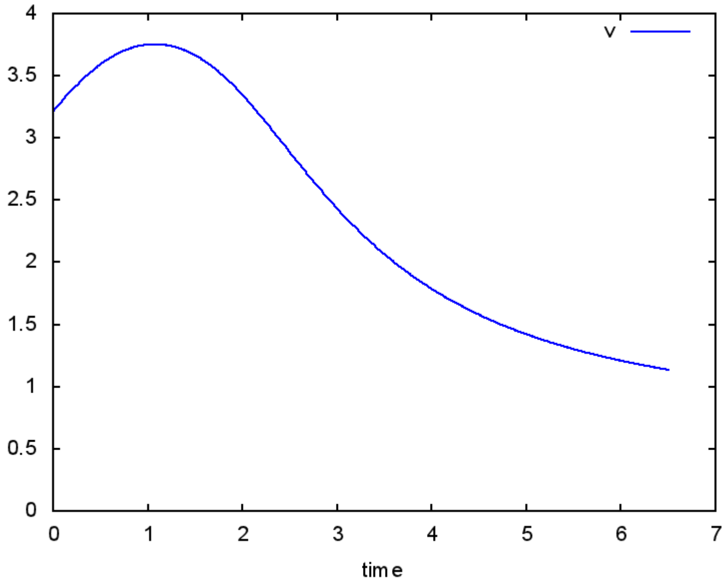

Figure 5: Velocity curve belonging to Fig. 4.

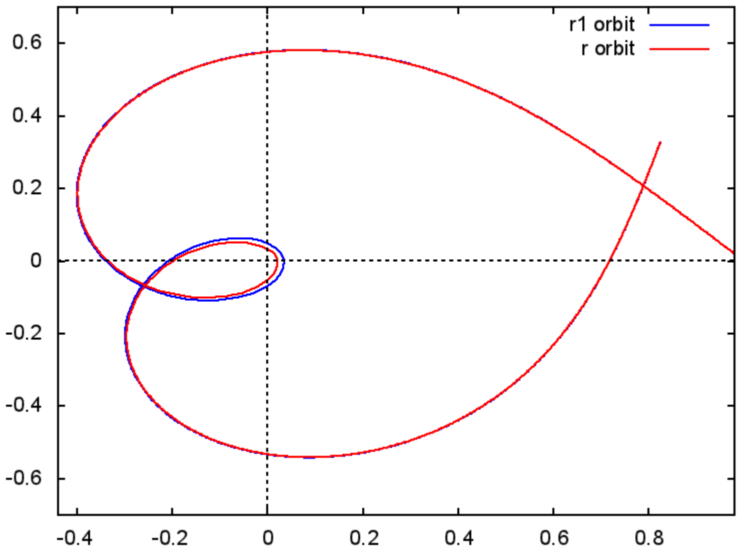

Figure 6: Orbits of Coates spiral in space (r_1, ϕ), ultra-relativistic limit with exponential m(r).

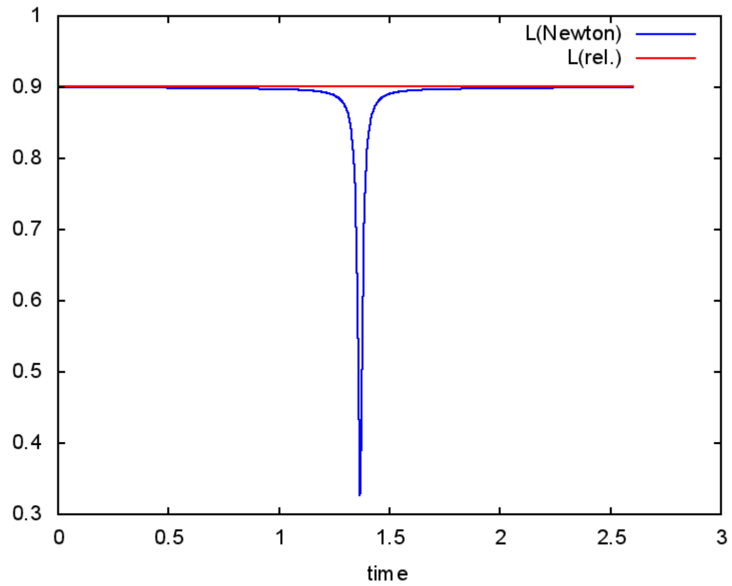

Figure 7: Angular momenta of Coates spiral in Fig. 6.

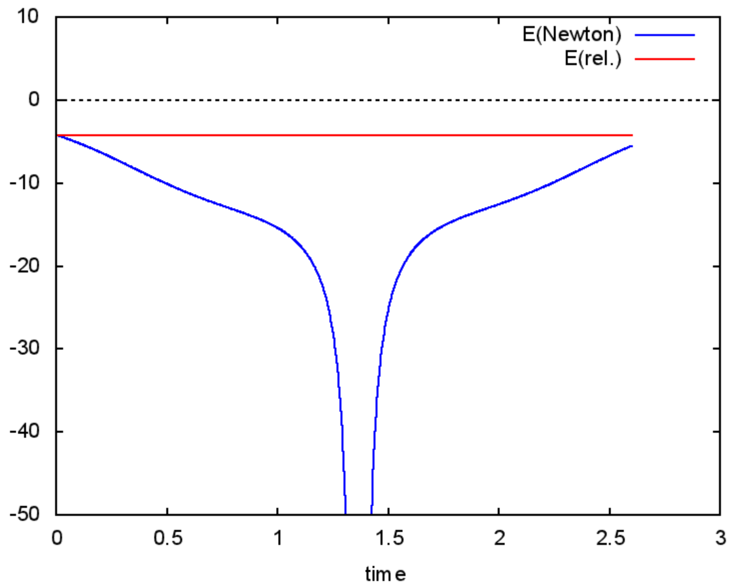

Figure 8: Total energies of Coates spiral in Fig. 6.

ACKNOWLEDGMENTS

The British Government is thanked for a Civil List Pension and the staff of AIAS and others for many interesting discussions. Dave Burleigh, CEO of Annexa Inc., is thanked for voluntary posting, site maintenance and feedback maintenance. Alex Hill is thanked for many translations, and Robert Cheshire nd Michael Jackson for broadcasting and video preparation.

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